

*UNDERSTANDING THE USE OF HYPER-COMPRESSION IN  
MUSIC PRODUCTION: A SYSTEMS BASED APPROACH TO  
EXAMINING INNOVATIVE CHANGE IN THE FIELD OF MUSIC  
PRODUCTION*

**Robert W. Taylor BVA (Newcastle); MDesSc (audio & acoustics)(Sydney)**



**School of Design, Communication and IT**

**Faculty of Science and Information and Technology**

**University of Newcastle**

**A thesis submitted in fulfilment of the requirements for the degree of Doctor of  
Philosophy in Communication and Media Arts**

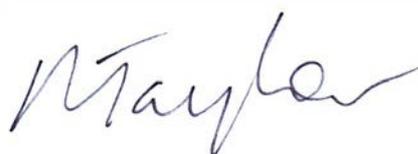
**July 2018**

**This research was supported by an Australian Government Research Training  
Program (RTP) Scholarship**



## DECLARATION

I hereby certify that the work embodied in the thesis is my own work, conducted under normal supervision. The thesis contains no material which has been accepted, or is being examined, for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968 and any approved embargo.

A handwritten signature in black ink, appearing to read 'R Taylor', written in a cursive style.

Signed:

Date: 23<sup>rd</sup> of February 2018

Robert W. Taylor BVA (Newcastle); MDesSc (audio & acoustics)(Sydney)

The University of Newcastle

The following publications are associated to this research project:

Taylor, RW and Martens, WL 2014, 'Hyper-compression in music production: listener preferences on dynamic range', *proceedings of the 136<sup>th</sup> Convention of the Audio Engineering Society*, April, Berlin.

Taylor, RW & Miranda, L 2016, 'Hyper-compression, environmental noise and preferences for the earbud listening experience', *proceedings of the 141<sup>st</sup> Convention of the Audio Engineering Society*, September-October, New York.

Taylor, RW 2016, 'Hyper-compression in music production: the loudness normalisation revolution and implications for music streaming delivery platforms', *proceedings of the 2016 ANZCA conference*, July, Newcastle, Australia.

Taylor, RW 2016, 'Hyper-compression in music production; agency, structure and the myth that "louder is better"', *Journal of the Art of Record Production*, issue 11.

Taylor RW 2017, 'Hyper-compression in music production: the loudness normalisation revolution and implications for music streaming delivery platforms', in McIntyre, P & Fulton, J (eds), *Creating the fifth estate*, Cambridge Scholars Publishing, Newcastle upon Tyne, UK.

Taylor RW 2017, 'Towards Standardised Loudness Normalisation in Music Streaming', conference paper, HDR Congress, School of Creative Industries, The university of Newcastle, November, Newcastle, Australia.

Taylor, RW 2018, 'Hyper-compression in Music Production: Testing the "Louder is Better Paradigm"', *proceedings of the 145th Convention of the Audio Engineering Society*, October, New York, USA.

## ABSTRACT

Described by a leading figure as the “destruction of an entire musical heritage” (Lund i/v, 2015), hyper-compression presents one of the most challenging issues facing Western mainstream popular music in the 21<sup>st</sup> Century. Historically, loudness has been utilised as a mechanism to influence consumer behaviour, taking advantage of the non-linearity of the human hearing mechanism. This process has been described as the “louder is better” paradigm. This paradigm conforms to an underlying belief that listeners consider louder music, both preferred and perceived, as sonically superior to that which is softer. During the so called “Loudness Wars” artists actively sought means to render their recordings as loud as possible, at times exceeding the medium’s limitations. Digital audio technology presented opportunities to significantly increase loudness levels, enabling the average level of an audio signal to be hyper-compressed, resulting in a greater perceived loudness when reproduced. This excessive use of compression, that is hyper-compression, can intercalate a range of undesirable artefacts such as non-linear distortion as various studies have shown. There is now a distinct tension between agent’s notions of loudness as a commercial imperative, its aesthetic intent and the integrity of the audio signal.

This thesis attempts to address why hyper-compression is so prevalent in music production despite scientific evidence that denotes deleterious consequences. Its use in the field exhibits little signs of abatement and therefore appears to represent a dominant structural determinant by acting as a prerequisite for recordings to enter the market. Previous focused research has examined many individual causal factors but has failed to adequately explain why hyper-compression continues to be reproduced as a structure within the popular music field. It is argued here that the issue is representative of a multi-factorial set of conditions that are systemic in nature. The origins of these factors are also illustrative of both objective and subjective concerns, and as such, the methodology underpinning this research project reflects a constructionist ontological position, providing, in addition to the objective work on signal analysis confirming the effect of hyper-compression on recordings and audiences, the necessary foundation for a broader socio-cultural investigation. It is argued that there is a profoundly interrelated system of objective conditions that governs possibilities of action by agents operating in the field of Western mainstream popular music. Understanding why agents *collectively* engage with hyper-compression was the central aim of this study.

To facilitate this aim, a framework was devised that accepts a systems perspective, drawing upon the theories of Csikszentmihalyi, Bourdieu and Rogers. The methodology employed reflects the underlying tenet of this framework, utilising a multi-strategy design of signal analysis and ethnography. Interviews were conducted with 29 industry participants in conjunction with the analysis of music recordings and audience reactions to them. Results indicate that despite the potential for loudness normalisation to mediate the immediate effects of the “louder is better” paradigm, there remains a multitude of factors in play that keep hyper-compression in use. All of the factors examined in this research collectively outweigh concerns focused on the quality of audio alone. It is further argued that a gradual and recursive change in the knowledge and symbolic structure of the domain of music production would be required to diminish the role of hyper-compression as a structural determinant, in a similar manner to the way it was instigated. The possibility of this occurring is discussed, with consideration to the multiple factors outlined in this thesis.

## ACKNOWLEDGEMENTS

My sincerest thanks to all directly and indirectly involved in this research project.

Thank you to my wonderful colleagues that I worked with for four plus years in the infamous “Vegas Room” at the University of Newcastle. You all gave me the strength and support to keep going. Plus, you’re all super fun to hang out with. Denise Mohan Tan, Victoria Jack, Karen Nobes, Ed Reddin, Harry Criticos, Caitlin Parr, Ngaio Stobbs, Yini (A.K.A. “Finn”) Wang, Andrea Xcassin, Deb Wise, Lauren Horder and my dear friend Leicha Stewart. Thanks also for the many hangovers! #phdlife.

One of the biggest issues in researching this topic was getting people to agree to be interviewed. It was surprisingly difficult and frustrating. Therefore, I’m very grateful to those that did participate, and you have my sincerest thanks. Leon Zervos, Jonathan Wyner, Don Bartley, William Bowden, Michael Romanowski, Scott Chae, Bigboom, Eric Broyhill, Björn Engelmann, Cem Oral, Florian Camerer, Sean Magee, John Dent, Alan Moulder, Bob Ludwig, Bob Katz, Thomas Lund, Greg Calbi, Susan Rogers, Bob Horn, Dave Pensado, Lachlan Mitchell, Scott Horscroft, George Massenburg, Andrew Scheps, Tony Mantz, Paul McKercher and Ian Shepherd.

Very near the end of this research, mastering engineer John Dent passed away from a long battle with cancer. He was the first person to agree to be interviewed and even snail mailed the acceptance forms from the UK which was very special and encouraging. He was one of the most interesting people to interview and one of the greatest minds in audio production that I have ever met. We lost someone very special. All that knowledge gone forever. Irreplaceable. I will be forever grateful that you offered so much of the precious time you had left for this research project. Thank you, John.

I am very fortunate to have some amazing friends that supported me unequivocally throughout this process. Sean Lowry, Andrew Barton, Joe Culp, Carl Avery, Simon Gilbert, Jonathan Wyner, Dave Henderson, Delores Foxtonfinn (my guru!), Luis Miranda, Ian Dash and the inimitable Fr. Rod Bower. Special mention to Andrew Magee for acting as my clinical psychologist/psychiatrist over coffee in the library café and various other university haunts.

Thank you to my family for being so patient while I did this. I know I’ve been AWOL in person and emotionally for a long time, but it was a necessary part of the process. I hope you all understand. You can all stop complaining now! Emma, Arlo, Linda, Monique, Paul x 2, Jack and Charlotte. I know Mum and Dad would also be very proud of this too if they were here.

A particular heart-felt thank you to my long-suffering supervisors. Phillip McIntyre, Michael Meany and Bill Martens. I hope I didn’t annoy you all *too* much. Many Thanks also to other members of staff that were so good to me during my time at the University

of Newcastle. Anne Llewellyn, Susan Kerrigan, Simon Weaving, Deb Cook, George Hyde and Andrew Evans.

Last, but not least. I was leaving *you* to the very important end. John Cooper, who more than anyone else contributed to this in so many, many ways. You kept telling me to “just finish it!”. Well here it is. Finished! John... this is for you.

Loudness. Hyper-compression. Shall we begin?



*In memoriam*

John Dent

27.7.54 – 29.12.17

# CONTENTS

<b>1 INTRODUCTION.....</b>	<b>21</b>
<b>2 LITERATURE REVIEW .....</b>	<b>41</b>
2.1 THEORETICAL FRAMEWORK .....	45
2.1.1 <i>The Agent, Agency and Structures</i> .....	46
2.1.2 <i>Habitus</i> .....	47
2.1.3 <i>Capital</i> .....	48
2.1.4 <i>The Systems Model of Creativity</i> .....	53
2.1.5 <i>The Field</i> .....	58
2.1.6 <i>The Domain and its Association to the Field</i> .....	63
2.1.7 <i>The Field as a Social Formation</i> .....	65
2.1.8 <i>Restricted and Large-Scale Production</i> .....	67
2.1.9 <i>Doxa</i> .....	70
2.1.10 <i>The Diffusion of Innovation</i> .....	71
2.2 POPULAR MUSIC AND THE MUSIC INDUSTRIES .....	79
2.3 THE LOUDNESS WAR.....	87
2.3.1 <i>'Brightly Lit Monsters'</i> .....	89
2.3.2 <i>Origins of the Loudness War (1.0)</i> .....	92
2.3.3 <i>The Loudness War (2.0)</i> .....	96
2.4 SOUND AND ITS PERCEPTION – SIGNAL AND RESPONSE.....	102
2.4.1 <i>The Perception of Loudness and Cognitive Response</i> .....	103
2.4.2 <i>Signal Processing</i> .....	114
2.5 CONCLUSION.....	135
<b>3 METHODOLOGY.....</b>	<b>143</b>
3.1 ONTOLOGICAL AND EPISTEMOLOGICAL FOUNDATION .....	146

3.1.1	<i>Ontology—Constructionism</i> .....	148
3.1.2	<i>Epistemology—Cultural Capital and Reflexivity</i> .....	149
3.2	THEORETICAL PERSPECTIVE .....	151
3.3	METHODOLOGY .....	152
3.3.1	<i>Ethnography</i> .....	154
3.3.2	<i>Signal Analysis (Artefact Evaluation)</i> .....	156
3.4	METHODS .....	158
3.4.1	<i>Interviews</i> .....	158
3.4.2	<i>Participant Observation</i> .....	162
3.4.3	<i>Artefact Evaluation</i> .....	164
3.5	DATA ANALYSIS .....	168
3.5.1	<i>Quantitative</i> .....	168
3.5.2	<i>Qualitative</i> .....	168
<b>4</b>	<b>THE LOUDNESS NORMALISATION REVOLUTION AND IMPLICATIONS FOR HYPER-COMPRESSION</b> .....	<b>169</b>
4.1.1	<i>Music Streaming and Loudness Normalisation – the Diffusion of an Innovation</i> .....	171
4.1.2	<i>The Social System</i> .....	176
4.1.3	<i>The Innovation</i> .....	178
4.1.4	<i>The Communication Channels</i> .....	180
4.1.5	<i>Time</i> .....	184
4.2	CONCLUSION.....	193
<b>5</b>	<b>DOMAIN – THE FIELD OF WORKS AND THE SPACE OF POSSIBLES ...</b>	<b>200</b>
5.1	ANALYSIS OF MUSIC CORPUS 1955-2016.....	206
5.2	‘THE GOLDEN SQUARE WAVE AWARDS’ .....	218
5.2.1	<i>Oasis — (What’s the Story?) Morning Glory</i> .....	220

5.2.2 <i>Metallica — Death Magnetic</i> .....	225
5.2.3 <i>Death Magnetic as an Act of Creativity</i> .....	234
5.2.4 <i>Death Magnetic and the Field of Struggles</i> .....	236
5.3 ACTION AND THE TRANSFORMATION OF THE DOMAIN .....	250
5.4 CONCLUSION.....	261
<b>6 THE FIELD – THE SPACE OF POSITIONS.....</b>	<b>268</b>
6.1 THE DEVALUATION OF THE MUSIC INDUSTRIES.....	273
6.2 GATEKEEPERS.....	279
6.2.1 <i>Radio Program Directors</i> .....	281
6.2.2 <i>Artist and Repertoire (A&amp;R) – The Transformation of a Business Model</i> ..	292
6.3 THE CONSUMER .....	299
6.3.1 <i>The Effect of the Playlist</i> .....	302
6.3.2 <i>Headphones and Laptops</i> .....	305
6.4 CONCLUSION.....	310
<b>7 AGENT: SECTION 1 – HABITUS &amp; CAPITAL.....</b>	<b>315</b>
7.1 THE MASTERING ENGINEER.....	318
7.2 THE MIX ENGINEER.....	332
7.3 THE RELATIONSHIP BETWEEN THE MIX AND MASTERING ENGINEER. ....	338
7.4 CONCLUSION.....	344
<b>8 AGENT: SECTION 2 – AGENCY.....</b>	<b>348</b>
8.1 THE INSECURITY OF COMPETITION.....	351
8.2 ARGUMENTS FOR AND AGAINST HYPER-COMPRESSION BY AGENTS .....	358
8.2.1 <i>Arguments for Hyper-compression</i> .....	358
8.2.2 <i>Arguments Against Hyper-compression</i> .....	366
8.3 AESTHETIC CONSIDERATIONS.....	382
8.4 LOUDNESS IN THE PRODUCTION CHAIN .....	392

8.5 THE REFERENCE MIX OR 'ROUGH', AND 'DEMOITIS' .....	397
8.6 CONCLUSION.....	403
<b>9 CONCLUSION .....</b>	<b>408</b>
<b>10 REFERENCES .....</b>	<b>430</b>
<b>11 APPENDICES.....</b>	<b>452</b>

## LIST OF TABLES

<i>TABLE 2.1:</i> THE RELATIONSHIP BETWEEN CAPITAL AND HABITUS RELEVANT SPECIFICALLY TO THE PRODUCTION OF MUSIC. THIS TABLE ILLUSTRATES THIS RELATIONSHIP BY IDENTIFYING THE INTERSECTION BETWEEN THE OBJECTIFIED AND THE EMBODIED. (ADAPTED FROM MOORE, 2014, P. 102).....	50
<i>TABLE 3.1:</i> FIELD EXCURSION SCHEDULE .....	159
<i>TABLE 3.2:</i> LIST OF INTERVIEWEES.....	161

## LIST OF FIGURES

<i>FIGURE 2.1:</i> HYPER-COMPRESSION AS A STRUCTURE IN MUSIC PRODUCTION, INTERPRETED USING CSIKSZENTMIHALYI’S SYSTEMS MODEL OF CREATIVITY, WHERE HIS FRAMEWORK OF DOMAIN, FIELD AND AGENT IS ASSOCIATED WITH CORRESPONDING ELEMENTS OF BOURDIEU’S FIELD THEORY. ....	55
<i>FIGURE 2.2:</i> THE S-CURVE GRAPHS ADOPTION RATE AS A FUNCTION OF TIME.....	77
<i>FIGURE 2.3:</i> THE MUSIC INDUSTRIES IDENTIFIED AS FOUR SEPARATE, INTERRELATED SECTORS: CULTURAL PRODUCTION, COMMERCE, AUDIENCE AND APPLIED FIELDS. ...	85
<i>FIGURE 2.4:</i> THE FIELDS, SUB-FIELDS AND AGENTS OF THE MUSIC INDUSTRIES THAT IS SPECIFICALLY RELATED TO RECORD PRODUCTION, GROUPED AS PER THE FOUR SECTORS OF THE MUSIC INDUSTRIES OUTLINED ABOVE. ....	86
<i>FIGURE 2.5:</i> THIS MODEL ILLUSTRATES LOUDNESS WITHIN THE NON-LINEAR SYSTEM OF COMMERCIALISED MUSIC AND ITS DISSEMINATION AFTER THE INTRODUCTION OF THE JUKEBOX, 7” DISC AND THE MUSIC CHARTS. TO DESCRIBE THE NON-LINEAR PROCESS IN WHICH ALL ELEMENTS ARE INTER-RELATED TO LOUDNESS, IT IS BASED UPON CSIKSZENTMIHALYI’S SYSTEMS MODEL OF AGENT, FIELD AND DOMAIN.....	93
<i>FIGURE 2.6:</i> THE COVER OF THE EDITION OF SOUND ON SOUND MAGAZINE (FEBRUARY 2014) IN WHICH ROBJOHNS REPORTS KATZ DECLARING THAT THE LOUDNESS WARS WERE OVER DUE TO THE INTRODUCTION OF LOUDNESS NORMALISATION ON FILE-BASED ON-LINE STREAMING PLATFORMS.....	101
<i>FIGURE 2.7:</i> PERCEIVED LEVEL OF A 2KHZ TONE AS A FUNCTION OF BURST DURATION. ZWICKER & FASTL SUGGEST THAT FOR DURATIONS LESS THAN 100MS, LOUDNESS WILL DECREASE BY 10 PHON FOR EACH DECADE DECREASE IN DURATION. (SOURCE: ZWICKER AND FASTL 1997) .....	104

*FIGURE 2.8:* THE TRANSIENT PEAKS (COMMONLY KNOWN AS *TRANSIENTS*) ARE ILLUSTRATED IN THIS WAVEFORM WITHIN THE WHITE DOTTED BOX. WE CAN SEE FROM THE LEFT-SIDE-TOP THAT THE HIGHEST PEAK ALMOST REACHES FULL-SCALE. DUE TO THE TEMPORAL INTEGRATION OF THE AUDITORY SYSTEM, THIS PEAK ALTHOUGH INDICATING THE HIGHEST LEVEL OF THE OVERALL SIGNAL, DOES NOT REPRESENT THE LOUDNESS AS PERCEIVED BY THE LISTENER. THE AVERAGE LEVEL (RMS) REPRESENTED BY THE RED SOLID LINE IS MORE REPRESENTATIVE OF THE ACTUAL PERCEIVED LOUDNESS AS OUR AWARENESS OF LOUDNESS IS A TEMPORALLY INTEGRATED EXPERIENCE..... 106

*FIGURE 2.9:* THIS WAVEFORM ILLUSTRATES A SEVERELY HYPER-COMPRESSED SIGNAL WHERE THE TRANSIENT PEAKS HAVE BEEN LARGELY REMOVED. THE AVERAGE LEVEL (RMS) REPRESENTED BY THE RED SOLID LINE HAS BEEN SUBSTANTIALLY INCREASED RESULTING IN A SIGNIFICANT INCREASE IN PERCEIVED LOUDNESS..... 106

*FIGURE 2.10:* THE *FLETCHER-MUNSON CURVES*. A COMPARISON BETWEEN THE CURRENT EQUAL-LOUDNESS-LEVEL CONTOURS (ISO 226:2003) AND THE ORIGINAL CHARACTERISTICS PUBLISHED BY FLETCHER AND MUNSON, AS ILLUSTRATED. (IMAGE SOURCED FROM THE NATIONAL INSTITUTE OF ADVANCED SCIENCE AND TECHNOLOGY, JAPAN..... 108

*FIGURE 2.11:* THE “LOUDER IS BETTER” PARADIGM; IF A LISTENER IS ASKED TO CHOOSE WHICH OF TWO RECORDINGS ARE PREFERED, THEY WILL INVARIABLY CHOOSE THE ONE WHICH IS PERCEIVED AS LOUDER, EVEN IF THEY ARE IDENTICAL RECORDINGS AND THE ONLY DIFFERENCE IS LOUDNESS..... 110

*FIGURE 2.12:* THE SIGNAL, ONCE ENTERING THE SYSTEM IS DUPLICATED AND FOLLOWS TWO PATHS. SIGNAL A IS THE PROGRAM PATH TO BE PROCESSED AND SIGNAL B IS USED FOR ANALYSIS OTHERWISE KNOWN AS THE CONTROL PATH OR *SIDE-CHAIN* (TALBOT-SMITH

1999, p. 2.151). SIGNAL A PASSES THROUGH A VOLTAGE-CONTROLLED AMPLIFIER (VCA) WHICH REGULATES THE GAIN OF THE SIGNAL. THE GAIN OF THE VCA IS DEPENDENT ON A CONTROL SIGNAL THAT COMES FROM EITHER PEAK OR ROOT-MEAN-SQUARE RMS ANALYSIS OF THE SIDE-CHAIN, WHICH IN SIMPLE TERMS, TELLS THE VCA “THERE IS A LOUD SOUND HERE, QUICKLY TURN IT DOWN BY THIS MUCH, AND THIS QUICKLY”. ..... 119

*FIGURE 2.13:* A CLIPPED PEAK IN A SIGNAL. THE SECTION THAT IS HIGHLIGHTED ILLUSTRATES A WAVEFORM THAT HAS BEEN SHAVED OFF AS A RESULT OF THE CLIPPING PROCESS; HENCE, A “SQUARE WAVE”. (SOURCE: ORBAN & FOTI 2001).. 121

*FIGURE 2.14:* TOP: AN AGGRESSIVELY HYPER-COMPRESSED MUSIC RECORDING—NOTE THE LACK OF HEADROOM REPRESENTATIVE OF THE DENSE AMPLITUDE (GREEN COLOUR). BOTTOM: A TRACK EXHIBITING A LARGE DYNAMIC VARIABILITY AS EVIDENT BY THE PRESENCE OF AMPLE HEAD ROOM (BLACK AREA) AND INTACT TRANSIENTS. .... 127

*FIGURE 2.15:* PEAK NORMALISATION VERSUS LOUDNESS NORMALISATION. THE RED LINE INDICATES PERCEIVED LOUDNESS. THIS ILLUSTRATES THAT THE PEAK LEVEL OF AN AUDIO SIGNAL DOES NOT CORRESPOND TO PERCEIVED LOUDNESS AND THE TRADITIONAL METHOD OF USING PEAK METERS TO REGULATE SIGNAL LEVEL CREATED LOUDNESS DISCREPANCIES. LOUDNESS NORMALISATION WHICH INSTEAD MEASURES THE LONG-TERM AVERAGE OF THE ENTIRE AUDIO SIGNAL PROVIDES A CORRELATION WITH PERCEIVED LOUDNESS. (SOURCE: LUND 2011) ..... 128

*FIGURE 3.1:* THE STRUCTURE OF THE RESEARCH METHODOLOGY IS ILLUSTRATED IN THIS FLOW CHART. .... 145

*FIGURE 4.1:* THE PETITION ON CHANGE.ORG, COMMISSIONED BY THE MLA TO ENCOURAGE MUSIC STREAMING COMPANIES TO COMPLY WITH THE SUGGESTED AES TD1004.1.15-

10, RECOMMENDATION FOR LOUDNESS OF AUDIO STREAMING AND NETWORK FILE  
PLAYBACK (AES 2015). (SOURCE: CHANGE.ORG VIEWED: 12 JANUARY 2016.) ... 183

*FIGURE 4.2:* SINCE THE LAUNCH OF SPOTIFY IN 2008, THERE ARE NOW ALLEGEDLY  
HUNDREDS OF DIGITAL PLATFORMS PROVIDING A VARIETY OF SERVICES AND  
'LICENSING MORE THAN 40 MILLION TRACKS'. (SOURCE: IFPI 2017, P.7) ..... 186

*FIGURE 4.3:* MUSIC STREAMING GROWTH FROM 2012 TO 2016 PRESENTS AN INCREASE IN  
REVENUE FROM US\$1BILLION TO US\$4.6BILLION. A 60.4% INCREASE WAS  
EXPERIENCED IN 2016 FROM THE PREVIOUS YEAR..... 188

*FIGURE 4.4:* GLOBAL RECORDING MUSIC REVENUES FROM 1999 TO 2016. TOTAL REVENUE  
HAD FALLEN 40% BETWEEN 1999 AND 2014, WITH 2016 BEING THE FIRST YEAR TO  
RECORD A SIGNIFICANT INCREASE OF 5.9% WHICH WAS LARGELY DUE TO REVENUE  
FROM THE MUSIC STREAMING SECTOR. (SOURCE: IFPI 2017 P. 11)..... 189

*FIGURE 4.5:* S-CURVE ADOPTION MODEL FOR ALL DIGITAL SERVICES COMBINED  
(DOWNLOAD AND STREAMING) ACCORDING TO THE TOTAL GLOBAL RECORDED MUSIC  
REVENUES. THE LOWER ARROW (50%) INDICATES THE ADOPTION RATE AS OF 2016  
(IFPI 2016, P. 6). THE UPPER ARROW INDICATES A PREDICTION WHERE ADOPTION RATE  
(LATE ADOPTERS) FOR CHANGE WITHIN THE SOCIAL SYSTEM. THE ACTUAL ADOPTION  
RATE REQUIRED FOR SOCIAL CHANGE IS HYPOTHETICAL. .... 191

*FIGURE 4.6:* S-CURVE ADOPTION MODEL FOR MUSIC STREAMING WITHIN DIGITAL SERVICES  
ACCORDING TO THE TOTAL GLOBAL RECORDED MUSIC REVENUES. THE LOWER ARROW  
(59%) INDICATES THE OF ADOPTION RATE AS OF 2016 (IFPI 2016). THE UPPER ARROW  
INDICATES A PREDICTION WHERE ADOPTION RATE (LATE ADOPTERS) FOR CHANGE  
WITHIN THE SOCIAL SYSTEM. THE ACTUAL ADOPTION RATE REQUIRED FOR SOCIAL  
CHANGE AND IS HYPOTHETICAL. .... 191

*FIGURE 5.1:* THE EVOLUTION OF PRRC ACCORDING TO TECHNICAL DEVELOPMENT ON A TIMELINE BETWEEN 1967 AND 2011 OF 4500 WESTERN MAINSTREAM POPULAR MUSIC RECORDINGS. A MEASUREMENT OF 1 SIGNIFIES LESS DRC USED AND 0, MORE. WE CAN SEE THAT CERTAIN TECHNICAL DEVELOPMENTS AND TRENDS INTRODUCED HAVE HAD CONSIDERABLE INFLUENCE ON THE DYNAMIC VARIABILITY OF THE RECORDINGS. THE INTRODUCTION OF “RADIO LIKE PROCESSOR’ I.E. DIGITAL LIMITER IN THE EARLY 90S SIGNIFIES A DRAMATIC INCREASE IN THE USE OF HYPER-COMPRESSION. .... 202

*FIGURE 5.2:* THE 210 MUSIC RECORDINGS CONTAINED IN THE MUSIC CORPUS, ASSEMBLED INTO FIVE-YEAR AVERAGED GROUPS. THE FIVE MEASUREMENT PROCEDURES ARE THEN AVERAGED AND THE MEDIAN PLOTTED: i) *Leq* (DBFS); ii) INTEGRATED LOUDNESS (LUFS); iii) LOUDNESS RANGE (LRA)(LU); AND iv) HIGH LEVEL SAMPLE DENSITY (HLSD)(DBFS). RED DOTTED LINE IS THE OVERALL TREND..... 209

*FIGURE 5.3:* RMS HISTOGRAMS OF i) BOB DYLAN *LIKE A ROLLING STONE* (1965), ii) KAISER CHIEFS *RUBY* (2007) THE RED LINE INDICATES THE SIGNAL LEVEL AVERAGE AS A FUNCTION OF TIME. .... 212

*FIGURE 5.4:* RMS HISTOGRAMS OF i) BEACH BOYS *GOOD VIBRATIONS* (1966), AND ii) PRODIGY *OMEN* (2009). THE RED LINE INDICATES THE SIGNAL LEVEL AVERAGE AS A FUNCTION OF TIME. .... 214

*FIGURE 5.5:* RMS HISTOGRAM OF OASIS (*WHAT’S THE STORY*) *MORNING GLORY?* (1996). THE RED LINE INDICATES THE SIGNAL LEVEL AVERAGE AS A FUNCTION OF TIME... 220

*FIGURE 5.6:* RMS HISTOGRAM OF METALLICA *MY APOCALYPSE* FROM THE ALBUM *DEATH MAGNETIC* (2008). THE RED LINE INDICATES THE SIGNAL LEVEL AVERAGE AS A FUNCTION OF TIME. .... 225

*FIGURE 5.7:* THIS FIGURE ILLUSTRATES THE VARIOUS ENTITIES INVOLVED IN THE CONTROVERSY OF *DEATH MAGNETIC* BY METALLICA (2008) DUE TO ITS EXCESSIVE

LOUDNESS. EACH ENTITY CAN BE LOCATED ON A SCALE BETWEEN ORTHODOXY (OPPOSING HYPER-COMPRESSION) AND HETERODOXY (EMBRACING HYPER-COMPRESSION). GLOBAL AUDIENCE, MEDIA AND PROSUMER CAN BE LOCATED AS POSSIBLY PART OF EITHER END OF THE SPECTRUM DUE TO THE WIDE VARIATION IN THE DOXA OF AGENTS WITHIN THESE GROUPS. .... 249

*FIGURE 11.1:* MUSIC CORPUS REPRESENTS 210 RECORDINGS FROM 1955-2016. THIS GRAPH ILLUSTRATES LEQ IN DBFS. RED DOTTED LINE IS A RUNNING AVERAGE. .... 458

*FIGURE 11.2:* MUSIC CORPUS REPRESENTS 210 RECORDINGS FROM 1955-2016. THIS GRAPHS ILLUSTRATES INTEGRATED LOUDNESS IN LUFS. RED DOTTED LINE IS A RUNNING AVERAGE. .... 459

*FIGURE 11.3:* MUSIC CORPUS REPRESENTS 210 RECORDINGS FROM 1955-2016. THIS GRAPHS ILLUSTRATES LOUDNESS RANGE IN LU. RED DOTTED LINE IS A RUNNING AVERAGE. .... 460

*FIGURE 11.4:* MUSIC CORPUS REPRESENTS 210 RECORDINGS FROM 1955-2016. THIS GRAPHS ILLUSTRATES DR VALUES. RED DOTTED LINE IS A RUNNING AVERAGE. ... 461

*FIGURE 11.5:* MUSIC CORPUS REPRESENTS 210 RECORDINGS FROM 1955-2016. THIS GRAPHS ILLUSTRATES HIGH LEVEL SAMPLE DENSITY IN DBFS. RED DOTTED LINE IS A RUNNING AVERAGE. .... 462

*FIGURE 11.6:* THE 177 MUSIC RECORDINGS CONTAINED IN THE MUSIC CORPUS, ASSEMBLED INTO FIVE YEAR GROUPS. THE FIVE MEASUREMENT PROCEDURES ARE THEN AVERAGED: I) LEQ (DBFS); II) INTEGRATED LOUDNESS; III) LOUDNESS RANGE (LRA); AND IV) HIGH LEVEL SAMPLE DENSITY (HLSD). (SOURCE: ORTNER 2012) ..... 464

*FIGURE 11.7:* THE 177 MUSIC RECORDINGS CONTAINED IN THE MUSIC CORPUS, ASSEMBLED INTO FIVE YEAR GROUPS. THE FIVE MEASUREMENT PROCEDURES ARE THEN

AVERAGED: I) LEQ (DBFS); II) INTEGRATED LOUDNESS; III) LOUDNESS RANGE (LRA);  
AND IV) HIGH LEVEL SAMPLE DENSITY (HLSD). (SOURCE: DERUTY & TARDIEU  
2014) ..... 466

## LIST OF ABBREVIATIONS AND ACRONYMS

A/D	analog to digital [conversion]
AES	Audio Engineering Society
ARIA	Australian Recording Industry of Australia
CAQDAS	computer-assisted qualitative data analysis
CD	compact disc
CF	crest factor
D/A	digital to analog [conversion]
DAW	digital audio workstation
dBFS	decibels full-scale
DR	a dynamic range rating system as used by the Tischmeyer Dynamic Range Meter
DRC	dynamic range compression (also known as dynamic range control)
EBU	European Broadcasting Union
EDM	electronic dance music
HLSD	high level sample density
IFPI	International Federation of the Phonographic Industry
IL	integrated loudness
ISO	International Organisation of Standards
ITU	International Telecommunications Union
JND	just noticeable difference
$L_{eq}$	level equivalent – average level over a period of time
LKFS	loudness K-weighted full-scale
LRA	loudness range
LUFS	loudness unit full-scale
LU	loudness unit
MLA	Music Loudness Alliance

PLR	peak to loudness ratio
PMD	personal media device
PRRC	peak to RMS regression coefficient
SPL	sound pressure level
TP	true peak

## LIST OF APPENDICES

APPENDIX 1 – MUSIC CORPUS SIGNAL ANALYSIS TABLE .....	453
APPENDIX 2 – MUSIC CORPUS SIGNAL ANALYSIS PLOTS.....	458
APPENDIX 3 – GRAPHS FROM ORTNER ANALYSIS 2012 .....	463
APPENDIX 4 – GRAPHS FROM DERUTY AND TARDIEU ANALYSIS 2014.....	465

# 1 INTRODUCTION

In the field of contemporary Western popular music, we can historically position *loudness* as one of the essential mechanisms used by those who produce and disseminate music. First to attract the attention of industry gatekeepers to gain access to the market machinery, and subsequently, to make their product stand out from competitors once it enters the marketplace. Similarly, radio stations have battled for loudness superiority on the airwaves so that when listeners tune in, they are immediately enticed by the superior sound of ‘loud’ as compared to rival stations (Milner 2009, p. 267). Advertising companies have also notoriously used loudness to compel viewers to take notice of products and services by rupturing the narrative flow of television programming (Eggerton 2014). Loudness has been a universal method of influencing consumers and their preferences by exploiting a psychoacoustic phenomenon known as the “louder is better” paradigm<sup>1</sup>, where a louder audio stimulus is accepted as more attractive to a

---

<sup>1</sup> The “louder is better” paradigm; if a person is asked to choose which of two recordings they prefer, they will invariably choose the one which is perceived as louder, even if they are identical recordings and the only difference is loudness. At the core of this assumption is the non-linearity of frequency response of the human auditory system in which listeners are able to gradually perceive a more linear frequency response at increased levels. Therefore, this wide-spread belief articulates that listeners consider louder program material both preferred and perceived as ‘sonically superior’ to that which is softer. This will be discussed in sections 2.4.1.4 and 2.4.1.5.

listener than something which is softer (Milner 2009, p. 248). Moreover, this is often at the expense of the quality of the communication of the intended message and in the case of music, loudness has always been a trade-off between commercial imperatives and audio quality. Similarly, in advertising it represents a trade-off between attracting the consumer's attention or annoying them. However, is this paradigm the only factor involved in this entrenched structure of music production or are there others at play? This is of particular interest and forms a significant part of discussions later within this research project.

The justification behind this production mechanism has been clearly stated in much of the literature as being due to this “louder is better” paradigm. The field of psychoacoustics<sup>2</sup> presents us with a deep understanding of the mechanisms of perceived loudness and its potential uses within this commercial context. This knowledge has also provided us with an understanding of how to increase the perceived loudness of recordings through a process known as dynamic range compression (DRC) more commonly known as “compression”. The effectiveness of this process was considerably expanded upon due to the introduction of digital audio technology in the 1990s which provided extended capabilities (von Ruschkowski 2008, p. 222). The debut of the compact disc in the 1980s introduced a storage and reproduction medium that was devoid of the limitations previously in place by analog counterparts such as the vinyl record (ibid). This enabled the facilitation of high-level audio signals without concerns for frequency response amongst other factors. This, in conjunction with advancements in

---

<sup>2</sup> The Oxford dictionary defines psychoacoustics as ‘the branch of psychology concerned with the perception of sound and its physiological effects’.  
<https://en.oxforddictionaries.com/definition/psychoacoustics> Viewed: 16 March 2016.

digital audio processing a decade later, initiated what has been popularised as the Loudness War. During the Loudness War, artists actively sought the means to make their recordings as loud as physically possible, louder than their competitors and at times exceeding the limitations of the medium. The subsequent refinement and widespread availability and adoption of this digital technology exacerbated the problem and produced a scenario whereby the loudness of recordings increased globally on an unprecedented and sustained scale. This digital technology provided various tools that could reduce the dynamic variability of a music recording, making them loud to such an extent that a new term was introduced to describe this effect, known as *hyper-compression*.

Scientific studies have clearly illustrated the damaging effects that the hyper-compression process causes to the audio signal and perceived audio quality. These studies outline how high-level audio signals such as those that contain hyper-compressed music often exceed the operating capabilities of digital audio reproduction systems. Of particular concern is the introduce of unwanted artefacts defined as non-linear distortion into both the signal path of PCM<sup>3</sup> systems and the encoding/decoding process of file reduction algorithms such as MP3 and AAC (Nielsen & Lund, 2003). Signals that these audio systems were never designed to handle. More anecdotally, these studies have also indicated the possibility of hyper-compression adversely altering properties of the music, which in turn is said to reduce its emotional impact (Vickers 2010a, pp. 5-6). In addition, as a result of the constant loudness level of the hyper-compressed music, a psychophysical condition known as “listener fatigue” has been noted to present a significant concern to the listening experience (ibid, pp. 9-13). For the same reason, it has also been linked in studies as the

---

<sup>3</sup> PCM or pulse-code modulation is the digital representation of an analog signal that is stored in binary code. This system is utilised for many applications such as the compact disc. (Pohlmann 2011, pp. 47-48).

possible cause of hearing loss in conjunction with portable media devices (PMDs) and is recognised as a serious problem to health worldwide (Lund i/v, 2015).

Despite the apparent problems associated with the hyper-compression process mentioned and the fact that research has also indicated that louder recordings do not necessarily correlate with increased sales figures, it is, however, suggested that loud recordings are advantageous in influencing gatekeepers within the music industries (Viney 2008, p. 54, Vickers 2011, p. 349) which thus corresponds to access to industry mechanisms. In addition, almost all participants in the production and dissemination of music are of the belief that a loud recording is necessary as a pre-conditioning of the recording before it enters the marketplace to be competitive. Therefore, the hyper-compression process has become a powerful structure within the paradigm of audio production. In simple terms, no one wants to have a recording that is softer than others in a playlist of music whether it be on the radio, on a personal media player or in a music director's office.

The literature tells us that there has been a significant backlash to the overuse of hyper-compression by various groups within the audio community and some sectors of the audience which has been extensively reported in both the media and by industry bodies such as the Audio Engineering Society (AES). The deleterious aspects of the hyper-compression process have been at the forefront of discussions for almost two decades, but this has done little to dissuade producers of music and the practice has continued largely unabated. Studies have indicated that the loudness of recordings peaked sometime during the mid to later part of the 2000s and has only slightly decreased on average through the measurement of enormous corpuses of popular music dating back to the 1960s (Ortner 2012, p. 92; Deruty & Tardieu, 2014, p. 54). This indicates that hyper-

compression is still considered an essential commercial mechanism in music production and agents feel compelled to hyper-compress their music to be competitively loud as contemporaries within the music market. It could also be suggested that referring to the “louder is better” paradigm as a singular cause, a situation which is reported in much of the literature, is short sighted and fails to address other broader potential causes.

Evidence of this is failing can be found in the discussion amongst industry personnel which points to a potential solution in music streaming with the inclusion of loudness normalisation. Loudness normalisation, is a predictive algorithm that adjusts the level of audio content to the same perceived loudness. Originating from television broadcast, it has since migrated to other forms of content delivery. Although the algorithms to achieve loudness normalisation may differ, it has been implemented across almost all music streaming platforms to primarily solve the problem of the different loudness levels of music from different eras. Many believe this could also present a set of conditions whereby the removal of loudness differences in reproduction would result in music being judged without the bias of loudness. It is thought by some that this logically would negate the need for loud recordings. Notwithstanding that music streaming represents an impressive share of global digital sales of 50% as of 2016 (IFPI 2017, p. 10), this solution has done little to change the mindset of those involved with the production and dissemination of popular music. If loudness bias as a result of the “louder is better” paradigm was the only cause of hyper-compression, then loudness normalisation by reason would have had some impact on production practice. It could be argued that there is no evidence to suggest this is the case.

From the literature, it is clear that not one force alone is sustaining the use of hyper-compression, there is a multitude of interrelated factors at play. Although adding to the overall knowledge base, narrowly defined research of particular aspects of the issue does not adequately explain the complex nature of how hyper-compression became *systemic* within what essentially is a field of cultural production. For example, regardless that hyper-compression has been proven to be damaging to audio quality beyond doubt, those involved in the production and dissemination of music have largely negotiated with or ignored this advice with an overarching aim to be loud and competitive. Therefore, the knowledge that audio quality may suffer because of hyper-compression is mediated as but one of myriad factors at play when choices are made. If we look from the bottom up, music that is produced, travels through various stages of production from writing, demos, pre-production, tracking, mixing and finally mastering before it is delivered to the consumer. Each stage entails decision-making processes. The recording has passed through a multitude of *systems* that have their own specific and shared sets of knowledge and symbolic rules that are governed by objective conditions or *structures* whether they be cultural, psychophysical or economic. This represents a set of scalable systems that at one scale represents the entire record production process. Loudness is a powerful force that exerts influence in the decision-making processes of these systems. It is also expected that loudness ultimately influences the decision-making process of the consumer.

Studies investigating the way the consumer listens to music and their preferences for hyper-compression suggest that the way in which the listener engages with music is cognitively complex (Ronan et al. 2015a). There are countless factors that influence the decision-making strategies of what one could term the “average” listener who is largely representative of the global audience. It could be argued that some factors exert more

influence than others. Unlike the professional audio practitioners who perform roles in production mentioned above, the consumer generally has no idea how music is made and is unaware of the processes involved. Hence their decision-making strategy is vastly different to the professional who most likely has had extensive training in detecting very subtle differences in the sonic qualities of music (Ronan et. al., 2016). It is assumed by those that produce music that one blunt force method to attract the attention of the consumer is through loudness, as all humans are bound by the effects of the non-linearity of the hearing mechanism. This can be substantiated to some degree as argued in (Taylor 2018). In this study, it was found that participants could not reach a significant consensus as to a preference for either hyper-compressed music or un-compressed music when they were at the same loudness level. However, when the experiment was repeated, and the hyper-compressed version was considerable louder—as loud as it would normally be in comparison to the un-compressed version—there was a significant consensus for the louder version (ibid). This differential in loudness between the two versions that is indicative of the hyper-compression process was substantial at around 10dB which suggests that it was the loudness that was the influencing factor in participant responses, and not the hyper-compression process itself (ibid). The perceptual attributes of hyper-compression itself were too weak for the un-trained listener to base definitive preference judgments upon, as opposed to loudness which was quite obvious to the listener. We can therefore say that a substantial increase in loudness level can have significant influence on the listener, however, we could also logically assume that as this loudness differential decreases, so does its influence on the listener. Here lies one of the most important arguments against the use of *excessive* hyper-compression and also that the “louder is better” paradigm cannot be accepted as the sole cause of this state of affairs.

When hyper-compression was first implemented in the 1990s, the loudness differential was substantial between music recordings that were hyper-compressed and those

previously that weren't. This was viewed as giving the newly hyper-compressed music a distinct advantage over softer music. As *all* popular music became hyper-compressed to some degree in the hyper-compression age of the 2000s, the differential between recordings became quite small which begs the question as to whether there is any real advantage in achieving relatively small increases in loudness to be louder than a competitor, as it most likely has very little influence on listener preferences. Therefore, at this time the "louder is better" paradigm arguably ceased to function within this environment. Small increases of 1-3dB beyond what might be considered maximal before more obvious artefacts become noticeable are arguably what is representative of excessive forms of hyper-compression that can cause significant damage to the audio signal, hence there is now a distinct trade-off between loudness for the sake of being as loud as competitor and quality. It is at this point that loudness and hyper-compression took on a completely different existence, one that was borne from the insecurity of competition within the market place, and one which had little bearing on influencing the consumer via the "louder is better" paradigm. It became a structure in music production practice that bore little resemblance to its original function and purpose.

As a by-product of the introduction of digital audio technology and concurrently, the internet and associated culture, the music industries underwent a significant transformation that the multi-national and smaller independent record companies were arguably unprepared for. We can position the proliferation of piracy in the late 1990s as the commencement of this transformation which rapidly led to a devaluation of music (Brabazon 2012, pp. 86-89). This provoked a cascading effect of change in countering this issue starting with the introduction of on-line digital music stores that promoted legal digital downloads such as iTunes Music Store (Strasser 2009). At the same time, digital

technology caused a major disruption to two foundational sectors of the music industries. Firstly, the introduction of the digital audio workstation miniaturised and made affordable production practices that before this time, were strictly the realm of the expensive recording studio (Théberge 2012, p. 83). The second was the internet and associated culture which provided artists and the consumer to connect outside the boundaries of the established record companies, who up until this time, acted as a filter to what music entered the market place. This process is epitomised by Hirsch's filter-flow system in which he states that 'more goods are produced and available than actually reach the consumer. Subsequent to their production, these are processed by a selection system which filters the available products, insuring that only a sample of the available "universe" is ever brought to the attention of the general public' (1970, p. 5). This filtering process was effectively by-passed as artists could record and publish music to a global audience via the internet utilising a plethora of platforms such as SoundCloud and Band Camp. This also rendered the expensive large-scale recording studio virtually obsolete which further devalued the record companies to which these studios were often financially aligned (Théberge 2012, p. 89).

As a consequence, between 1999 and 2014, the amount of product released *dramatically* escalated (Lunney 2014, p. 292), while revenues globally collapsed by an estimated 40% (IFPI 2017, p. 11). Due to this devaluing of music, an environment of intense competition was created and as a result, an atmosphere of intense insecurity. Hyper-compression had not only become a pre-condition for entry into the market place, but it had also become a circumstance where no artist would risk having their recording lower in loudness level than others. This created what Weymouth describes as the *prisoner's dilemma* which can be classified as 'a theoretical two-player game in which the two players may not co-

operate, even if it seems to be in their best interest' (2012, p. 3). It has also been described by some as a type of "cold war" with digital technology as weapons and any de-escalation seemingly improbable. At the front line of the Loudness War was the mastering engineer, responsible for the final stage in the production process in which the music recording is prepared for its release to the consumer. This process involves fine tuning the overall sonic attributes and, most importantly, where the loudness level of the recording is traditionally defined through the implementation of hyper-compression. Therefore, the mastering engineer has to negotiate client expectations and their insecurities which are generally expressed via a comparison to other recordings that the client is familiar with. This loudness level that the client requests is where the trade-off between loudness and quality occurs, which we will discover, can be particularly challenging for the mastering engineer to navigate.

Although the mastering engineer was traditionally the operative that would mediate and perform the process of hyper-compression, during the past decade this role has been adopted by other stages of the production process such as mixing where the final balance of all elements in the music recording is achieved. In fact, loudness had eventually permeated all stages of the production process which added another layer of insecurity, specifically to the various engineers who use hyper-compression as a means to satisfy and/or influence the decision makers who are in positions of authority on the project. As loudness is often equated as a quality judgement, premature stages of the production process were loudness maximised before a comparison was made to already finished and loud product. This meant that all stages of the process were viewed through the lens of loudness during evaluations as to whether the project was achieving its desired goals, to which loudness is of considerable influence. This presents itself as another point of

contention in that the loudness level was then determined at earlier stages, which limited possibilities for action at later stages when it was more pertinent. This manifested into a source of considerable tension between the various production stages and respective engineers who feel as though they are forced to make significant compromises in roles they perform against their better judgement.

Despite the backlash against the practice of hyper-compression by certain areas of the audio community and more discerning consumers, in contrast, there are many operatives in audio production that openly embrace hyper-compression as aesthetic intent. As we will see, loudness and its mediation developed into processes that were actively consolidated into practice, not to simply satisfy commercial imperatives, but to fulfil a function within the creative system. Some of these operatives strongly denounce even the existence of a said Loudness War, nor that loudness represents anything other than a form of artistic expression. Here, hyper-compression is considered not only as a structural mechanism, but also part of an aesthetic sensibility. From this perspective, it is the product of a distinct cultural shift in what is considered art, and agents believe strongly that they should not be delimited in their expression if something is indeed a part of the creative process, despite there being consequences that may not satisfy concerns from a scientific or purist perspective. This cultural shift is also viewed as part of the transformation of the music industries which relates directly to the consumer and the way that they approach music within the new paradigm of the internet and associated technologies.

Yet another part of this transformation was the incorporation of the “prosumer”. Once considered formerly as a music enthusiast or simply a consumer, the prosumer was afforded the means to produce music on many of the same levels as the professional. The

introduction of miniaturised and affordable digital technology characterised by the digital audio workstation (DAW) and the vast array of plug-ins that can be operated from a laptop was directly causal of this uprising. The prosumer also embraced the self-publishing culture of the internet and as such, bypassed traditional modes of filtering. Due to their relative inexperience, they also embraced loudness as a signifier of quality which was enabled via the many plug-ins available that are extremely easy to use. We can identify this group as one of the main proponents of the propagation of hyper-compression to which the professional was now engaged with competitively.

There are many other factors that need to be taken into consideration which are discussed in detail in the following chapters, however, the aforementioned provides a globalised outline of the topic under question. What is clearly evident, it represents a complex array of factors that are highly interrelated. Previous research directly related to the issue of hyper-compression, has addressed many individual factors from arguably narrowly focused perspectives. As an overview, these studies have addressed the following topics: from an historical perspective (Thiele 2005): properties of the audio signal that are effected by the process (Nielsen & Lund 2000, 2003; Lund 2004, 2006); listener preferences on hyper-compression (Campbell, W., Toulson, R. and Paterson, J, 2010; Croghan & Arehart, 2012; Hjortkjær & Walther-Hansen, 2014; Wendl & Lee, 2014; Taylor & Martens, 2014; Ronan et al 2015a, 2016); the perception of dynamic range compression (Ronan et al 2014b, 2015b); loudness and radio (Milner 2009); loudness normalisation and music streaming (Ronan et al. 2014a; Taylor 2017); whether hyper-compression is correlated to increased sales (Viney 2008; Vickers 2011); hyper-compression in the presence of environmental noise (Taylor & Miranda 2016); a post-

human interpretation (Accattatis 2010); and a general overview of factors (Vickers 2010a).

Many of these research studies provide an exemplary understanding of a discrete topic but none provide an adequate explanation as to why hyper-compression acts the way it does within the paradigm of music production from a broader perspective. For example, the evidence from a scientific perspective of what hyper-compression does to the signal from an objective viewpoint, though compelling, has done little to dissuade its use. It could therefore be argued that aesthetic judgment, which forms a salient part of the decision-making strategy of agents in music production, is of course inherently subjective, for it brings together what we might more broadly understand as objective reasons and subjective desires. These being, after all, a subjective union of sensory, emotional and intellectual responses to art, culture and nature. Using scientifically measurable assessments of sense perception as the only criterion for forming a judgment is clearly problematic. Hence the research question posed, *why does the myth persist despite scientific evidence to the contrary?* It could be argued that we have extensive knowledge *about* the issue of hyper-compression as presented, however, we have little understanding *why* it continues to play such a formative role in music production despite this knowledge. Missing from the literature, and as such representing a gap in the knowledge base, is the lack of a socio-cultural investigation from a *systems* approach that examines the use of hyper-compression from the perspective of the structure and interaction of the many factors mentioned within the social system that the agent operates within.

It is argued herein that a sociocultural investigation that considers both subjectivist (action) and objectivist (structure) viewpoints on the same footing is required to provide a better understanding of this issue. There are a multitude of highly interrelated factors and forces that influence the actions of agents and represent a set of objective conditions that provide possibilities for action. These forces exist within a set of scalable, networked systems that span from the initial thought processes of the songwriter, to the various mechanisms that have significant influence on the dissemination of music to the consumer, and all stages in between. The parameters of the investigation need to be broad enough to encapsulate both worlds of the objective and the subjective as they are highly integrated in practice. This kind of approach represents the foundation of Bourdieu's methodology for he argued the inadequacies of examining one devoid the other:

Both subjectivism and objectivism fail to account for what Bourdieu refers to as the 'objectivity of the subjective'. Subjectivism fails to grasp the social ground that shapes consciousness, while objectivism does just the opposite, failing to recognize that social reality is to some extent shaped by the conceptions and representations that individuals make of the social world. (Johnson in Bourdieu 1993, p. 4)

In keeping with the aims of this research project, a theoretical framework is therefore proposed that utilises three separate, but deeply connected philosophical theories: Csikzentmihalyi's systems model of creativity (1997, 1999); Bourdieu's field theory (1993, 1996); and Roger's theory of the diffusion of innovation (2003). It is argued herein that both Csikzentmihalyi and Bourdieu's theories are complimentary for as McIntyre maintains, 'both [...] emphasise the location of the agent in a sociocultural context' (2012, p. 76). In short, Csikzentmihalyi's concept of the circular causality of creativity defined by the agent, field and domain, are integrated with Bourdieu's notions of habitus, doxa, capital, agency and formation of the field; the space of positions, position takings, large-scale and restricted production. This correspondence provides a foundation to examine

an agent's behaviour from within the social system they exist in, and also to dissect this social system into its constituent parts to determine the forces that are imposed upon the agent and how they influence action. We could describe these influences as a set of objective conditions that make action possible. Janet Wolff argues that 'all action, including creative and innovative action, arises in the complex conjunction of numerous structural determinants and conditions' (1981, p. 9).

When considering hyper-compression and its use in audio practice, these objective conditions are not resigned only to those of a biological or physical nature such as the non-linear nature of the hearing mechanism or the formation of an audio signal, but also social mechanisms which Schirato and Yell describe as 'cultural trajectories, literacies and dispositions' (1996, p. 148). Bourdieu maintains that agents 'do not act in a vacuum, but rather in concrete social situations governed by a set of objective social relations' (Johnson in Bourdieu 1993, p. 6). The positioning of the framework of investigation in itself differentiates this research project from all other studies conducted on the topic. As opposed to examining individual objective conditions, this research project examines the issue from the perspective of the agent to whom these conditions present themselves as a field of forces or set of structures that either constrain or enable action. As mentioned, hyper-compression is viewed by some agents, not only as constraint as represented by commercial imperatives, but also as an enabling part of their aesthetic intent. Agents operate within the boundaries of a social formation that Bourdieu describes as the *field* and maintaining positions within this field require the agent to constantly negotiate with these forces and changes that may occur in the social system.

In addition to Csikzentmihalyi and Bourdieu, Rogers' theory of the diffusion of innovation places technology or a given innovation within a social system which therefore has the capacity to invoke social change within that system. We can identify the diffusion of digital audio technology as causal of significant change within the field of Western mainstream popular music as a social system that the agent must negotiate. The introduction of loudness inducing technologies into this social system is recognised as the cause of the Loudness War, and consequently, it is widely recognised that the introduction of loudness mediating technologies has the potential to reverse this circumstance. Rogers' theory articulates the mechanisms involved in the diffusion process, enabling an understanding of the uncertain and predictive nature of determining the trajectory of the diffusion process and what is required to facilitate change.

To achieve the aims of the research project with respect to this theoretical framework, a multi-strategy approach of methodology design is employed under the ontological premise of constructionism (Chapter 3). Crotty maintains that constructionism acts as the bridge between 'the great divide' of 'objectivist research associated with quantitative methods' and 'subjectivist research associated with qualitative methods' (1988, pp. 14-15). The underlying principal of constructionism is that truth and meaning is not within or without the object, we construct meaning through our interaction with the object; 'meanings are constructed by human beings as they engage with the world they are interpreting' (ibid, p 43). Therefore, signal analysis is utilised initially to examine music recordings as cultural artefacts that both Csikzentmihalyi and Bourdieu maintain that as a collective, are the material manifestation of the knowledge and symbol structures of the social system under question. While Csikzentmihalyi denotes this as the *domain* (1997, p. 27), Bourdieu refers to it as the *field of works* and *space of possibles* (1993, p. 37; 1996,

p. 235) which arguably speak of the same thing. Embedded within these artefacts are the means by which something is created. Quantitative in its approach, signal analysis provides an essential insight into the trajectory of hyper-compression temporally, and also the effectiveness of technologies that may have the potential to mediate its use. However, the analysis of artefacts was not always purely conducted from a quantitative perspective. These artefacts also provided much more in the way of understanding the creative system within which their creators operate.

In gaining an insight into the agents who are operatives within the field of Western mainstream popular music, who are bound by the objective conditions of this field which delimit their action, the primary qualitative methodology employed was that of ethnography. Methods utilised were semi-structured interviews in conjunction with participant observation. Twenty-nine interviews were conducted with participants from seven countries which were conducted predominately face to face in their specific environments. These interviews provided an extensive and in-depth insight into a universe of habitus, capital, agency and doxa of agents that provide the means for action and maintaining various positions within the field.

When integrated for interpretation in the analysis stage of the research project, both quantitative and qualitative methods facilitated a systematic deconstruction of the field into the many possible factors that determine agency. These factors are examined in great detail. What will be evident, is that reasons for the establishment and reproduction of the use of hyper-compression as structure is not as straight forward as some would indicate. It involves a vastly complex system of interrelated factors that are physical, economic and cultural in nature. It is exactly this circumstance, it is argued, that answers the research

question which philosophically asks why agents act the way they do despite specific knowledge that informs them, categorically, that it may not be in their best interest. In this instance, it is asking why agents use hyper-compression when scientific research informs us that it is deleterious to audio quality. The answer is that there are a multitude of factors that outweigh this evidence alone, which is representative of but one amongst myriad factors within the social system. The primary argument against the use of hyper-compression largely hinges on this scientific evidence yet the practice continues to proliferate. This evidence and other historical factors are detailed in an exhaustive literature review that encompasses both objective and subjective perspectives.

Chapters 4 to 8 accommodate the analysis of the research project. Chapter 4 examines the potential solution to mitigate hyper-compression as a dominant structure via the introduction of loudness normalisation. The value in examining this topic first, which at first glance may seem counter intuitive to the narrative, is that an understanding how to remove hyper-compression as a structure, also introduces many key factors that hold it in place. Through the lens of Rogers' theory of the diffusion of innovation, music streaming in conjunction with loudness normalisation is investigated as a technology that has the potential to cause change in the social system of music production. Within this discussion, the transformation of the music industries from a physical to digital delivery system to the consumer is introduced, key members of the movement against hyper-compression are identified, and newly introduced technology defined.

The following four chapters (5 to 8) are defined by the three moments of Csikzentmihalyi's systems model of creativity to which elements of Bourdieu's field theory are respectively associated. The first of these chapters (5) under the heading

Domain – the Field of Works and the Space of Possibles, looks to music artefacts for clues to uncover the structures of the domain and the composition of the field that allows changes to the domain. This begins with an initial comparison of the signal analysis conducted on a corpus of 210 music recordings with previous studies. The historical trajectory of hyper-compression is discussed as punctuated by the introduction of various forms of digital technology which caused significant change in the domain. Two specific albums that are representative of these changes, being (*What's the Story*) *Morning Glory?* by UK group Oasis (1995) and Metallica's *Death Magnetic* (2008) are examined as case studies which are addressed both as acts of creativity and examples of the field in action.

The second of these chapters (6) under the heading Field – the Space of Positions, looks at the many agents who represent the field of Western mainstream popular music, the positions they hold and the challenges they face. Within Csikzentmihalyi's systems model of creativity, the field acts as a filter to changes in the domain through the introduction of novel ideas (1997, pp. 43-45). The field, according to Csikzentmihalyi, acts as a "field of experts" who, with expert knowledge of the domain, are best equipped to determine what novel ideas are worthy of inclusion (ibid). Due to the introduction of various forms of digital technology, the internet and associated culture, the music industries experienced the start of an extensive transformation in the late 1990s which continues to this day. The role played by record companies as field of experts diminished significantly during this period as artists and consumers bypassed traditional modes of production and dissemination. This caused the domain to be flooded with unassimilated product which devalued music as a commodity and also a significant downturn in global revenues. As such, an atmosphere of intense insecurity and competition was established within the field which is argued as one of the central tenets to the establishment of hyper-compression as

a dominant structure. This transformation, the role of various gatekeepers, the audience, the effect of the playlist and new modes of reproduction are discussed as key factors in the propagation of hyper-compression.

The last two chapters under the headings Agent – Habitus and Capital (7) and Agent – Agency (8) looks at the individual human agent who operates within the field, the habitus and capital that is required to hold positions, and the objective conditions that determine their agency. In this chapter, the responses of interview participants represent the entirety of the discussion. Topics under question include the roles played by the mastering and mix engineer, their relationship to each other and other agents in the field, the impact of the prosumer, negotiating the intense insecurity of clients, arguments for and against hyper-compression, aesthetic considerations and loudness as a consideration within the production chain, which are extensively examined.

## 2 LITERATURE REVIEW

This literature review is presented in four parts to ameliorate a basic understanding of sometimes complex key concepts and to present current knowledge based on a range of subjects from a narrative that is germane to the topic of hyper-compression. Importantly, a suggested investigative framework into its use in music production is introduced. The review traverses the spectrum of what Grix describes as ‘foundationalism’ and ‘anti-foundationalism’, or more simply, of a subjective or objective nature (2004, p. 61). As a direct example of this constructionist ontological posture, the representation of sound as a dichotomy between the audio signal as an acoustic or electro acoustic property and the human’s subjective response to those signals fundamentally underpins much of this research. Likewise, with a direct address to the socioeconomic jurisdiction of what is described as the music industries, and a subsequent concentration on sectors that are directly involved in the production and dissemination of music as cultural product, a theoretical framework is presented as a mechanism for the investigation into the use of hyper-compression as a *social system*. An analysis of this social system is also based on a foundation which, as Bourdieu attests, ‘subjectivism represents a form of knowledge about the social world based on the primary experience and perceptions of individuals’ and ‘objectivism attempts to explain the social world by [...] focusing instead on the objective conditions which structure practice independent of human consciousness’ (Johnson in Bourdieu 1993, pp. 3-4). Both subjective and objective viewpoints in this review are considered as two sides of the same coin, in which either one without the other is considered an incomplete depiction of the matter as a whole. Therefore, on a broader scale, the review presents both an analysis of current knowledge on an extremely broad

range of topics that are all in some way interrelated, and significant to the subject of the use of hyper-compression. This broad scope is vital in providing the means for such an examination. It also provides a much-needed basis for an understanding of the many, and at times complex concepts that underpin much of the following research project.

Section one introduces a proposed theoretical framework which consists of the confluence of three separate but complementary theories to achieve the main objective of the research project from the perspective of the music industries representing a social system. Relevant aspects of theories by Mihaly Csikzentmihalyi, Pierre Bourdieu and Everett Rogers are discussed which respectively address the topics of creativity, cultural production and the diffusion of innovation – all of which relate individually and collectively to the relevant concerns. Topics include: agent, habitus and capital; the field; the domain; the domain and its association to the field; the field as a social formation; restricted and large-scale production; doxa; and lastly the diffusion of innovation which is represented as a system of four elements – innovation, social system, time and communication channels. It is proposed that these elements provide a means by which to examine the music industries as a complex social system.

Section two presents a brief review of what constitutes the notion of popular music and the music industries with the relevant and current knowledge on the topic. This industry, whose primary focus is the performance, recording and dissemination of popular music is described as a complex set of inter-related sub-industries that are referred to as a set of scalable systems, commonly referred to at one scale, as the music industries. Most importantly, the effect of digital technology is discussed being causal of a significant transformation, most notably to an entrenched economic model resulting in a significant

downturn in global revenues in the decades after a peak in 1999. This review provides an essential background explanation to the structure and composition of the music industries and the challenges it faces with the advancement of technology.

Section three addresses the issue of loudness and the use of hyper-compression as a significant structural factor in music production. From an historical perspective, it examines its trajectory from the mid 20<sup>th</sup> Century onset of the commercial music economy, through to the hyper-compression age commonly referred to as the so-called “Loudness War”. Besides providing this historical perspective, it also provides a fundamental and general overview of the topic as an ongoing concern despite the extensive scientific evidence available which highlights the pitfalls of the hyper-compression process.

Finally, section four addresses the issue from a largely objective perspective, examining topics that are directly related to, and underpinning the hyper-compression process and a range of psychophysical consequences. Key concepts, processes and terminology are defined and presented in two sub-sections. The first sub-section addresses the topic of the perception of loudness and cognitive response (psychoacoustics) which includes the sub-topics of: loudness; temporal integration; the loudness of a music recording; the “louder is better” paradigm and the act of comparison; and listener fatigue. The second sub-section addresses the topic of signal processing and digital systems which includes the sub-topics of: signals and systems; dynamic range; the dynamic range of music; dynamic range compression (DRC); clipping; the compressor/limiter; the deleterious effects of DRC to the audio signal, musicality and music conservation; measurement of dynamic range; and loudness normalisation. A review of these topics is crucial for understanding

much of that which underpins most discussions throughout the research project,  
particularly regarding nomenclature.

## 2.1 Theoretical Framework

For this investigation, it is vital to examine those that produce musical artefacts - the human agent - and the environment in which the agent operates within to get a better understanding of how hyper-compression functions as it does. Hence an examination from the point of view of: the agency of the music artist/practitioner, the agent's ability to make choices; and the structures that are available to that agency by the networks present, that is, the opportunities and limitations for choice of action. Secondly, it examines the creative interaction between the many interrelated entities that perform as discrete systems individually but also act, at the same time, as a network of scalable systems. The relationship between these entities and the agents that inhabit them are examined as a social formation, described by McIntyre as an 'arena of social contestation' (2008, p. 1). The research project therefore proposes a theoretical framework to examine these creative and social systems to expose the relationship between agency and structure in the use of hyper-compression as a creative and mechanical tool.

This framework utilises Csikzentmihalyi's systems model of creativity (1998, 1999); Bourdieu's theories of agent, habitus and capital (1993, 1996); and Roger's theory of the diffusion of innovation (2003). Csikzentmihalyi's systems model of creativity supplies the overarching foundation of the system at work through the concept of domain, field and agent 'to pinpoint the phenomenon of creativity itself and explain the mechanisms which surround it' (McIntyre 2012a, p. 76). Bourdieu then provides the detail of how agents operate and interact within this system, an interaction he often refers to as a *game* in which agents are involved in a 'field of struggles' where they 'strategically improvise

in their quest to maximise their positions' via acquiring various forms of capital (Maton 2012, p. 53). Lastly, technology plays a substantial role in the music industries and can have significant influence on these structures, hence Rogers' theory of how innovation can generate social change by presenting new ways of solving problems or causing disruption to established technological forms is essential to this overall framework (Rogers 2003, p. 7). These concepts of agent, their agency and the structures that define the possibility of action are concepts central to all three theories that are manifested into the overarching theoretical framework.

### 2.1.1 The Agent, Agency and Structures

A common term within all the theories presented in this theoretical framework that defines the individual entity that operates within a field is the *agent*. The agent has been alternatively defined, as a 'person' (Sawyer 2006, p. 123), an 'individual person' (Csikszentmihalyi 1997, p. 28), 'a group, a work team or an ensemble' (Abra 1994; John-Steiner 2000; Paulus & Nijstad 2003; Sawyer 2003 - Quoted in Sawyer 2006, p. 123), or a 'producer' (Bourdieu in Johnson 1993, p. 6). Csikszentmihalyi claims that 'creativity occurs when a person, using the symbols of a given domain [...] has a new idea or sees a new pattern' (1997, p. 28). Therefore, the choices that agents make in the creative process is their *agency*, which Giddens alternatively defines as making decisions and acting upon them (1984, p. 5). Structures exist in any domain and field. They present both opportunities and limitations for choice of action, since 'structure is not to be equated with constraint but is always both constraining and enabling' (ibid p. 25). Without structures, an agent would not know what to do or how to behave within their respective fields. McIntyre describes structures as 'those things or objects thought to determine

actions and behaviours' (2012b, p. 4) and that actions and structures are axiomatically interrelated:

Human agents, all seven billion of them, are inescapably implicated in a set of structures that both limit and enable their agency; agency, in this case, being the ability of a subject to make choice and act on that choice. (ibid)

Bourdieu on the other hand uses the concept of *habitus* 'to transcend the structure/agency dichotomy' (Maton 2012, p. 53), and this notion is described as:

...a "feel for the game", a "practical sense" (*sens pratique*) that inclines agents to act and react in specific situations in a manner that is not always calculated and that is not simply a question of conscious obedience to rules. Rather, it is a set of dispositions which generates practices and perceptions. (Johnson in Bourdieu 1993, p. 5)

### 2.1.2 Habitus

Bourdieu uses the idea of *habitus* to link 'both objective social structure and subjective personal experiences' or what could also be described as the 'outer and inner' forces that guide the actions of agents (Maton 2012, p. 52-53). To operate within a social field the agent must be in possession of an internalised set of dispositions that is accumulated throughout the agent's lifetime, and in particular, a specific set of dispositions that is pertinent to the particular field that the agent wishes to operate within. McIntyre points out that these dispositions represent cultural knowledge that is accumulated via 'a long process of inculcation or immersion in the knowledge, developing a 'feel' for it, or a sense of how it operates' (2012a, p. 205). Without this knowledge, the agent would simply not be able to operate, nor compete within what Bourdieu describes as the 'field of struggles' (Bourdieu 1993, p. 30).

These skills or *dispositions* (as Bourdieu refers to them) may or may not be acquired by formal training/education but nevertheless are acquired over many years of immersion in the field of operation, or life in general for that matter. This is an important part of what Bourdieu defines as habitus; dispositions that are ‘durable’ and ‘transposable’ (Johnson in Bourdieu 1993, p. 5). Bourdieu explains that these dispositions are ‘durable in that they last throughout the agent’s lifetime’, ‘transposable in that they may generate practices in multiple and diverse fields of activity’, and finally that they are “structured structures” in that they inevitably incorporate the objective social conditions of their inculcation’ (ibid).

McIntyre, quoting Grenfell and James echoes this last statement in particular by describing habitus as an ‘acquired system of generative schemes objectively adjusted to the particular conditions in which it is constituted’ (Grenfell & James 1998, p. 14 in McIntyre 2012a, p. 72). Bourdieu points out that the habitus an agent possesses directly corresponds to the position the agent occupies within the field (1993, p. 165). Having a habitus that is advantageously matched to the social system which the agent operates within gives the agent an advantage, and likewise, an incorrectly matched habitus, produces a distinct disadvantage. To sum up, Johnson describes habitus as a ‘theoretical intention...A practical operator of object constructions’ (Johnson in Bourdieu 1993, p.5).

### 2.1.3 Capital

Another concept that is particularly pertinent to Western mainstream popular music is Bourdieu’s concept of *capital* which is closely interlinked with habitus. In fact, one

cannot be considered without the other, especially when discussing the power relations that exist within the field. Like its economic counterpart, Bourdieu's notion of capital describes a broader scheme of transubstantiated currency that can be exchanged within complex social systems and networks—fields. In particular, he posits these forms of capital as currency for trade in power relationships within the field. These can be summarised as; 'economic capital' (monetary), 'social capital' (social networks, family and cultural heritage), 'cultural capital' (forms of knowledge, education, aesthetic preferences) (Bourdieu 1986a, p. 243) and 'symbolic capital' (prestige, celebrity, credentials), of which the latter two are 'particularly important in the field of cultural production' (Johnson in Bourdieu 1993, p. 7). From Bourdieu's perspective, all practices are 'oriented toward the maximising of material or symbolic profit' (Bourdieu 1990, p. 209), in McIntyre's 'arena of social contestation' (2008, p. 1). All four forms of capital can, however, be readily associated to the music industries. Moore asserts that fields therefore 'can be understood as means of production of symbolic capitals of different types and the regulators of the social distribution of those capitals' (2014, pp. 101-102).

To further highlight the non-linear nature of Bourdieu's 'three main "thinking tools"' of field, habitus and capital (Maton 2014, p. 50), we can first examine the relationship between capital and habitus and then 'the nature of the field they are active within' (ibid, p. 51). Regarding the cultural production of music specifically, we can view capital both as objectified in the form of music recordings, audio equipment, concerts and so forth, and also embodied, such as knowledge and dispositions that are incorporated into an agent's consciousness (Moore 2014, p. 102). Between the objectified and the embodied is where capital and habitus intersect (*figure 2.1*).

<b>Forms of capital/types</b>	<b>Objectified</b>	<b>Habitus</b> (dispositions & attitudes)	<b>Embodied</b>
<b>Cultural</b>	Music recordings Concerts Performances	Knowledge of the canon Discrimination of genres & periods "Rules of the game"	Cultural understanding Cultivated taste Social skills Desire for recognition
<b>Scientific</b>	Physics Music Theory Musical instruments Audio production equipment Recording & mastering studios Computers/internet Text books & manuals	Knowledge of problem field Mastery of problem solving techniques Performance Objectivity	Knowledge of music theory Knowledge of audio & acoustic principals Knowledge & ability to manipulate audio systems Desire for peer recognition through innovation

Table 2.1: The relationship between Capital and habitus relevant specifically to the production of music. This table illustrates this relationship by identifying the intersection between the objectified and the embodied. (Adapted from Moore, 2014, p. 102)

The procurement of embodied capital is indistinguishable from the cultivation of habitus, which adapts to the specialised needs of the field through protracted exposure to its structures and knowledge base, and is ‘transposable beyond them’ (ibid, p. 107). Moore confirms this pattern of inculcation and relationship to the field further by stating that:

Cultural capital is acquired in the systematic cultivation of a sensibility in which principles of selection implicit within an environment (a milieu or habitat) translate, through inculcation, into principles of consciousness that translate into physical and cognitive propensities expressed in dispositions to acts of particular kinds [...] habitat  $\Leftrightarrow$  habitus  $\Leftrightarrow$  habituation  $\Leftrightarrow$  habit. (Ibid, p. 108)

Hence, practices are not solely the result of one’s habitus and the capital they possess but also determined by the field in which the agent operates in or within. Bourdieu reviews this relationship in the following equation: [(habitus) (capital)] + field = practice (1986b, p. 101). Thus, ‘one’s practice results from relations between one’s dispositions (habitus) and one’s position in a field (capital), within the current state of play of that social arena (field)’ (Maton 2012, p. 50).

Due to this non-linear, systemic nature of these three elements, any change in one element will effect change in another. Bourdieu believes that fields are dynamic and modified by changes of an agent's position (Johnson in Bourdieu 1993, p. 6) and of course, agent's positions can be modified by a change in their habitus or capital. An example of this kind of modification is exemplified by the introduction of and subsequent access to digital audio technology within the field of music production, radically altered pre-existing power structures. The introduction of this technology has given rise to what could be considered a new form of *techno* capital (a form of objectified capital) that has empowered the consumer as *prosumers* to challenge established traditional networks.

The *prosumer* is a broad term which Comor describes as 'melding the producer with the consumer', representing a significant 'social change' in which the dichotomy between 'the aberrant separation of production and consumption' is removed (2011, pp. 1-2). Ritzer and Jurgenson attest that the term prosumer is 'generally attributed' to Alvin Toffler in *The Third Wave* (1980), in which Toffler notes in 'the rise of the prosumer, the inevitable reintegration of production and consumer in post-industrial revolution society (2010, p. 17). Ritzer and Jurgenson also substantiate that the internet and associated technologies have enabled a 'dramatic explosion' in 'users to produce content collaboratively' in what they describe as Web 2.0, citing many examples such as Wikipedia, Facebook, Youtube and Twitter (ibid, p. 19). It is within these domains that the consumer not only consume content, but also actively provide the content. The literature on this topic is very broad and many terms have been created to explain this phenomenon such as Alex Brun's "produser";

In the emerging social software, 'Web2.0' environment, the production of ideas takes place in a collaborative, participatory mode which breaks down the boundaries between producers and consumers and instead enables all participants to be users as much as producers of information and knowledge, or what can be described as *produsers*. (2008, p.1)

Within the boundaries of music production, the prosumer is defined as the consumer that moves freely into the space of production that was once occupied only by the professional audio practitioner. This is largely due to the persistent introduction of various forms and updates of digital technology that miniaturised and made high-end audio equipment affordable and readily available. Those described as audio enthusiasts or just avid music listeners have therefore been provided with the opportunity to become active participants in the production of music. Cole provides a comprehensive examination of this area through the lens of Bourdieu and his notions of habitus and capital, stating that:

Traditional recording professionals have relied on their cultural capital to portray project studio owners as mere consumers of mass technology: hence within the field of music recording, the term ‘pro-sumer’ also denotes a *pro*-fessional *con*-sumer. In recording circles, the term ‘prosumer’ applies to both a class of technology, mid-level economical recording technology, and the people who buy and use such gear. (2016, p. 451)

Cole goes further to demonstrate how the ‘development of inexpensive digital recording equipment has helped reconfigure the music recording field’ and attests that agents ‘therefore attempt to secure their field position by (re)configuring the field’s major institutions and standards to reflect their own perceptions, tastes, and values’ (ibid, p. 448). The prosumer, in concert with web-based portals such as SoundCloud that contribute a vehicle to share cultural products, has created an entirely new cultural environment that suits their own cultural requisites. It necessarily follows that access to this type of technology can be viewed as a form of capital which Cole also describes as “technological capital”. He states that ‘technological capital accumulates as one finds the most high-tech “bang for the buck” equipment that renders other equipment choices ludicrous’ (ibid, p. 452).

Bourdieu's view that fields can have specific forms of capital that fit the particular dynamic of a field supports this idea of *techno* capital. It could be argued that access to this technology has redistributed the power from the traditional towers of influence to a broader assembly. Taking this one step further, access to this techno capital over time also changed agent's habitus; they had time to learn how to use and discover new ways to utilise this new technology (therefore acquiring cultural capital), further altering the field.

#### 2.1.4 The Systems Model of Creativity

Before continuing to a discussion on the field which is logically next, it is first necessary to introduce Csikszentmihalyi's systems model of creativity as it will be argued that this and Bourdieu's field theory have striking similarities and are complementary; first noted by McIntyre (see for example: 1995a; 1995b; 1997; 2012a). Both theorists present a framework to examine how agents work within a structured system but from different viewpoints. While Bourdieu is more concerned with cultural production within a multi-dimensional social space, Csikszentmihalyi's 'prime concern is to pinpoint the phenomenon of creativity itself and explain the mechanisms which surround it' (McIntyre 2012a, p. 76). It will be argued in this research project that hyper-compression or more generally, loudness, symbolises a key structural influence during all stages of the creative process within the production of contemporary mainstream music. It is also argued that the systems model of creativity will provide a valuable contribution to the examination of this phenomena, as this structural influence exists within the mechanisms mentioned.

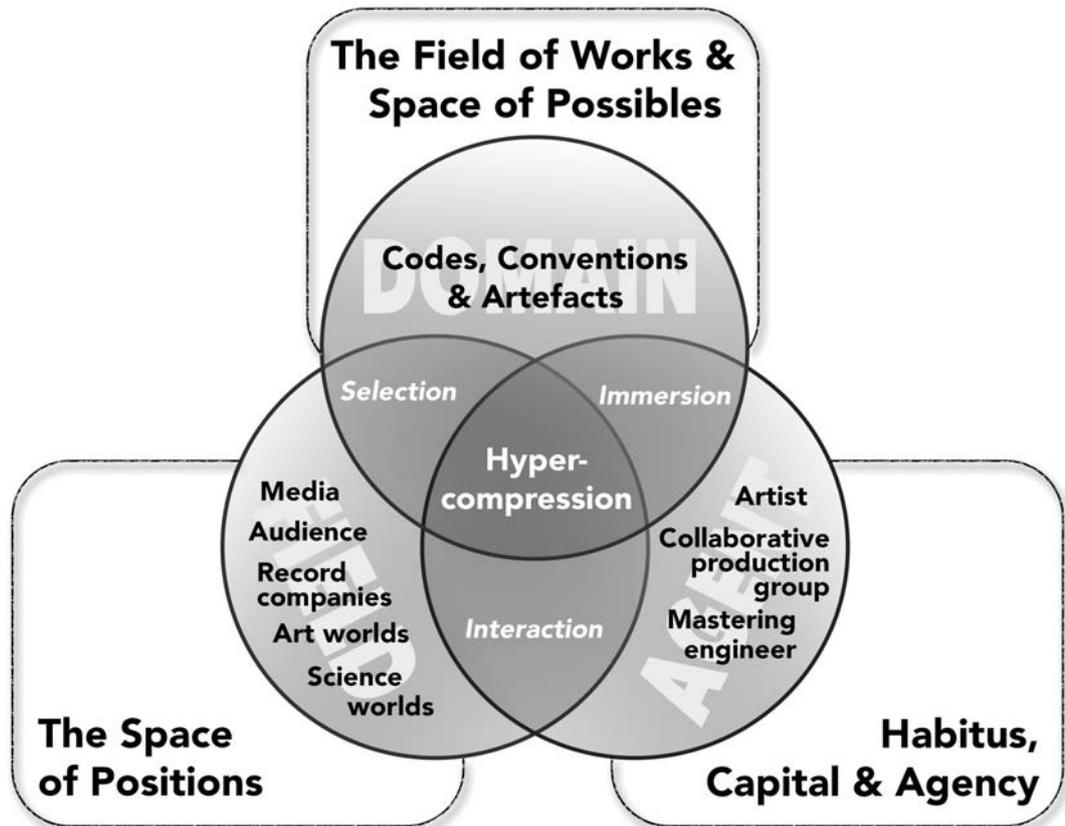
As McIntyre confirms, the agent is bound by structures imposed upon them by the social space they exist within:

The artist's ability to make artistic choices, that is their agency as creative individuals, is seen to be bounded by the institutional constraints of the cultural field they work within, which includes, amongst other things, current technology and the techniques needed to utilise that technology. (2012a, p. 53)

Sawyer maintains that 'creativity can only be identified and judged within a social system' (2006, p. 134) and like Bourdieu's habitus, capital and field, the systems model of creativity that Csikszentmihalyi elucidates is a three-pronged framework. He states that 'creativity results from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings novelty into the symbolic domain, and a field of experts who recognise and validate the innovation. All three are necessary for a creative idea, product, or discovery to take place' (1997, p. 6). This framework can be described more specifically as the:

- i. **Domain:** the sum of all knowledge, symbolic structures and artefacts.
- ii. **Field:** the users who work within and understand the domain and provide the social structures of the music industries, who act as 'gatekeepers' to new inclusions to the domain.
- iii. **Agent:** an individual or collective that actively works with and within the symbolic and social structures of the music industries to create new ideas to be selected by the field for inclusion into its domain (ibid). As explained earlier, there are various terms that have been used to describe the agent by various theorists, such as "person" by Csikszentmihalyi. Despite Csikszentmihalyi never referring to the term agent within his writing, what he describes as the "person" within the

systems model is representative of the general definition of agent and therefore, for the sake of coherence within this research project the term agent will be used herein.



*Figure 2.1:* Hyper-compression as a structure in music production, interpreted using Csikszentmihalyi's systems model of creativity, where his framework of domain, field and agent is associated with corresponding elements of Bourdieu's field theory.

The 'three moments of the same creative process' Csikszentmihalyi characterizes as 'circular causality' (1988, p. 329). He indicates that this represents a non-linear system: the agent requires immersion in the domain to understand its workings; there is an interaction between the agent and the field in which the novel idea brought forward by the agent is presented to the field for appraisal; and the field selects those novel ideas that are deemed exemplary to be included into the domain (consecration). Due to the non-

linear nature of the systems model, creativity can start at any of the three moments of the creative process (ibid). If we apply this model to record production (*figure 2.2*), hyper-compression is signified as both a practice and structure within this model with influence on all three moments - agent, field and domain. The various entities involved are then segregated into their perspective areas, and their influence on each other - immersion, interaction and selection. This represents a circular movement of information and action, a system at play.

The domain that Csikszentmihalyi proposes is the embodiment of all knowledge, symbolic rules and artefacts of a particular discipline (for example: mathematics, literature, medicine, sculpture), we can posit as comparative to what Bourdieu describes in *The Rules of Art* (1996) as the ‘field of works’ and the ‘space of possibles’. This domain is added to or transformed by novel ideas brought forth by the agent. To do this, the agent must have access to this information to make a creative contribution which can be found in the domain. Csikszentmihalyi makes the analogy that ‘one needs to know music to write a creative symphony’ (1988, p. 330). He further adds that:

The information that will go into the idea existed long before the creative person arrived on the scene. It had been stored in the symbol system of the culture, in the customary practices, the language, the specific notation of the “domain”. (1988, p. 329)

To Csikszentmihalyi, an act of creativity is ‘to bring into existence something genuinely new that is valued enough to be added to a culture’ (1997, p. 25). The field acts as a gatekeeper to the domain, effectively screening new ideas for only those of significant value; ‘every field is embedded in a specific social system’ (1988, p. 331). We can equate this with what Bourdieu denotes as the ‘space of positions’ within the field, held by agents who are involved in the ‘consecration and legitimation which make cultural products what

they are' (Johnson in Bourdieu 1993, p. 9). Csikszentmihalyi states that only a 'very small percentage of the great number of novelties produced will eventually become part of a culture' for if all the novelties presented by agents were to be assimilated into the culture, it would '[dissolve] into chaos' (ibid, p. 41). Therefore, the field, which consists of experts, must have an acute knowledge of the domain to know what is truly novel or of some importance to the domain to perform this function. Csikszentmihalyi stresses that the domain functions only as well as the field can operate. If the field allows too many or not enough novel ideas to enter the domain, the domain itself may suffer. Csikszentmihalyi argues that 'at times fields become unable to represent well a particular domain' (ibid, p. 45) and also that 'when a field becomes too self-referential and cut off from reality, it runs the risk of becoming irrelevant (ibid, p. 89).

The agent must also have access to and knowledge of the domain, similar to Bourdieu who believes that for an agent to operate within a field, they must first acquire the necessary habitus or knowledge how to 'play the game', as well as the necessary capital to hold a position (Johnson in Bourdieu 1993, p. 5), Csikszentmihalyi argues that the agent must acquire a considerable understanding of the codes and symbols of the domain through the field of works to navigate it's 'internal logic' and 'respond to this logic' when deciding on which potential problems are to be worked upon (Csikszentmihalyi 1997, p. 87). In this way, the agent's work will be understood and deemed credible by peers within the field. This knowledge is often only available through access to the field which touches upon the Darwinian undertones of Csikszentmihalyi's systems model. The ability to be creative within a field may not solely rely on the talent of the individual, but the luck (as it were) to have access to education, contacts within the field otherwise known as acquiring social capital or any other advantageous situation that may arise from some

‘special sensory advantage’ (ibid, p. 53). In addition, Csikszentmihalyi comprehensively dismisses the romantic notion of the *genius* that acts alone, guided by some higher power and is devoid of any outside influence. He argues that ‘creativity does not happen inside people’s heads, but in the interaction between a person’s thought and a sociocultural context. It is a systematic rather than an individual phenomenon’ (ibid, p. 23). Creativity is built upon what precedes it.

Similarly, Bourdieu also rejects the romantic notion of the individual acting alone and argues that ‘rather than an instance of individual creativity (in accordance with a Romantic conception) or ‘literariness’ (as the formalists would have it), each work thus becomes an expression of the field as a whole’ (Johnson in Bourdieu 1993, p. 11). The agent is of course equally important in the creative process, but their ideas are shaped by knowledge of the domain as they acquire the necessary cultural capital and their output is ultimately consecrated by the field; ‘the information that will go into the idea existed long before the creative person arrived on the scene. It had been stored in the symbol system of the culture’ (Csikszentmihalyi 1988, p. 329). The problem and the solution existed long before the agent.

### 2.1.5 The Field

It has been argued that the notion of *field* presented by both Csikszentmihalyi and Bourdieu are largely complimentary to one other. McIntyre asserts ‘these two authors [deal] in similar territory and may be describing essentially the same phenomenon’ as

‘both authors emphasise the location of the agent in a sociocultural context’ (2012a, p. 76). He goes further to suggest that:

...it can be argued that the systems conception of creativity appears close to what Bourdieu was attempting to do with the concepts of habitus, field, various forms of capital and field of works, that is, provide a way of seeing that recognises the degree of freedom an individual possesses within the constraints and enabling factors of the sociocultural sphere they exist in. (ibid, p. 85)

Here, McIntyre draws a comparison that they both focus ‘on communities that may or may not nurture creativity’ rather than the individual (2012a, pp. 82-83). Bourdieu sees the world in which the agent operates according to the necessary enabling factors and limitations for action, where it is the field, not the agent, which provides the necessary environment for creativity to occur. Similarly, Csikszentmihalyi believes ‘it is the community and not the individual who makes creativity manifest’ (1999, p. 333). Csikszentmihalyi and Bourdieu’s notion of the *field* are closely related and perform similar functions as they can both bring forth change to the domain structure. While Csikszentmihalyi’s field is defined by ‘all those who can affect the structure of the domain’ (Sternberg 1988, p. 330 quoted in McIntyre 2012a, p. 79), it consists in part of a group of experts on a given topic that act as gatekeepers to new ideas entering the domain. Here, the field is almost mechanistic, defining how creativity occurs by the field being either reactive or proactive in encouraging agents to present novelty (Csikszentmihalyi 1997, p. 43). Bourdieu on the other hand, expands the notion of field into that of a ‘structured space’, the ‘space of positions’ and the ‘space of position takings’ (Johnson in Bourdieu 1993, p. 6). Bourdieu’s field is ‘a structured space with its own laws of functioning’ whose:

...structure, at any given moment, is determined by the relations between the positions agents occupy in the field. A field is a dynamic concept in that a change in agents’ positions necessarily entails a change in the field’s structure. (ibid)

Furthermore, it is a world or universe in which there is a complex interaction between agents and the way agents interact with the field's structures, determining action, and hence, also creating change to the structure of the field of works.

Bourdieu's notion of the field is far more expansive than that of Csikszentmihalyi and can be easily understood in very general terms as a game in which the field is described by Thomson as a *football field* in the following:

A football field is a bounded site where a game is played. In order to play the game, players have set positions - when the football field is represented in visual form, it is as a square with internal divisions and an external boundary, with the set positions marked in predetermined places. The game has specific rules which novice players must learn, together with basic skills, as they begin to play. What players can do and where they can go during the game, depends on their field position. The actual physical condition of the field (whether it is wet, dry, well grassed or full of potholes), also has an effect on what players can do and thus how the game can be played. (2014, pp. 66-67)

We can see that Bourdieu not only marks out the space for the field to operate within but also includes the rules of play and a social hierarchy in which there is struggle and conflict. Although, as mentioned, Csikszentmihalyi's theory 'tends to emphasise its Darwinian functionality' (McIntyre 2008, p. 1), seen in its 'right place at the right time' mindset (Csikszentmihalyi 1997, p. 28-29), Bourdieu's partial Marxist mentality of struggle and conflict is not far removed from this conception as they both importantly indicate a necessity to gain *access* to the field.

Within the overarching theoretical framework proposed, it is argued that Csikszentmihalyi's notion of field merges into that of Bourdieu's, because Bourdieu's idea of the field encapsulates everything that Csikszentmihalyi intended and with far greater detail. Therefore, it is unnecessary with this framework to continually refer to either as a separate entity. They are arguably talking about the same thing. Like

Csikszentmihalyi, Bourdieu believed that to understand and place some value on some form of creative act which leads to an outcome such as an artistic work or scientific breakthrough, it is essential to examine the social space in which the act was born. To which, a work is not automatically equipped with value, it is the field who possesses the appropriate knowledge to recognise and bestow such value – the ‘production of value’:

The producer of the value of the work of art is not the artist but the field of production as a universe of belief which produces the value of the work of art as a fetish by producing the belief in the creative power of the artist. Given that the work of art does not exist as a symbolic object endowed with value unless it is known and recognized - that is to say, socially instituted as a work of art by spectators endowed with the aesthetic disposition and competence necessary to know it and recognize it as such - the science of works takes as object not only the material production of the work but also the production of the value of the work or, what amounts to the same thing, of the belief in the value of the work. (Bourdieu 1996, p. 229)

This ‘production of value’ which Bourdieu mentions corresponds directly with Csikszentmihalyi’s notion that ‘jurisdiction over a given domain is officially left in the hands of the field of experts’ (1997, p. 45) and that the field acts as gatekeepers to the domain. Likewise, Bourdieu believes that ‘the work of art is an object which exists as such only by virtue of the (collective) belief which knows and acknowledges it as a work of art’ (1993, p. 35). The field decides what ideas have validity and are worthy of inclusion into the domain. Bourdieu terms this process as ‘consecration’ (see for example: 1996, pp. 122-123), in which the work’s worth is validated through the critical reception of a collective judgement as opposed to individual commentary, within what could be either a closed or open system that is the field. Although the structural formation of the field will be discussed in more detail later, it is important to note here that the closed or open system of the field that Bourdieu alludes to, essentially refers to whether or not the audience is involved in this process of consecration (1993, p. 125). If a work is consecrated only by those strictly within the closed circuit of the field (of experts) then it is a closed field; ‘the field of restricted production’ (ibid). In what he describes as ‘the field large-scale production’ which could be argued is typified by the commercial music

industry, then Bourdieu believes ‘these works are entirely defined by their public’ (ibid). However, it could also be argued that in the case of the music industries, the works must sometimes also pass through a series of gatekeepers (field of experts) before it enters the realm of the audience via the mechanisms of the industry such as record companies and the various associated media outlets (radio broadcast in particular).

Bourdieu also mentions in the above that the field must be ‘endowed with the aesthetic disposition and competence necessary to know [...] and recognize’ the value of the work (1996, p. 229) which also corresponds to the requirements of the agent to be able to function within the field. Csikszentmihalyi asserts that ‘in order to function well within the creative system, one must internalise the rules of the domain and the opinions of the field, so that one can choose the most promising idea to work on and do so in a way that will be acceptable to one's peers’ (1999, p. 332). Both the field and individual agents must acquire the necessary knowledge (habitus) to *play the game*, and more specifically to cultural artefacts such as music, the ability to ‘decode’ the contents of these artefacts. Bourdieu refers to this as an ‘aesthetic disposition’ and as such, an important part of the agent’s habitus. He also believes that this ability is ‘neither a natural nor a universally distributed capability’ and is only acquired by access and participation in the field (Johnson in Bourdieu 1993, p. 23). Schirato and Yell support this by saying that ‘practice is always informed by a sense of agency and that the possibilities of agency must always be grounded in “cultural trajectories, literacies and dispositions”’ (1996, p. 148 quoted in McIntyre 2012, p. 76). McIntyre agrees by adding that ‘it can therefore be suggested that it is the interplay between the spheres of an individual’s habits, the field they operate in and the accumulated knowledge that exists in the field of works that makes practice possible’ (ibid).

### 2.1.6 The Domain and its Association to the Field

This accumulated knowledge Csikszentmihalyi denotes as the *domain* - the knowledge, symbolic structures and artefacts - in many ways defines the field for it is this knowledge system that agents must immerse themselves in and utilise in order to be creative. This knowledge and the workings of this structured cultural system must become naturalised as habitus by the agent, for as Csikszentmihalyi asserts, 'every domain has its own internal logic, its pattern of development, and those who work within it must respond to this logic' (1997. p. 87). He further states that:

Knowledge mediated by symbols is extrasomatic; it is not transmitted through the chemical codes inscribed in our chromosomes but must be intentionally passed on and learned. It is this extrasomatic information that makes up what we call culture. And the knowledge conveyed by symbols is bundled up in discrete domains - geometry, music, music, religion, legal systems, and so on. Each domain is made up of its own symbolic elements, its own rules, and generally has its own system of notation. In many ways, each domain describes an isolated world in which a person can think and act with clarity and concentration. (ibid, p. 37)

If the domain defines the field as such, it is difficult therefore to enter into an examination of the field without also examining the domain from which the agent's action is so predisposed. Csikszentmihalyi states that 'we internalise the knowledge of the domain, the concerns of the field, and they become part of the way our minds are organised' (ibid, p. 102). Every new idea that the agent comes up with is built upon what is already known. Although the term *domain* does not exist in Bourdieu's vocabulary, he nevertheless recognises the significance of this body of knowledge that precedes the agent and their actions, and this has a direct influence on the field; 'a field is a separate social universe having its own laws of functioning independent of those of politics and the economy' (Bourdieu 1993, p. 162). As McIntyre points out, 'the concepts of *field of works*, set out by Bourdieu in his book *Rules of Art* (1996), seem remarkably similar to that of the

domain' (2012a, p. 76) and also that the concept of habitus provides a useful tool in understanding 'an individual's personal yet shared background as a factor in the process of creativity' (ibid. P. 77). Like the domain, the field of works represents all historical antecedents of cultural production of the field. What has already been created, presents agents with an understanding of what is possible; what he refers to as the *field of possibles*. Toynbee contends that Bourdieu also includes 'established techniques and codes of production' (2000, p. 38) within the field of works providing what Bourdieu describes as 'an ensemble of probable constraints which are the condition and counterpart of a set of possible uses' (Bourdieu 1996, p. 235). For Bourdieu, these artefacts include the means by which something is created which is stored along with the actual artefact, providing an opportunity for further creation.

We can summarise that there is little need to distinguish between Csikszentmihalyi and Bourdieu's notion of field within this overarching theoretical framework as they are both alluding to a similar thing. On the most basic level, the field is defined as a field of experts (agents) that are in possession of a unique and exclusive knowledge of the domain (or field of works) whose role is to consecrate or reject works. It is, as Bourdieu suggests, 'a separate social universe having its own laws of functioning' (1993, p. 162), that is involved in the production of value of a cultural work. It could also be argued that Csikszentmihalyi's notion of domain (all knowledge, symbolic structures and artefacts) complements Bourdieu's notion of field by representing a boundary delineated by this knowledge which is essential for the field to operate. The boundaries of the field according to Bourdieu are unclear and overlapping with other fields. The domain as described by Csikszentmihalyi may serve as a method to provide such a delineation.

### 2.1.7 The Field as a Social Formation

One of the distinguishing factors between Bourdieu and Csikszentmihalyi is how Bourdieu approaches the field as a social formation within a social space. Thompson examines this very issue concerning the production of music in a recording studio, in which he states that ‘the scale of the systems model of creativity appears to be too large to be applicable to the participants inside the recording studio’ (2016, p. 74). As such Csikszentmihalyi’s theory, it could be argued, is problematic when taking into consideration the collaborative processes that take place in such a scenario that acts as a social space and system (ibid). We could consider the music industries as a social space that includes many objective positions and fields are sub-sets of these positions within that social space that are ‘given coherence by the shared interests, activities and dispositions of the positions of the participants’ (Hardy 2014, p. 231) such as record production or copyright law and so on. Inside this social space is a space of struggles in which agents are involved in a competition for positions within the field:

...a structured social space, a field of forces, a force field. It contains people who dominate and people who are dominated. Constant, permanent relationships of inequality operate inside this space, which at the same time becomes a space in which inside various actors struggle for the transformation or preservation of the field. All the individuals in this universe bring to the competition all the (relative) power at their disposal. It is this power that defines their position in the field and, as a result, their strategies. (Bourdieu 1998, pp. 40-41)

Here, Bourdieu suggests that agents are not only confined to the symbolic rules of the domain which Csikszentmihalyi favours, but also by another set of social structures in which the agent’s position within the field can also determine action. Csikszentmihalyi believes that ‘every field is embedded in a specific social system’ (1988, p. 331). The positions that agents occupy in each field are viewed as relational and determined by the

amount of capital (either economic or symbolic) generated or acquired by the agents. Bourdieu calls this the *space of positions*, and the struggle to either attain or keep these positions as the *space of position takings*, also relational to an agent's habitus and capital - their suitability to the position (Johnson in Bourdieu 1993, p. 6). This position held by the agent within the hierarchy of the field is commensurate with their 'subjective intentions and unconscious dispositions' (their habitus), which as Bourdieu asserts, 'tends to guide agents to their "natural niche" in the structure of the field' (1993, p. 134). The agent must have a well-suited habitus which includes 'an understanding of how particular fields function, a recognition of established field structures and how to interpret them in the struggles for desired field positions' (Hardy 2014, p. 231). The positions within the field are dynamic and can be subject to change due to changes in the structure of the field, which can be the result any type of disruption. Similarly, but in the obverse, 'a change in agents' positions necessarily entails a change in the field's structure' (Johnson in Bourdieu 1993, p. 6). The agent's position also determines the potential for choice of action within the field, which he terms as the *space of possibles* - the type of position can delimit the action of the agent due to the inherent structure of the field.

There is a hierarchy that exists in each field, and in the cultural field in particular, there is a struggle for 'recognition, consecration and prestige' where agents 'engage in competition for control of the interests or resources which are specific to the field in question' (Johnson in Bourdieu 1993, pp. 6-7). This also means that agents are in competition for various forms of capital that are specific to their field, which Bourdieu asserts are not always material or economic. Some forms of symbolic capital that come in the forms of authority over the consecration of cultural works are not always translatable to economic gains, however, can be used as currency in the space of position

takings. Bourdieu places great emphasis within the field of cultural production on the act of consecration and the influence that comes with this act:

All critics declare not only their judgement of the work but also their claim to the right to talk about it and judge it. In short, they take part in a struggle for the monopoly of legitimate discourse about the work of art, and consequently in the production of the value of the work of art. (1993, p. 36)

Hierarchies not only exist within the field but also amongst fields themselves; they can also be dominated or dominant. Some fields wield more power than others within the larger social space and as such, he describes those fields that wield absolute power such as the government or institutions of law and economy as the *fields of power*. Fields within the social space of more specific sectors such as the music industries form a distinct hierarchy with major record companies generally holding the position of power as they have the potential to a) provide economic support to artists, b) provide specialized infrastructure to artists, c) influence gatekeepers of the field, and d) employ studios and music production personnel; they possess vast amounts of various forms of capital (although this dynamic has changed somewhat since the early 2000s).

### 2.1.8 Restricted and Large-Scale Production

Bourdieu goes to great lengths in *The Field of Cultural Production* (1993) to describe the way fields function in exhaustive detail. He examines fields from the scale to which they produce and whom they produce for, how autonomous these fields are to external influence, and how the field's structure influences the output of the agent and the type of capital that is generated from this output. He primarily defines fields as either that of

*restricted production* (which represents the majority of his concentration), or that of *large scale production*, which he explains as:

The field of production per se owes its own structure to the opposition between the field of restricted production as a system producing cultural goods (and the instruments for appropriating these goods) objectively destined for a public of producers of cultural goods, and the field of large-scale cultural production, specifically organized with a view to the production of cultural goods destined for non-producers of cultural goods, 'the public at large'. In contrast to the field of large-scale cultural production, which submits to the laws of competition for the conquest of the largest possible market, the field of restricted production tends to develop its own criteria for the evaluation of its products, thus achieving the truly cultural recognition accorded by the peer group whose members are both privileged clients and competitors. (Bourdieu 1993, p. 115)

We can, of course, view sub-fields of the music industries as belonging to either group, however, we can also generalise with some degree of certainty that the music industries by and large are a commercially driven set of entities that fall under the category of large-scale production. It is within this scale of production that the use of hyper-compression is expressed as a mechanism (what Bourdieu mentions above as 'laws of competition') to exist within this commercial world where the general public - and not other producers - is the main target audience. If we consider the sub-field of classical music, they have a vastly reduced capacity to reach an audience because of the type of specialised habitus required to understand (decode) the music and therefore tend to fall under the category of restricted production; not only because there is a smaller audience base but also that this is music produced largely for other producers. Within the field of classical music, the use of hyper-compression would be considered, as Bourdieu would term, *heresy*, as it represents the "vulgarity" of commercialism (see for example: Moore 2014, pp. 104-106).

We can also view the field of Western mainstream popular music (large-scale production) as heteronomous because as Bourdieu points to in *Rules of Art* (1996), it is influenced by all manner of external influences. One prime example is technology which has had an enormous influence in many facets of the field; musical structure, type of instruments,

generation of genres, recording techniques and so on. The field of classical music (restricted production) on the other hand are autonomous and are relatively resilient to external influences (this field have not been influenced by external influence to adopt the use of hyper-compression). The generation, value and distribution of capital are also vastly different between these two types of functioning fields. The commercial industries are, as Bourdieu asserts, interested in ‘the conquest of the largest possible market’ (Bourdieu 1993, p. 115) and therefore economic capital resulting from extensive sales is the accepted measure of success, which therefore generates various other forms of capital. Classical music, which is resigned to a limited audience and capacity for sales, are “disinterested” in economic capital and may even consider this as negative to acquiring the recognized symbolic capital which has greater currency in this field; which Bourdieu considers to be the ‘economic work reversed’ (Johnson in Bourdieu 1993, p. 7).

The music industries and the use of hyper-compression by those working within this field is predominately what Bourdieu considers the field of large-scale production and the true definition of restricted production (the downtrodden bohemian artist that rejects all that is mainstream) that Bourdieu often refers to, rarely enters the discussion. We can, however, locate various bodies that reject the use of hyper-compression that symbolise a purist (audiophile) disposition. Therefore, the methodological mechanism that Bourdieu presents here is useful in understanding how these various sub-fields function and their relationship to the topic under investigation, for as Bourdieu asserts, ‘the autonomy of a field of restricted production can be measured by its power to define its own criteria for the production and evaluation of its products’ (1993, p. 115).

### 2.1.9 Doxa

Another concept Bourdieu proposes that is key to an understanding of the stance that certain sub-fields and agents adopt concerning the use of hyper-compression, is the notion of “doxa”. Doxa represents an internalised belief system that ‘lies beyond ideologies’ which can ‘generate conscious struggles’ (Deer 2014, p. 115) between what is considered orthodoxy and heterodoxy:

Orthodoxy refers to a situation where the arbitrariness of doxa is recognized but accepted in practice. The "rules of the game" are known and played accordingly. On the other hand, heterodoxy depends on the recognition of the possibility of competing beliefs and on the emergence of such competing beliefs, which entails a move from practical action to discursive exchanges and the emergence of a field of opinion. (ibid, 118)

Doxa is an intrinsic element of Bourdieu’s notion of habitus. It is ‘a set of fundamental beliefs which does not even need to be asserted in the form of an explicit, self-conscious dogma’ (Bourdieu 2000, p. 16). Deer interprets doxa as a shared set of unquestioned beliefs that determines the limits of the agent’s habitus:

In modern societies, doxa refers to pre-reflexive, shared but unquestioned opinions and perceptions conveyed within and by relatively autonomous social entities - fields - which determine "natural" practice and attitudes via the internalized "sense of limits" and habitus of the agents in those fields’. (Deer 2014, p. 115)

Doxa is used in this theoretical framework to position the stance of various sub-fields and agents along a scale between orthodoxy and heterodoxy concerning the use of hyper-compression. It could be contended, however, that a particular stance on hyper-compression transcends the typical characterisation of habitus to something that *is* more aligned with the notion of an “ideology” despite claims that it lies beyond this – what each agent *believes* to be correct according to their own notion of “quality”. What some

may consider to be a form of aesthetic expression concerning the use of hyper-compression may be deemed “heretical” behaviour by others. Neither stance, however, can be considered as absolute truth and only a matter of opinion which is simply a manifestation of one’s “doxa”. Bourdieu states that:

This experience we shall call doxa, so as to distinguish it from an orthodox or heterodox belief implying awareness and recognition of the possibility of different or antagonistic beliefs. (Bourdieu 1977, p. 164)

Therefore, what will become evident in further chapters is that within the sub-fields of the field of Western mainstream popular music, there are competing doxical stances vying for dominance in the discussion on hyper-compression. As such, Bourdieu mentions that:

In a determinate social formation, the stabler the objective structures and the more fully they reproduce themselves in the agents' dispositions, the greater the extent of the field of doxa, of that which is taken for granted. (ibid, pp. 165-166)

Within the context of this discussion, the accepted use of hyper-compression is viewed as heterodox – which is dominant – and the opposition to its use is viewed as orthodox – which is dominated. There is a struggle by the sub-field that is considered orthodox for their doxical stance to become dominant in the greater field of Western mainstream popular music.

#### 2.1.10 The Diffusion of Innovation

Technological innovation has been one of the most important nexus of change within Western popular music industries. Examples are littered across time from the jukebox to the introduction of digital technology. One prime example can be identified in the sudden dominance of digital audio workstations (DAW), representing a monumental change in audio production practices. Likewise, we can position the introduction of digital

technology as the enabler of the Loudness War. Everett Rogers asserts that the introduction and subsequent diffusion of an innovation ‘explains social change’ and further adds that this is ‘one of the most fundamental of human processes’ (2003, p. xvii). His theory of how innovations such as technology are introduced into social systems, termed the *diffusion of innovations* provides a comprehensive framework for understanding how this process occurs. Considering that a particular innovation known as loudness normalisation is widely considered to be the answer to ending the Loudness War, but has so far failed to do so in any effective way, it is argued that Rogers’ theory presents a powerful tool for an examination of this failure and the circumstances surrounding it. Therefore, as the final element of the overarching theoretical framework presented for this research project, Rogers’ theory represents a pivotal part of this investigation.

Rogers’ theory is consistent with the previous theories reviewed in that it describes social systems and defines a mode of structural change within these systems. He states that ‘diffusion is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system [...] When new ideas are invented, diffused, and adopted or rejected, leading to certain consequences, social change occurs.’ (Rogers 2003, p. 6). However, unlike Bourdieu who looks to power struggles, Rogers’ is primarily concerned with the communication of information through various channels, as a function of change. When a new idea (innovation) is introduced into a social system, he believes it generates what he describes as uncertainty in the social system and therefore individuals pursue information about the innovation to reduce this uncertainty (ibid, p. xx). This exchange of information is conducted through a series of interpersonal networks, as Rogers explains:

Information about an innovation is often sought from peers, especially information about their subjective evaluations of the innovation. This information exchange about a new idea occurs through a convergence process involving interpersonal networks. The diffusion of innovations is essentially a social process in which subjectively perceived information about a new idea is communicated from person to person. [...] The meaning of an innovation is thus gradually worked out through a process of social construction. (ibid)

The diffusion of innovations is therefore a broad theory to examine how new ideas are, or are not, embraced by a social system and has the potential to create change. As Rogers states from the outset, the theory is a ‘general process’ and not constrained to the type of adopter or the cultural setting but is a ‘universal process of change’ brought about by new ideas that are introduced to the social system (ibid, p. xvi). What actual changes may occur to the social system as a result of this diffusion (consequences) is dependent on the type of innovation and the structure of the social system and less a concern within the scope of the theory. A primary concern of the process is *how* this change occurs and importantly, *why it may not*. Likewise, the type of innovation is of little consequence to the theory as the process is, as he suggests, universal. Rogers does, however, make some distinctions for innovations that are based on technology as he states these innovations *embody* information and this therefore influences the process of communication, ‘reduc[ing] uncertainty about cause-effect relationships in problem solving’ (ibid, p. 6). Technology is described as usually consisting of two components: ‘hardware, consisting of the tool that embodies the technology as a material or physical object’; and ‘software, consisting of the knowledge base for the tool’ (ibid, p. 36). This draws a distinct resemblance relationally to Csikszentmihalyi’s notion of domain and Bourdieu’s notion of the field of works.

The reductionist stance of technological determinism in which technology is seen as driving the development of social structure and cultural production is rejected by Rogers as he suggests that ‘technology is a product of society and is influenced by the norms and

values of the social system' (ibid, p. 147). He defines 'technology transfer' as a form of communication which he describes as the 'application of information to use' (ibid, p. 150):

Clearly if one understands that a technology usually consists of software as well as hardware and thus that a technology is essentially composed of information (matter-energy that affects an individual's choice of alternatives in a decision-making situation), technology transfer is a communication process. (ibid)

He points out that the process of research, development and diffusion is a recursive 'two-way exchange', in which 'problems flow from potential users to researchers, and technological innovations flow to users, who ask many questions about them [...] thus technology transfer is usually a two-way, back-and-forth process of communication' (ibid). It is evident that the process of diffusion also represents a non-linear system where although it may appear to start at the point in design, if we take into consideration the creative process that Csikszentmihalyi proposes, the actual *idea* may have come from any of the three moments of agent, field or domain. Rogers also mentions that there may be several elements of technology that make up the innovation that are interdependent and highly related, described as 'technology clusters' (ibid, p. 14). This means that the ability for one element to perform a specific function, or not as the case may be, could have an impact on others in the cluster. On-line file-based streaming platforms are an excellent example of this kind of technology cluster in which loudness normalisation presents itself as being one element alongside many others such as the membership portal, interface design, size of music library, access and so on.

On a more general level, innovations present the social system with ways of solving existing problems and either complement or become disruptive to existing technologies and practices (ibid, p. xx). Importantly, Rogers also points out that the implementation of an innovation can sometimes present 'new means of solving problems' (ibid) that may

arise in ways that could not have been predicted when the innovation was being designed due to the ‘newness’ which ‘means some degree of uncertainty is involved in diffusion’ (ibid, p. 6). It takes time for the diffusion of an innovation to be evaluated, which is ‘gradually worked out through a process of social construction’ (ibid) operating not unlike Csikszentmihalyi’s field. Therefore, it could be argued that simply stating that loudness normalisation has failed to have any effect on the agency of audio practitioners concerning hyper-compression at this point in time, and hence never will, could be false and simply a case that more time is required in the diffusion process. Rogers mentions that the speed by which innovation is adopted, causing the desired change in the social system is routinely over anticipated:

Many technologists believe that advantageous innovations will sell themselves, that the obvious benefits of a new idea will be widely realized by potential adopters, and that the innovation will diffuse rapidly. Seldom is this the case. Most innovations, in fact, diffuse at a disappointingly slow rate, at least in the eyes of the inventors and technologists who create the innovations and promote them to others. (Ibid, p. 7)

Four elements are identified in the theory of the diffusion of innovations as ‘(1) an innovation, (2) is communicated through certain channels (3) over time, (4) among the members of a social system’ (ibid, p. 11), which forms the basic structure of the theory. A brief description of these four elements is provided:

Innovation—The innovation is described as ‘an idea, practice, or object that is perceived as new by an individual or other unit of adoption’ (ibid, p. 12) although what is classified as “newness” is subjective, much like Hennessey and Amabile’s idea of ‘big C’, ‘little C’ and ‘mini C’ creativity (2010, p. 572). Five attributes of innovations are suggested as relative advantage, compatibility, complexity, trialability and observability. An innovation with a greater degree of these attributes and also ‘less complexity’ has a greater chance of being rapidly adopted (ibid, p. 15).

Communication channels—Since diffusion is a ‘particular type of communication’ in which the transfer of information about the innovation occurs, Rogers states that this process involves ‘a communication channel [...] by which messages get from one individual to another’ (ibid, p. 18). Despite the mass media being the most ‘rapid and efficient’ means of communicating the innovation to potential adopters, he suggests that this process largely depends upon ‘subjective evaluation’ from others who have become adopters themselves (ibid).

Time—Rogers call this the ‘innovation-decision’ process in which the adoption/rejection rate can be monitored over time, which generally represents the success/failure of the innovation. This process is defined in stages and represents the time it takes from when the adopter first is aware of the innovation to adoption; (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation (ibid, p. 20). The rate of adoption can be viewed graphically as an S-curve which represents the rate of adoption as a function of time (*figure 2.3*) in which adopters are further categorised as (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards (ibid, p. 22).

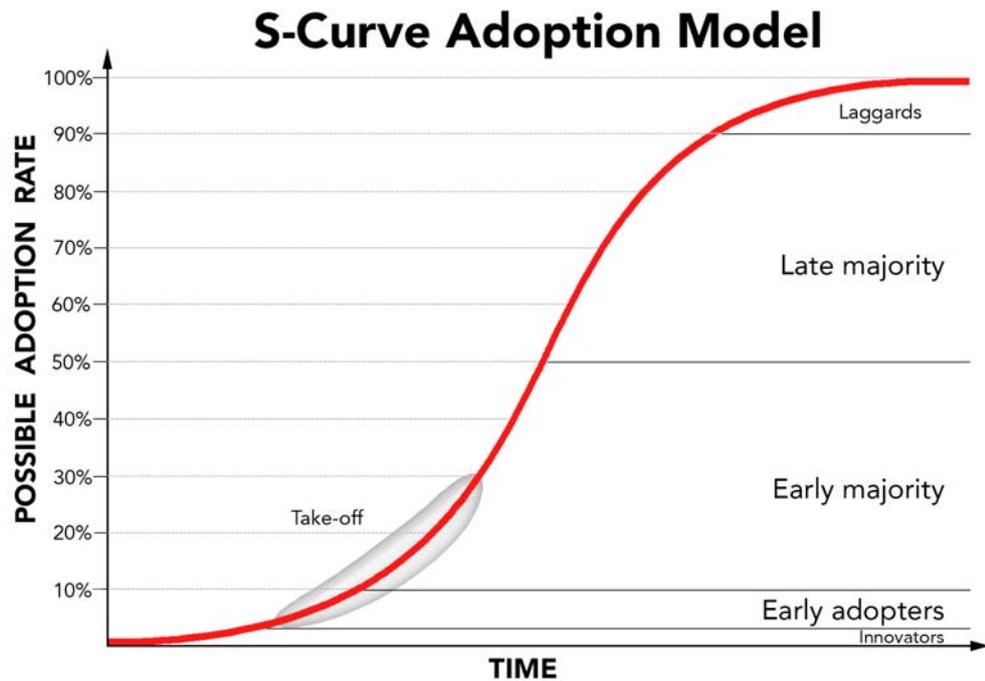


Figure 2.2: The S-curve graphs adoption rate as a function of time.

Social system—A social system is defined as all members – ‘individuals, informal groups, organizations or sub-systems’ – involved in ‘seeking to solve a common problem in order to reach a mutual goal’ (ibid, p. 23). This includes the developers of the innovation, however, of specific relevance is the adopters, for as Rogers asserts, ‘the social system constitutes a boundary within which an innovation diffuses in which a social structure exists’ (ibid, p. 24). This social structure, although similar in regard to Bourdieu’s field of positions, is more defined in terms of the legitimisation of certain communication channels over others, which Rogers’ describes as ‘patterned communication flows’ (ibid). Put another way, certain individuals or groups are in possession of large amounts of cultural or symbolic capital and therefore influence, and as such can dominate these communication channels and form networks of influence with others that are homophilous in their dispositions. Therefore, these ‘opinion leaders’ or ‘change agents’, as Rogers refers to them, can influence the diffusion of an innovation both positively and negatively depending on the agenda.

Lastly, Rogers outlines a number of impeding elements to the diffusion of innovations in which the structure of the social system, which he describes as ‘patterned arrangements of the units in a system’, is at the forefront (ibid, p. 24). This structure can directly affect the flow of communication and therefore have some determination over speed and effectiveness of diffusion. Another ‘barrier to change’ he mentions, which is particularly relevant to the discussion of hyper-compression is what he defines as ‘norms’; ‘the established behaviour patterns for the members of a social system’ (ibid, p. 26). We can immediately equate “norms” to the kind of dominant social structures that have been mentioned throughout the review of theories presented for this proposed theoretical framework as Rogers also describes norms as ‘a range of tolerable behaviour and serve as a guide or standard for the behaviour of members of a social system’ (ibid). If we consider the use of hyper-compression loudness as a norm, and the diffusion of loudness normalisation within the paradigm of music streaming as the innovation and agent of change, then loudness per se could be rightly considered as what Rogers describes as a barrier to change.

## 2.2 Popular Music and the Music Industries

There are many and varying definitions of what is considered “popular” music. Kassabian describes popular as ‘contemporary, mass-produced and consumed culture’ and when attributed to music, claims it immediately alludes to specific genres at the exclusion of others; ‘Top 40 to alternative to hip-hop to world beat music’ as opposed to ‘both folk and "art" music’ (1999, p. 116). However, Brabazon argues that relying on genre is problematic as ‘the boundaries between different forms and modes of music are permeable’ and further that ‘popular music changes in its definitions as it moves through time and space’ (2012, p. 2). Slobin and Titon support this stance by arguing that music, ‘though a universal phenomenon gets its meaning from culture, and different cultures interpret it differently’ (2001, p. 1). Frith looks at the issue more from a sociological perspective and claims that ‘popular music culture is, if you like, an immense communication network’ (2001, p. 28). Despite the apparent fluidity of what defines popular music both temporally and geographically, a simplistic definition that is echoed in much of the literature is that popular music is music that is mass-produced for mass consumption (see for example: Negus 1992; Negus 1996; Frith 2001; Shuker 2001; Wikstrom 2009; Brabazon 2012). Therefore, the topic has extremely broad boundaries and offers a diverse range of opportunities for examination including ‘media policy, textual analysis, theories of technological change, musicology, ethnography, sociology, men's and women's studies, geography and history’ (Brabazon 2012, p. 4).

Ironically, the ‘mechanical operation motivated purely by commercial gain and social manipulation’ (Negus 1996, p. 37) that Adorno so despised in the early twentieth century became the modus operandi of the industry that produced and mass-distributed popular

music later in that century (see for example: Hirsch 1970). We can locate a pivotal moment in 1950s United States that heralded a paradigm shift in popular music with the advent of rock n' roll, the popularity of the jukebox, the introduction of the 7" 45 rpm vinyl record and the introduction of music-based radio and the top-40 format - the birth of the modern *music industry* (see for example: Frith 2001). Although we can locate the business of selling music related products back to the late nineteenth century, it was during this period that new forms of music, technology and corporate interests came together to create a *recording* industry - the sum of many parts - with the sole intention of making profit. As Frith explains:

The music industry question is straightforward: how to make money out of music? But the answer is 'with difficulty', and pop music as we know it now has been shaped by the problems of making music a commodity and the challenges of adapting money-making practices to changing technologies. (2001, p.26)

Previously, the music industry had revolved around retaining and protecting the rights of those who owned the copyright of music, hence, before this period where music was stored on media and mass distributed, 'the music business was a rights business' (ibid, p. 30). With the advancement of recording and reproduction technology, this shifted to a "record business" in the very early part of the twentieth century with the gramophone (Katz 2010, pp. 10-12). This then lead to associated problems of unauthorised reproduction and methods to combat this problem to maintain profits later in the century (see for example; Strasser 2009).

A great deal of the recent literature on popular music concerns the structure of the music industry post 1950: record companies, both major and independent, that have significant control over the production and distribution of music (Hirsch 1970; Frith 1983; Kruse 1988; Negus 1992; Leyshon 2001; Wikstrom 2009; Strasser 2009); the media as a vehicle for promotion, acting symbiotically with these record companies (Negus 1992; Shuker

2016; Thorburn & Jenkins 2003; Berland 2003; McIntyre 2006); technology and its influence on the music industries at many levels (Frith 1986; Jones 1992; Millard 1995; Théberge 1997; Shuker 2016; Théberge 1999; Strasser 2009; Katz 2010; Brabazon 2012); and record production, studio personnel and recording practices (Chanan 1995; Zak 2001; McIntyre & Paton 2008; McIntyre 2008; McIntyre & Morey 2012, Frith & Zagorski-Thomas 2012). The scope of this literature is indeed so large that it is unrealistic within the confines of this review to express any great detail, however, it is reasonable to concentrate on particular areas that are relevant to this research project.

The development of technology and its impact on almost every aspect of the music industry is of course of primary concern, and as Frith asserts, ‘the changing technological possibilities of musical storage, the possibilities that have shaped the music industry and its practices, are best understood historically’ (Frith 2001, p. 1). With each new media that has been introduced, from the 7” 45rpm vinyl single to the MP3 file presented popular music and the music industry with a new set of challenges and affordances. As Strasser contends, ‘to many in the recording industry, recent technologies have been highly disruptive to existing music markets and well-established distribution mechanisms’ (2009, p. 23). This significantly affected the established business model used by record companies as outlined by Hirsch (1970) as the ‘filter flow model’ where these companies had control of what entered the market, how it was distributed and on formats that were largely difficult to illegally mass-reproduce; in effect, controlling the flow of supply. Digital technology enabled mass illegal reproduction and the most notable example being Napster who facilitated tens of millions of users to share songs over the internet without any revenue flowing back to the record companies and artists (Brabazon 2012, pp. 86-89). Strasser provides one of the most comprehensive examinations of this challenge to the record companies’ business model and argues that the record companies were reticent

and slow to adapt to this new digital world. In fact, he suggests that it was other third-party companies such as Apple (iTunes), Spotify, Pandora, and even internet service providers and mobile phone carriers, that were able to provide on-line alternatives that were able to monetise music once again (2009). Strasser states that the current business model of digital distribution is via the internet:

Currently, there are four different configurations for the delivery of music content over the Internet. Two models are structured on the way music is accessed: either via streaming or downloading. The other structures are based on business models that provide the consumer with the ability to purchase or “lease” individual songs, the so-called subscription or “a la carte” models. (ibid, p. 25)

Digital technology not only disrupted the business model of the established record companies but also of record production itself. Théberge points out this disruptive technology devalued the large-scale recording studio leading to the closure of many iconic studios in the United States giving rise to the mid-size and smaller project studio (2012, p. 83). In tandem, he suggests that the role that professional personnel performed within these establishments was also devalued. Technology that was previously exclusive to the recording studio environment and prohibitively expensive was re-packaged, smaller, more powerful, and above all, affordable for the average person to acquire for use at home:

The rise of the Internet and what has been called, in more general terms, 'digital culture', has posed both challenges and opportunities to contemporary musicians, engineers and producers; indeed, the widespread dissemination of software-based tools for music recording challenge the very idea of who can lay claim to those roles in contemporary culture. (ibid, p. 90)

However, it is made clear that Théberge believes this represents a natural evolution as the computer became the centre of ‘music making activities with the micro-possibilities of digital recording’, reconfiguring the requirements of the recording space and associated practices (ibid, p. 82).

It's also important to note that the way music was delivered to the consumer was also deeply affected by this disruptive technology. Brabazon makes special mention of the Apple iPod as representing a definitive transformation in the way people listen to music and argues that 'clearly, the iPod did transform the production and consumption of music as well as our listening to it' (2012, p. 120). The iPod in conjunction with iTunes played another critical role in this new paradigm of digital music. Due to its extraordinary popularity, it acted as a primer for audiences to move to the digital shopfront for music purchases instead of illegal downloads:

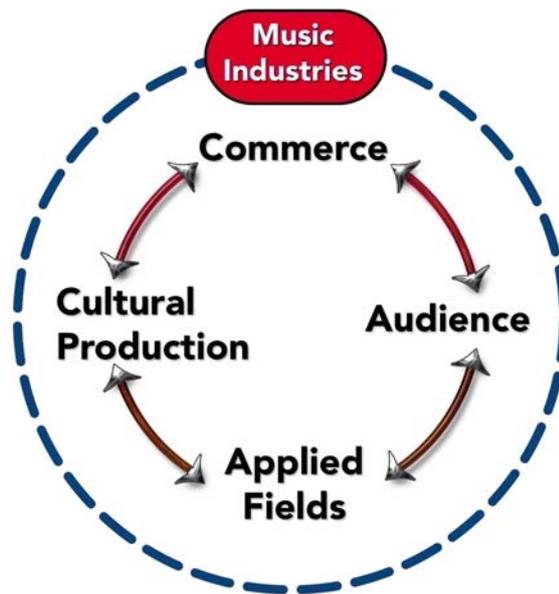
Apple not only created the most significant design object of the twenty-first century - an instrument for playing music - they also made the most significant intervention in bringing music listeners back from 'illegally' downloaded music to accepting a purchase model for music. The iPod and iTunes have altered our listening and the distribution patterns for music. (2012, p. 121)

According to the International Federation of Phonographic Industries (IFPI), global recording industry revenues plummeted almost 40% between its peak in 1999 and 2014 which is directly attributable to this major transformation to a digital music economy (2017, p. 11). A sharp increase in the adoption of on-line streaming platforms in the 2010s which, in addition to the use of already established digital download services, resulted in these digital services overtaking physical sales for the first time in 2015 (ibid). By 2014, the IFPI maintain that there were 43 million tracks licensed to over 400 music services (2015, p. 5). The single biggest issue that faced the global music economy during this period was re-establishing economic growth in this new digital economy and streaming had singularly become 'the most prevalent and significant format in the modern music industry, fuelling growth in almost all music markets' (IFPI, p. 16).

In addition to this transformation, Williamson and Cloonan also highlighted the confusion

surrounding what had become commonly, and broadly known as the *music industry*; ‘that the notion of a single music industry is an inappropriate model for understanding and analysing the economics and politics surrounding music’ (2007, p. 305). As they point out, the music industry in reality ‘is of disparate industries with some common interests’ (ibid). In some instances, where it is seen as necessary, institutions demarcate themselves as representing the “recording industry”, ‘primarily as a means of detaching the process of making and selling music from such activities as, for example, concert promotion or music publishing’ (ibid, p. 306). Similarly, the use of the term “music business” is used to bluntly dissociate the economic from the cultural. What is of importance here, however, is that Williamson and Cloonan outline a large number of sectors involved in the production and dissemination of music in all its forms under the umbrella of the music industry. They state that these are not homogenous, and hence implying a single entity such as the *music industry* is incorrect; ‘the reality is that this picture is, at best, out-dated and an inaccurate portrayal of the organisational structure of the global music economy’ (ibid, p. 305). They sensibly suggest the use of the overarching term *music industries* to encompass the many sub-fields that make up this overall entity.

Importantly, Williamson and Cloonan argue that any examination into any aspect relating to the music industries must be approached from the perspective of a *system* of interrelated organisations – fields or sub-fields – and not viewed as one single entity. Their rationale for this stems from the fact that these interrelated entities may or may not share common interests or internal structures and are not all affected by the same external factors that might arise (ibid, p. 306-309).



*Figure 2.3:* The music industries identified as four separate, interrelated sectors: cultural production, commerce, audience and applied fields.

One could therefore consider Williamson and Cloonan's description of the music industries as a set of *scalable* systems, referred to at one scale as the music industries. To relate this directly to the theoretical framework, each system represents a field and associated domain, or subfield with shared or partially shared domain. This relationship is of particular importance when considering that loudness and the use of hyper-compression can be a structural influence on some fields and sub-fields and not others, with varying degrees of significance, and for varying reasons. To simplify from this perspective, we can group the relevant fields and sub-fields into four interrelated sectors that represent the music industries as a system to provide a working model for this research project: those that develop audio systems and applications (applied fields); those that produce artefacts (cultural production); those that promote and sell the artefacts (commerce); and those that consume the artefacts (audience) (*figure 2.3*).

**Understanding** the Use of Hyper-compression in Music Production: A Systems Based Approach to Examining Innovative Change in the Field of Music Production

Applied Fields	Cultural Production	Commerce	Audience
Physics <small>(physical laws such as the speed of light)</small>  Psychoacoustics Psychology Acoustics Computer science Electrical engineering Research & development Design  Manufacturing companies Universities Societies Regulatory bodies	Technology <small>(musical instruments &amp; audio production equipment, social &amp; other online media)</small>  Songwriting Musical training <small>(artist/ensemble)</small>  <u>Music production</u> Production Mastering Mixing Engineering Music programming Pre-production Rehearsal  Recording studios Home studio	Technology <small>(internet, broadcast, productivity)</small>  Publishing  Media corporations <small>(radio, television, print media, on-line media, advertising)</small> Major record labels Independent labels <small>(artist &amp; repertoire)</small> Artist management  Marketing & research Public relations  Retail Accounting	Technology <small>(internet, method of delivery)</small> Psychoacoustics <small>(human auditory system)</small> Environment <small>(acoustic space, presence of other noise)</small> Disposition <small>(personal preference, education, mood)</small>  <u>Listening Capacity</u> Tonmeister Audiophile Trained Motivated (fan) Average  <u>Listening Type</u> Active or passive

*Figure 2.4:* The fields, sub-fields and agents of the music industries that is specifically related to record production, grouped as per the four sectors of the music industries outlined above.

Using this working model, we can then examine how loudness and hyper-compression is related to the music industries as a set of scalable systems (*figure 2.4*), with regards to what has been termed as the Loudness War.

## 2.3 The Loudness War

Essling, et al. rightly suggest that ‘in markets with thousands of products, firms cannot take it for granted that consumers are even aware of their articles’ existence’, and further add that, ‘advertising and actions to attract consumer attention are therefore integral components of a firm’s competitive toolbox’ (2015, p. 1). Loudness is undoubtedly one of the integral components they mention, utilised not only by the music industry since the onset of the commercialisation of music in the mid twentieth century, but also by broadcast in the broader sense; the “louder is better” paradigm. They expand on this idea that:

In markets with a multitude of products, the costs of information acquisition for consumers are substantial; therefore, capturing and retaining consumer interest is of particular importance. This is of special relevance in entertainment markets due to the large variety of offerings in film and television programmes, video games, smartphone applications, books and music. In such settings, consumers cannot possibly be aware of every offering that exists, so that producers must muscle for their attention. In that vein, [the] Loudness War generally refers to the practise of ramping up the audio levels on music recordings in the belief that it will make tracks more appealing (or at least noticeable) to listeners. The idea is that, especially on the radio, louder songs stand out, and attract consumers’ notice more easily (2015, p. 1).

The principal behind something louder attracting the attention of the listener has been explained as the “louder is better” paradigm; extensively discussed in section 2.4.1.4. As a brief introduction, the spectral (frequency) response of human hearing is non-linear at lower sound pressure levels, becoming more linear as levels increase. In short, we hear less detail in low and high frequencies as volume decreases and more as it increases. This characteristic of hearing is particularly pertinent to music as a sound quality judgement because as the music level decreases, it can render some instruments such as the bass guitar inaudible whilst still allowing the voice to be heard clearly.

As such, when a music recording or broadcast programming of radio or television is

comparatively louder than others, the listener is potentially attracted to the louder variant due to the possibility that it will be perceived as superior in quality and more therefore more exciting. This description is a distinct abridgement for what is a very complex series of conditions that may influence listener behaviour which will be explained later in far greater detail. But for now, it provides a simple explanation as to why musical artists, record companies, television advertisers, radio stations and the like, seek to increase the level of their product with the aim of attracting listeners over competitors. This situation forms the basis behind what has been popularised as the “Loudness War”. Although this term has been used more recently to describe excessive levels in music recordings, the concept actually originates from radio stations in the 1980s who were at “war” with one another to create the loudest radio station on the dial (Greg Milner 2010, pp. 268-277).

This section regarding the “Loudness War(s)” looks historically at the trajectory of loudness as a mechanistic tool in gaining the attention and preference of an audience as Essling et al. suggested earlier. The foundations of commercial music practice and how loudness developed into such a tool is explored. The development and adoption of the jukebox format led to the development of radio formats such as top-40, instigating an atmosphere of competition that eventually led to the first “Loudness War” more than two decades later in the 1980s. We can also position the introduction of various forms of technology and subsequent practices with advancements in the capability of creating perceptually louder audio signals and recordings. This is particular relevant in later decades, corresponding directly to the current “Loudness War” (2.0) that is more strictly confined to music recordings post 1990. The term hyper-compression is derived from practices there were a direct result of introduced digital technology that provided a potent ability to reduce the dynamic variability of recordings and raising overall levels, culminating in excessive loudness. This resulted in artists and related bodies *actively*

seeking to make their music recordings as loud as physically possible within the boundaries of the medium to which the music was stored. In particular, the introduction of the compact disc (CD) which negated any previous restrictions inherent in the physical structure of the vinyl record, in conjunction with digital processing, provided the catalyst and means by which loudness on an unprecedented scale could be achieved. As new levels of loudness were accomplished, representing some competitive advantage, others followed, characterising a “war” to be the loudest. Once the maximum level was maintained by a majority, a state much like a “cold war” had developed with parties unwilling to reduce level in fear of losing competitiveness within the marketplace.

In contrast to the original “Loudness War” of radio, the current adaptation has been widely documented by the media and the subject of extensive scholarly research with an extremely broad base of subject matter including subjective responses to hyper-compressed audio stimuli and signal degradation. This documentation is examined including movements against the use of hyper-compression and the introduction of loudness normalisation which has been declared by some as a mediating factor of the Loudness War.

### 2.3.1 ‘Brightly Lit Monsters’

Thiele describes the 1950s as the period that Western popular music ‘changed forever’ with the introduction of jukeboxes that were installed in many social spaces as a form of entertainment (2005, p. 130). He refers to these ‘brightly lit monsters’ as being a catalyst for the pursuit of loudness on vinyl recordings that signified the beginning of a

phenomenon which will eventually consume production practises until this day (ibid). Furthermore, Thiele states that competing for program loudness ‘survived the age of the jukeboxes and permanently changed the culture of much popular music’ (2005, p. 130). This report typifies a common belief that this preoccupation with loudness originates from the jukebox era (late 1950s), in which the volume control was fixed, hence for a track to stand out from its competitors, it had to be louder on the medium that it was played from (Weymouth 2012, p. 1). It presents a text book scenario of the “louder is better” paradigm:

This presented a problem for recording companies. The customers of jukeboxes had no control over the sound level. The system gain was set by the owner and stayed fixed. The peak level of sound on a recording was set immutably by the spacing between adjacent grooves and the laws of physics. So the wider the range of levels on a recording, the lower its average level would have to be, and the less it could compete with high ambient noise. So competing recording companies, vying for maximum loudness, applied more and more dynamic compression. This convention is no longer necessary, but it has survived the age of jukeboxes and permanently changed the culture of much popular music. (Thiele 2005, p. 130)

There are two other key innovations that are interlinked with the upsurge of jukeboxes during the 1950s in the United States; the 45-rpm vinyl record and the top-40 radio format; both had a significant impact on the commercialisation of music which led to the loudness becoming a mechanism for gaining market attention. The 7” 45 rpm disc was introduced to jukeboxes in the 1950s predominantly because the format became ubiquitous with a new era of music commercialisation. They were fast and inexpensive to manufacture, perfectly suited to the new domestic record systems and perfectly suited to a new paradigm of radio broadcast that was born from a social culture that the jukebox had initiated (Carson, Burt & Reiskind, 1949).

Radio programming in 1940s North America up to this point was dominated by ‘variety’ shows, drama and live music concerts, hosted by celebrities such as Jack Benny, Bing Crosby and Johnny Carson (Fisher, 2009, pp. 4-6). With the introduction of television

broadcast in 1948, these celebrities all saw ‘the writing on the screen and bid radio adieu,’ moving to the new media format that ‘rocketed from 97 to 550’ television stations by 1953 (ibid, p. 5). The jukebox, however, had introduced a new form of collective listening whereby a playlist of popular songs was made accessible in a public environment and listener preferences were made within this social context (Frith 2001, pp. 27-28). This had a direct impact on recorded music in the sense that the music itself evolved to suit these noisy environments where these assemblies took place; ‘The music responded to this new medium: it grew more rhythmic and increased in volume, developing into the rhythm and blues that foreshadowed rock ‘n’ roll’ (Osbourne, 2012, p. 119). Radio was left with a content vacuum as television absconded with both talent and subject matter and ratings subsequently plummeted along with advertising revenue (Fisher, 2009, pp. 4-6). Radio needed to reinvent itself to survive and the top-40 radio format was a potential solution; Todd Storz, station owner of KWOH-AM in Omaha, Nebraska, is widely accredited with its invention (Brewster & Broughton, 2006, p. 58). Since the jukeboxes themselves held 40 songs and could register the amount of plays for each song, it was possible, along with records sales, to enumerate the most popular songs to feature (Osbourne, 2012, p. 119).

This symbiosis of jukebox, 7” 45 rpm record and top-40 charts represented a new era in Western mainstream popular music in 1950s North America. The jukebox had not only influenced listener preferences, reproduction technology, radio formatting and of course, the evolution of music itself, but it had also instigated a scenario whereby artists ‘were always in competition, shouting against each other to the heard’ (ibid, p. 125). By the early 1960s the quest for loudness was evident, albeit, inhibited by the technology that was available at the time. But there is one more important point to be made here. The jukebox introduced the idea of the “playlist” which became synonymous with the

personal media device introduced in the 21<sup>st</sup> Century by Apple - the iPod and iTunes (Brabazon 2012, pp. 118-12). This concept whereby thousands of songs can be curated in jukebox style playlists was considered as one of the most influential factors in the hyper-compression era that was to follow. It was highly undesirable for an artist's recording to be softer by comparison in a playlist.

### 2.3.2 Origins of the Loudness War (1.0)

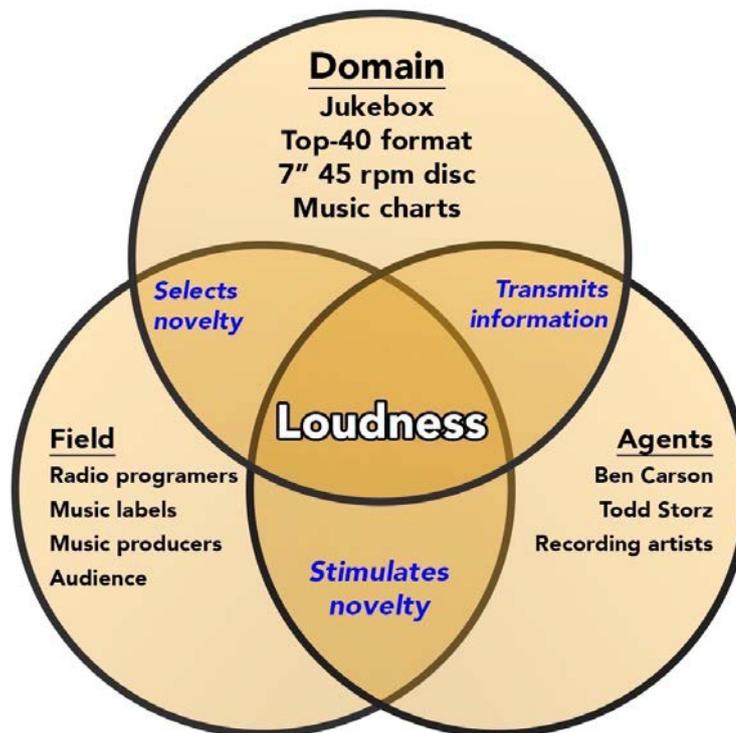
Bob Ludwig, one of the most celebrated American mastering engineers whose career spans more than 50 years provides evidence that loudness was an important consideration on 7" 45rpm records that dates back to the 1960s:

The Loudness Wars have gone back to the days of 45s. When I first got into the business and was doing a lot of vinyl disc cutting, one producer after another just wanted to have his 45 sound louder than the next guy's so that when the program director at the Top 40 radio station was going through his stack of 45s to decide which two or three he was going to add that week, that the record would kind of jump out to the program director, aurally at least (quoted in Seigel, 2009).

Here, Ludwig not only verifies the existence of loudness as a prime consideration in the early days of vinyl by producers, but also, importantly, addresses the issue that loudness was crucial in acquiring the approval of key stakeholders of the music industry itself; the 'gatekeepers' who held power as to whether a song would be able to enter the marketplace at all. This is a significant clue that although loudness was initially seen as an effective means to attract listeners in the jukebox scenario, it also began to operate as a method to influence preferences within the entire *system* of the broadcast and music industries. With the advent of the top-40 radio format and the music charts, an interaction was established between radio-charts-jukebox-media-audience-music industries, operating symbiotically

but to serve a commercial agenda (*figure 2.5*).

Southall echoes Ludwig’s assertion that ‘the Loudness War has been going on almost as long as pop music has existed, and probably longer’ but importantly adds that ‘nobody has ever wanted their record to be the quietest on the jukebox or the radio’ (2006).



*Figure 2.5:* This model illustrates loudness within the non-linear system of commercialised music and its dissemination after the introduction of the jukebox, 7” disc and the music charts. To describe the non-linear process in which all elements are inter-related to loudness, it is based upon Csikszentmihalyi’s systems model of agent, field and domain.

Another very relevant factor within this system is that record labels not only wanted their products to sound louder than competitors on the jukebox, but also on radio for exactly the same reasons. Radio stations themselves then adopted a similar stance with the overall station output to be louder than competitors; ‘A station competes against other stations in the market. The station wins the war if the engineer can make it sound louder than the

competitors, and ideally wins the ratings as well (Milner, 2009, P. 267).

Although the term Loudness War is used to describe a very modern problem of extreme loudness facilitated by digital audio technology, its origins actually date back to the 1980s with New York FM radio stations WHTZ (OR Z-100) and WPLJ FM (Milner 2010, pp. 268-277). It is reported that Robert Orban, the inventor of the “Optimod” radio processing unit that incorporated a range of loudness inducing technology was the first to coin the term Loudness War in response to the battle for loudness between rival FM radio stations in general (Vickers 2010a, p. 3). This term was then re-appropriated to describe the ensuing battle for loudness between music recordings a decade later. But if we return to the pre-Loudness War 1960s, we can find evidence of a similar mode of operation to gain loudness working within the very limited physical capabilities of the vinyl medium. One of the most documented examples is that of the Motown “Loud and Clear” method (ibid).

#### 2.3.2.1 Vinyl

Although loudness was an important consideration in the release of a music recording in the vinyl era by those concerned, it was certainly not as contentious a subject as it is now. The subject was limited to a technical discussion that never entered the public arena, unlike the discussion on the use of hyper-compression which has proliferated endlessly via the media, internet blogs, video blogs, on-line petitions, academic papers and so on. It was rarely an issue for the listener unless the record failed to work properly which was a distinct problem as increased loudness on vinyl required ‘tradeoffs and difficult choices’ due to the physical limitations of the media (Vickers 2010a, p. 3). If the bass was too loud the needle could jump off the groove and disrupt playback as ‘louder signals required

wider grooves and shorter playing times' (ibid).

Neal points out that 'pop and rock music-makers in the 1960s perpetually pushed against the loudness levels possible on a seven-inch vinyl record' (2010). Achieving a 'louder cut'<sup>4</sup> on vinyl was highly desirable by artists and the American mastering and pressing plants were by far the most successful. George Martin, producer of the Beatles was baffled at how "hot"<sup>5</sup> American records were, and he wanted to get the Beatles that sound (Martin & Pearson 1995, p. 143). The Beatles in fact lobbied their record label Parlophone to 'get their records pressed on thicker vinyl so they could achieve a bigger bass sound' (Southhall 2006). Motown were 'particularly adept at this' (Thiele 2005, p. 2) and adopted a standard called 'loud and clear' (Vickers 2010a, p. 3) using a multitude of methods to achieve maximum level while retaining clarity; 'developed for the first Supremes hit, "Where Did Our Love Go?"' (Dennis n.d.). The development and execution of this process by the Motown label, famous for discovering many legendary African-American recording artists in 1960s United States, undeniably exposes a specific practice that exploited the "louder is better" paradigm for competitive advantage.

Bob Dennis states he celebrated his 18<sup>th</sup> birthday on his first day as 'disc mastering engineer' for Motown records (Dennis n.d.). The rationale he explains for this process is strikingly similar to that of the modern day recording in which there is a trade-off between loudness and quality:

---

<sup>4</sup> A "cut" refers to the process of cutting into the lacquer plate with a cutting head to produce the grooves of a vinyl record. A louder "cut" means the grooves are deeper and will result in a louder playback outcome. of the record as an art-form that requires considerable knowledge and experience.

<sup>5</sup> The term "hot" is a descriptive term to represent a very large magnitude of signal recorded onto a given media, in particular, analog media.

Technically, we examined the limitations of the equipment and the media with the idea of "pushing the envelope" of loudness and distortion. Sometimes the right amount of distortion enhances the product. We became experts at the limitations of 1960's AM broadcast, the limitations of the playback equipment, of the media (the disc), of the recording amplifiers used to make the masters and even the limitations of ears. We became experts at approaching the edge of the sonic cliff that threw it into objectionable distortion. (ibid)

Overcoming the technical limitations of the vinyl media obviously was a serious issue for Motown, and importantly he mentions 'the limitations of the ears' in which he is presumably alluding to the equal-loudness contours which is the foundation of the "louder is better" paradigm.

A decade or so later, the introduction of digital technology and in particular the use of the compact disc (CD) in the mid-80s, negated all these complications associated with the previous analog media. Mastering engineers were 'not constrained by the limitation of the sound storage medium anymore' (von Ruschkowski 2008, P. 222) as there were 'hardly any technical limitations for the CD' (ibid). Production techniques continued to be developed that would continue this quest for loudness.

### 2.3.3 The Loudness War (2.0)

It is unclear exactly when the use of excessive dynamic range compression (DRC) – which eventually became known as *hyper-compression* – first came into the collective consciousness of the audio community but we can locate a presentation delivered by mastering engineer Bob Katz at the 107th Audio Engineering Society Convention in 1999 as one of the pivotal moments (Katz 2015, p. 242). In this presentation, Katz highlighted

the excessive hyper-compression used on *Livin' La Vida Loca* by Ricky Martin (1999). The use of hyper-compression was becoming standard mastering practice during the late 1990s but apart from those few that were monitoring its progression such as Katz, it remained a curious but accepted trend and relatively unknown outside of the field. At some point during the early 2000s, the term Loudness War was again coined and became ubiquitous with the trend in music production.

von Ruschkowski asserts that 'digital dynamics processors are broadly seen as the main premise for the Loudness War' (2008, p. 222) and this claim is supported by Deruty et al. (2014). Utilising various methods of measurement to examine an extensive corpus of music from the 1967 to 2011, Deruty et al.'s results indicated a definitive correlation between the introduction of digital technology (look-ahead limiters) and the increase in loudness as that expressed as the Loudness War (ibid).

In 2010, the seminal research paper presented and published by Earl Vickers at the 129<sup>th</sup> AES convention in San Francisco, *The Loudness War: Background, Speculation and Recommendations* (2010a) is arguably the most comprehensive and cited investigation on the topic of the Loudness War. Although there were numerous papers that pre-date Vickers' highly recognised paper (see for example: Theile 2006; Rumsey 2008; Viney 2008; Accattatis 2010; Blau 2010) his research is widely accepted to have inspired a plethora of related studies, particularly into the perception of dynamic range and listener preferences regarding hyper-compression (see for example: Vickers 2011; Chae 2011; Croghan et al. 2012; Serra et al. 2012; Lalér 2012; Weymouth 2014; Hjortkjær & Walther-Hansen 2014; Taylor & Martens 2014; Wendl & Lee 2014; Ronan et al. 2014a, 2014b, 2015a, 2015b, 2016 Eslling et al. 2015; Granville-Fall 2015; Taylor & Miranda 2016).

Also pre-dating Vickers 2010 AES paper was the landmark research by Nielson and Lund which concentrated on the deleterious effects of the hyper-compression process on the audio signal. Importantly, this research further investigated the effects of high-level signals (close to or at to 0dBFS) on both the D/A conversion process and data reduction process (codec). It uncovered serious ramifications in which further distortion was introduced into the signal path during reproduction (See for example: Nielsen & Lund 2000, 2003; Lund 2004, 2006).

Further investigations into mapping the trajectory of hyper-compression from a temporal perspective were conducted by Deruty, Tardieu, Ortner and Pachet. Deruty et al. claim that ‘Loudness War appears to peak in 2004, and a modest movement toward the opposite direction can be observed’ (2014, p. 54), in which Ortner similarly confirms this approximate time frame (2012, p. 92). Both studies indicated that loudness levels started to increase around 1990 corresponding with the first available digital look-ahead limiters.

In gaining an understanding of how this trajectory evolved into what was later coined as a “Loudness War” or “Loudness Race”, it is necessary to also investigate the proliferation of the digital processing technology that facilitated excessive loudness in recordings. This technology that was initially prohibitively expensive, gave some artists an early advantage over their competitors. Rapidly over time, the technology became affordable and commonplace in the field which introduced a scenario that Weymouth describes as an ‘archetypal example of the famous *Prisoner’s dilemma* - a theoretical two-player game in which the two players may not co-operate, even if it seems to be in their best interest’ (2012, p. 3). With all parties having access to the same technology and ability to make

loud masters, a situation developed not unlike a “cold war” with either unwilling to back down for fear of being uncompetitive; something that Katz is quoted as describing as a ‘vicious circle of loudness envy’ (Vickers 2010a, p. 16). Vickers is blunt in his description of this standoff as ‘a zero-sum mindset of “beating the other guy”’ via the use of loudness (2010a, p. 17). He takes the prisoner concept one step further by stating that:

The two-player Prisoner’s Dilemma does not effectively model a situation like the Loudness War, in which there may be dozens, hundreds or thousands of players, each of whom have limited interaction with (and limited leverage over) the others. This type of situation is a “social dilemma,” in which individually reasonable behavior leads to a result in which everyone is worse off. As Kollock writes, “a group of people facing a social dilemma may completely understand the situation, may appreciate how each of their actions contribute to a disastrous outcome, and still be unable to do anything about it” (ibid, p. 15).

The media engaged with the topic from 2005 due to the attention that was gathering momentum, with varying degrees of accuracy, viewpoint and understanding of the issue (for example see: Jones: 2005; Emery: 2007; Levine 2007; Sreedhar: 2007; Masterson: 2008; Anderson: 2008; Smith: 2008; Clarke: 2009; Donahue: 2010; Mauch: 2011; Inglis: 2011; Reiersen: 2011; Michaels: 2012; and Robjohn 2014). Specific cases of excessive hyper-compression were then highlighted, in particular that of Metallica’s *Death Magnetic* (2008) (See for example: Michaels 2008). Soon after the album’s release the audience entered the conversation with an alleged 22,000 fans making complaint of the album’s excessive loudness (Smith 2008). Around this period, several internet-based organisations were established to rally against the use of hyper-compression; e.g. The Pleasurize Music Foundation; Turn me up!; and Dynamic Range Day.

It has been widely noted that hyper-compression became a significant structure in the field of Western mainstream popular music during the 2000s, acting as a mechanistic tool to acquire competitiveness within the marketplace. As producer/musician Butch Vig (Nirvana) explains, ‘compression is a necessary evil. The artists I know want to sound

competitive. You don't want your track to sound quieter or wimpier by comparison. We've raised the bar and you can't really step back.' (quoted in Lamere 2009).

In 2014, Bob Katz proclaimed that 'The Loudness Wars Are Over' at the AES conference in New York which Robjohns reported in a feature article in the magazine *Sound on Sound* – declaring it 'a surprising announcement' (2014) (*figure 2.6*). Katz' statement was enthusiastic regarding 'the recent adoption by the audio and broadcast industries of a new standard measure of loudness' (ibid) which he believed would eventually negate the need for hyper-compression; 'if all music is played back at the same perceived volume, there's no longer an incentive for mix or mastering engineers to compete in these "Loudness Wars"' (Ibid). Robjohns, providing a comprehensive background to the issue was more measured to its possible effectiveness as a counter response to the Loudness War by stating that 'the reality is probably not quite as straightforward as Katz would have us believe' (2014).

Katz, however, was not the only agent to respond in this way to the prospect of loudness normalisation. UK mastering engineer Ian Shepherd was arguably the first to express this opinion in his blog "Production advice" regarding Spotify and its introduction of loudness normalisation on its output (2009). By 2011, this belief that loudness normalisation was the answer to disarming the Loudness War had begun to take hold within the consciousness of the audio community. Barthel quotes Bob Ludwig who reiterates this notion by saying 'once a piece of music is ingested into this system, there is no longer any value in trying to make a recording louder just to stand out [...] There will be nothing to gain from a musical point of view. Louder will no longer be better!' (2011).

Similarly, Reiersen states in the authoritative magazine *Mix* with some confidence that ‘it’s just a matter of time now’ (2011) which is then echoed by Colletti the following year with an assurance that ‘all of this means that loudness is quickly becoming irrelevant’ (2012). At this point, most of the on-line streaming services had adopted some form of loudness normalisation which caused many to draw a logical conclusion that an end was indeed imminent. Katz is quoted as stating ‘the last battle will be over by mid-2014’ (Resnikoff 2013) but in reality, hyper-compression is still endemic within the system of music production and no evidence exists to support anything otherwise three years later in 2017. The Loudness War is indeed, not at all over. It then suggests that there are other factors at play within the system of music dissemination that require investigation.



Figure 2.6: The cover of the edition of *Sound on Sound* magazine (February 2014) in which Robjohns reports Katz declaring that the Loudness Wars were over due to the introduction of loudness normalisation on file-based on-line streaming platforms.

## 2.4 Sound and its Perception – Signal and Response

Complementary to the proposed theoretical framework discussed earlier, this section refers directly to the many underlying concepts pertaining to sound and its perception. Understanding what hyper-compression and related practices are, requires an awareness of a multitude of concepts relating to signal processing and the resultant perceptual response by the listener. For one, we can therefore understand the fundamental motivation behind the agency of operatives in the field and consequently why hyper-compression is seen as a significant and objective structure. As previously mentioned, according to Bourdieu:

...subjectivism represents a form of knowledge about the social world based on the primary experience and perceptions of individuals' and 'objectivism attempts to explain the social world by [...] focusing instead on the objective conditions which structure practice independent of human consciousness' (Johnson in Bourdieu 1993, pp. 3-4).

Accepting this framework, Bourdieu then uses the concepts of habitus and field in which 'habitus represented a "theoretical intention...A practical operator of object constructions"' (ibid, p. 5). This conception is directly echoed in the philosophy of audio and sound where perception and subsequent meaning is the 'practical operator' of audio signals. There is a simple analogy that can be used here, in that an innate understanding of what audio signals can represent to the listener is a form of habitus, and the audio signal itself represents the field which can determine action. Changes to the audio signal (or as such, the field) change possibilities for action.

Therefore, aside from this section of the literary review providing a basic understanding of nomenclature used throughout this research project which is of obvious importance,

there is a distinct correlation between structure and the action of the agents when discussing how sound influences the response of the agent – their agency. Hyper-compression as a practice is governed by a set of objective conditions that is directly causal of the action of the agents. If we therefore consider hyper-compression – or more generally, loudness – as a structure that influences action, then the agent must be in possession of the necessary habitus to understand its importance and act accordingly. This section therefore investigates what knowledge regarding related principals would be necessary for the agent to act, forming the required habitus.

## 2.4.1 The Perception of Loudness and Cognitive Response

### 2.4.1.1 The Complexity of Loudness

As one of the primary functions of hearing, loudness is ‘the perceived strength of an audio stimulus’ (Johnston, 2008, p. 2) and we interpret this acoustic intensity as a sensation of loud or soft corresponding to the magnitude of sound pressure level (SPL) present; ‘loudness belongs to the category of intensity sensations’ (Fastl & Zwicker, 2007, p. 203). As such, loudness is subjective and a mental construct derived from the interpretation of sensory information. Goldenstein delineates the perception of sound from the physical stimulus by definition, suggesting it is the human experience that transforms this physical stimulus into what we call ‘sound’ and its associated meaning (2002, pp. 333-334).

Researchers in psychoacoustics have been able to map human cognitive response to sound of varying forms, create modes of measurement and develop models to predict responses (see for example: Stevens, 1957; Moore et al. 1997; Glasberg & Moore 2002; Soulodre

et al. 2003; Soulodre & Norcross 2003; Seefeldt et al. 2004; Skovenborg & Nielsen 2004; Fastl & Zwicker 2007; Ferguson et al. 2010; Burdiel et al. 2012). The human response to loudness is immense in its scale between the softest sound detectable and the loudest sound that causes pain; ‘the human threshold for sound approaches the reception of the sounds made by the random movement of air molecules’ to that of the loudest, ‘millions of times more intense’ (Schiffman, 2001, p. 347). This sensitivity is highly dependent on frequency in that ‘each frequency has its own threshold value’ with the 3-4 kHz area being arguably the most sensitive; ‘with intensity held constant [...] a sound of 3000Hz is louder than sounds of other frequencies’ (ibid). We can also add to this complexity, the spectral and temporal qualities of the sound which also significantly influence perception of loudness (Fastl & Zwicker, 2007, pp. 208-220).

#### 2.4.1.2 Temporal Integration

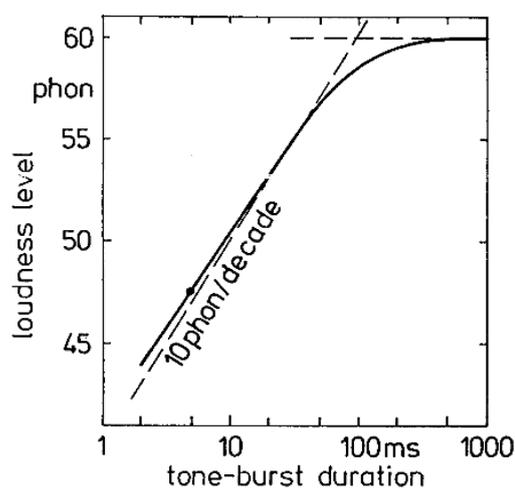


Figure 2.7: Perceived level of a 2kHz tone as a function of burst duration. Zwicker & Fastl suggest that for durations less than 100ms, loudness will decrease by 10 phon for each decade decrease in duration. (Source: Zwicker and Fastl 1997)

An important element in understanding how the human auditory system cognitively

processes loudness is the temporal integration of acoustic stimuli. The duration of individual sounds has a direct influence on the perception of loudness, decreasing as the duration gets shorter than approximately 200ms. Research has indicated that loudness becomes 'independent of duration' once the duration reaches more than 500ms (Moore, 2003, p. 61).

Fastl and Zwicker assert that 'most natural sounds are not steady but strongly time dependent (...) typical examples are speech or music, and also quite a few technical noises that sound impulsive or rhythmic where the loudness cannot be described by steady-state condition,' (2003, p. 216). The most significant decrease in loudness perception according to the research of Fastl and Zwicker occurs below 100ms (2007, p. 218) (*figure 2.7*). When evaluating the loudness of music, extremely short duration sounds (defined as *transients*) that are regularly less than 200ms in duration, do not provide a true indication of the overall loudness of the listening experience even though they regularly represent the highest signal level of a music recording (*figure 2.8*). They are however, intrinsic to the sonic structure produced by some musical instruments such as the percussive sounds of a drum kit.

This phenomenon of hearing is a critical element within the overall discussion concerning the use of hyper-compression and also to methods of measuring and regulating loudness in audio content. Hyper-compression is fundamentally a method of exploiting this phenomena by removing the transients in music, increasing the average level of the musical recording and therefore increasing the perceived loudness of the listening experience (*figure 2.9*).

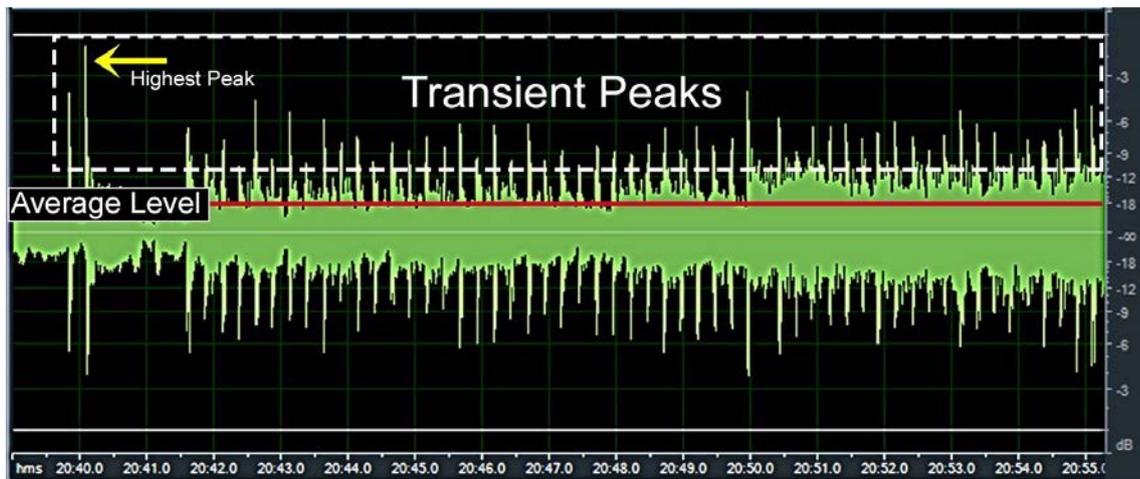


Figure 2.8: The transient peaks (commonly known as *transients*) are illustrated in this waveform within the white dotted box. We can see from the left-side-top that the highest peak almost reaches full-scale. Due to the temporal integration of the auditory system, this peak although indicating the highest level of the overall signal, does not represent the loudness as perceived by the listener. The average level (RMS) represented by the red solid line is more representative of the actual perceived loudness as our awareness of loudness is a temporally integrated experience.

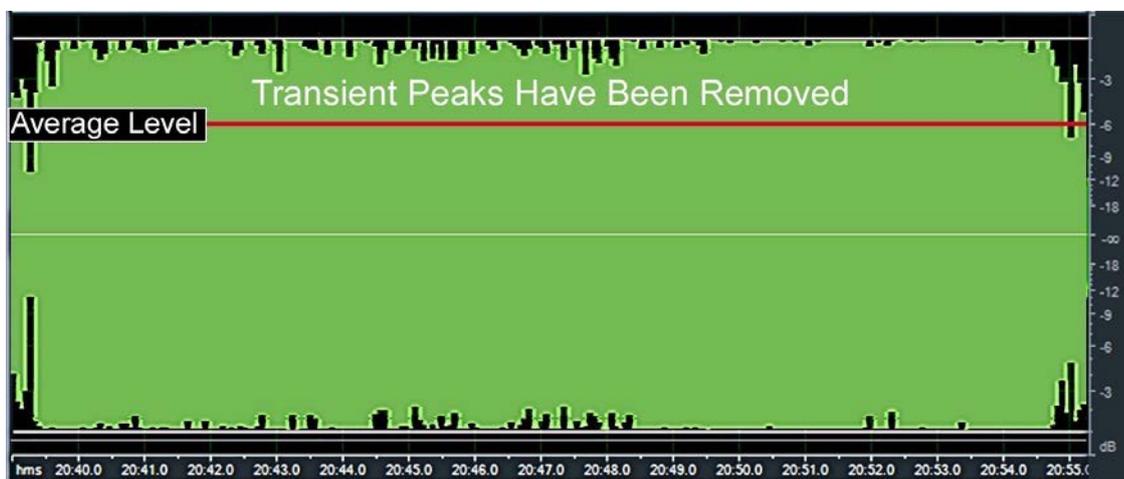


Figure 2.9: This waveform illustrates a severely hyper-compressed signal where the transient peaks have been largely removed. The average level (RMS) represented by the red solid line has been substantially increased resulting in a significant increase in perceived loudness.

### 2.4.1.3 The Loudness of a Music Recording

It is common within the sphere of audio to associate the term “loudness” with signal level in reference to a music recording. Once an audio signal is reproduced by an audio system and converted to acoustic energy by a transducer (loudspeaker) creating fluctuations in air pressure, these fluctuations are then transformed by the human auditory system into sensations that we perceive and interpret as sound (Schmidt & Rutledge, 1996, p. 1014). Therefore, what constitutes the signal, and the behaviour of the system, will have a direct bearing on what is perceived. Altering properties of the signal will result in a change in perception by the listener, and in particular, altering the level of the signal will result in a change of perceived loudness, hence there is a connection between signal level and perceived loudness (see for example: Fletcher & Munson 1933). Within the context of hyper-compression, the underlying psychoacoustic principals of perceived loudness are exploited in the processing of the signal to achieve the greatest magnitude of perceived loudness possible (see for example: Vickers 2010a).

### 2.4.1.4 The “Louder is Better” Paradigm

Within the scope of the literature, the “louder is better” paradigm plays a cornerstone role in the motivation and also presumed justification for the continued use of hyper-compression. A qualification is necessary by presenting this listening paradigm predominately as a sound quality judgment that has the capacity to influence listener preferences, not only with music, but audio programs in general (Ronan et al., 2014b, p. 2). At the core of this assumption is the non-linearity of frequency response of the human auditory system in which listeners are able to gradually perceive a more linear frequency response at increased levels. Therefore, this wide-spread belief articulates that listeners

consider louder program material both preferred and perceived as ‘sonically superior’ to that which is softer, even if the audio material is identical apart from loudness (see for example: Moore 1989, p. 53; Milner 2009, p. 248; Vickers, 2011, p. 346; Weymouth, 2012, p.1; Taylor & Martens, 2014, p. 1; and Katz, 2015, p.42).

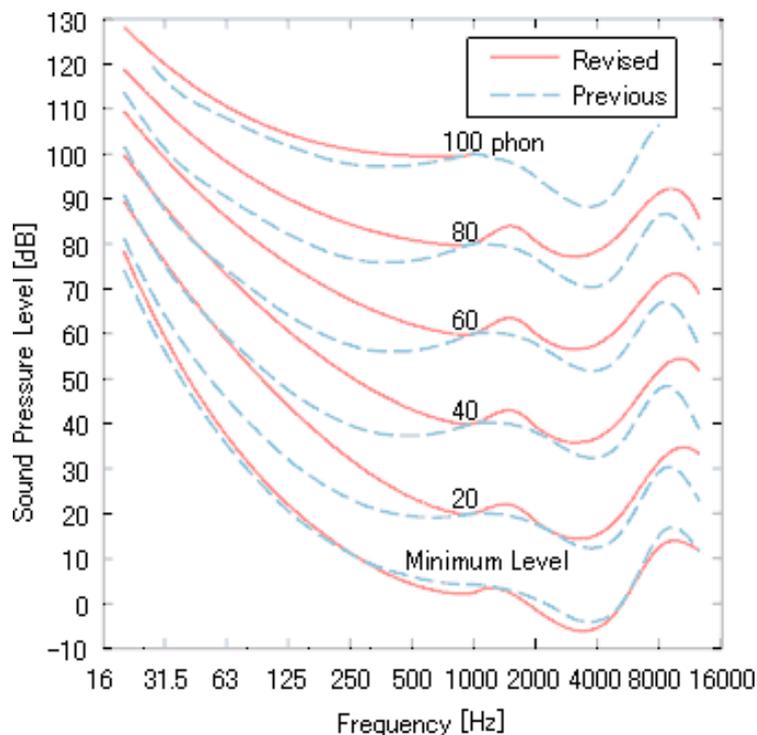


Figure 2.10: The Fletcher-Munson curves. A comparison between the current equal-loudness-level contours (ISO 226:2003) and the original characteristics published by Fletcher and Munson, as illustrated. (Image sourced from the National Institute of Advanced Science and Technology, Japan. (Source: AIST, 2003)

The ‘varying sensitivities... throughout the audio range’ of critical bands as Fielder suggests (1995, p. 326), accounts for the non-linear frequency response of the hearing mechanism; a ‘fundamental property of the human auditory system and... of basic importance in the field of psychoacoustics’ (ISO, 2003, p. v). First discovered by researchers Fletcher and Munson of Bell Labs (1933), the perception of loudness is not equal across the frequency spectrum; ‘we are more sensitive to frequencies in the range

1000-5000Hz, while thresholds increase rapidly at very high and low frequencies' (Moore, 1989, p.49). As the overall intensity of loudness increases, the frequency response becomes more linear, hence the disparity between the perception of frequencies decreases. This sensitivity to mid-frequency ranges is due in part to the transfer characteristic of both the pinna (outer ear) and meatus (ear canal), which, for example, amplify 3kHz by approximately 15dB (ibid). Contributing to this, the transmission characteristic of the middle ear is 'most efficient for midrange frequencies and drops off markedly for very low and very high frequencies' (ibid pp. 49-50). The research presented by Fletcher and Munson has undergone several revisions in more recent times with significant changes especially to low frequencies (Moore, Glasberg & Baer, 1997, p. 224), and presented as an international standard (ISO, 2003) (*figure 2.10*).

This non-linearity of frequency response of the human auditory system forms the basis of the "louder is better" paradigm and as Moore asserts, this phenomenon:

...[has] certain implications for the reproduction of sound; the relative loudness of the different frequency components in a sound will change as a function of the overall level, so that unless the sounds are reproduced at the same level as the original, the 'tonal balance' will be altered. (1989, p. 53)

At particularly low playback levels the tonal balance that Moore describes, is undeniably perceived as balanced differently as compared to higher levels. As the playback level is decreased even further, the very low and high frequencies rapidly attenuate leaving predominately only the mid frequencies audible (Luce, 1993, p. 131).

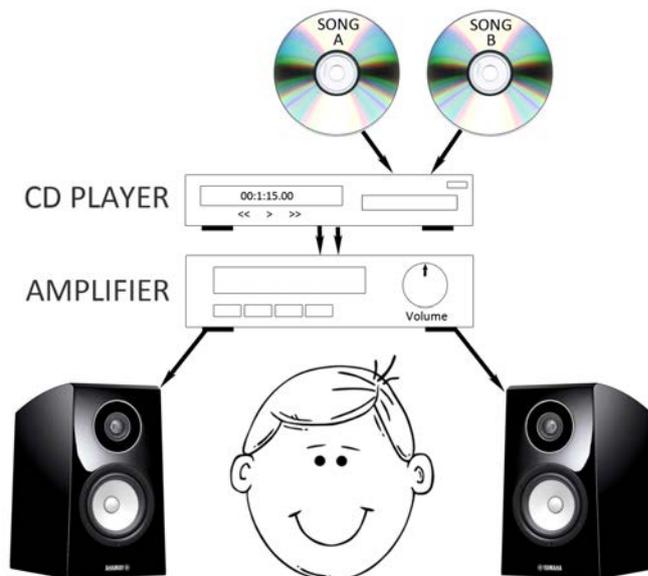


Figure 2.11: The “louder is better” paradigm; if a listener is asked to choose which of two recordings are preferred, they will invariably choose the one which is perceived as louder, even if they are identical recordings and the only difference is loudness.

Of particular importance to the “louder is better” paradigm is the *act of comparison* between audio program material. All program material is constantly being compared either for evaluation, critique or assessment by the listener. A particular song that is broadcast on the radio is being compared to others prior or succeeding. As a point of difference to competitors, perceived loudness has been considered in commercial terms as a mechanism for attracting listener attention for the reasons outlined above (see for example: Milner 2010, pp. 268-278; Vickers 2010a, p. 3). Within this competitive market for listener attention, whether it is in music, television or radio broadcast, it is widely considered that a louder audio program will be more attractive to listeners because more detail of the low and high frequency spectrum will be experienced. With regards to music and the Loudness War specifically, the “louder is better” paradigm is seen as a fundamental incentive for artists and music companies to ‘actively seek increases in recording levels, such that their product was relatively louder than its competitors’ (Taylor & Martens, 2014, p. 1). Katz refers to this paradigm in a more colourful fashion as

‘loudness envy’ in which he similarly argues that ‘when two identical programs are presented at slightly differing loudness, the louder of the two appears to sound “better” and therefore attracts listener attention’ (Katz, 2015, p.42) (*Figure 2.11*). In support of this argument, Milner states that:

...[t]his quirk of hearing has played an important role in enabling the Loudness War. If you play the same piece of music at two different volumes and ask people ‘which sounds better?’, they will almost always choose the louder, partly because more of the frequencies are audible. (2009, p. 248)

#### 2.4.1.5 Listener Fatigue

Listener fatigue is a contentious issue that forms the basis of many concerns regarding the use of hyper-compression and is extensively reported. The discussion relies primarily on anecdotal evidence rather than robust scientific research, based on an assumption that due to the lack of dynamic variability due to the hyper-compression process, listening to music of this nature ‘may become physically or mentally tiring over time; listeners may lose interest without knowing why’ (Vickers 2010a, p. 9). We can position this viewpoint as belonging to both the physical and cognitive realms which can therefore respectively be defined as “ear” or “auditory” fatigue (physical) or “listener” or “listening” fatigue (cognitive) due to the properties that are affected (Truax 200, pp. 15-16).

Vickers provides one of the most comprehensive reports, placing a focus on what he assumes is the primary cause of listener fatigue, being the restriction of dynamic variability in music. He states that ‘despite the lack of published studies, it is widely believed that excessive compression results in listening fatigue’ and the ‘anecdotal evidence is quite compelling’ (2010a, p. 10). The hyper-compression process dramatically reduces the dynamic variability of music to the point in which ‘everything from a gently strummed guitar to a pounding snare [...] [are] equally loud’ (Smith, 2008).

Milner who also extensively reports on the subject, echoes Vickers' assumption and at the same time reinforces the lack of credible research by quoting psychoacoustic researcher, Stephen McAdams:

"I am unaware of any studies on this phenomenon," says Stephen McAdams, the head of McGill University's Centre for Interdisciplinary Research in Music Media and Technology, who studies the psychoacoustics of music cognition. "It may be an urban myth." McAdams thinks that if compression has a fatiguing effect, it's most likely a cognitive fatigue brought on by decreased dynamic range. (2009, p. 257)

Although loud, highly compressed music is intended to get the initial attention of the listener, it is reported that listener fatigue is particularly evident during longer periods of exposure; 'if you ever wonder why you don't like modern music as much as older recordings, or why you don't like to listen to it for long periods of time (much less over the year), this physical and mental hearing fatigue is a big part of the reason' (Weston quoted in Neal 2010). A definitive scientific rationale underpinning these assumptions is not easily found as there are any number of factors that could provide causal relationships. In particular, being able to measure fatigue is universally agreed to be difficult as there are too many subjective variables that could adversely affect results. One specific factor that may provide a solution is to measure the listeners 'ability to remember content' (Rumsey 2008, p. 497). In this way, it would be possible to tell if listeners were paying attention and actively listening. Truax asserts that one of the fundamental elements to cognitive processing is noticing change, and that 'sound is predicated on change at every level' (2001, p. 19). Constantly loud stimulus 'produces a psychological reaction called *habituation*' (italics in quote), which he describes 'in terms of information theory, the degree of repetitiveness in a message is termed "redundancy"' (ibid). At a neurological level, this repetitiveness results in reduced neural activity and therefore less attention is afforded by the listener; in other words, they *tune out*. This could support the argument

that testing the memory of the listener could be an effective indicator of cognitive fatigue.

Apart from cognitive fatigue, mechanical fatigue (also defined here as “ear fatigue”) from excessive SPL can be explained as *post-stimulatory auditory fatigue* from sustained exposure to excessive stimulus, ‘which is usually considerably in excess of that required to sustain the normal physiological response of the receptor’ (Hood quoted in Moore 2003, p. 146). However, during a discussion at an Audio Engineering Society (AES) seminar reported by Rumsey, psychoacoustic researcher Ellyn Sheffield suggests there are other factors involved in the type of fatigue reported and it ‘is just not related to how loud something is’ but believes it is more a cognitive issue (2008, p. 497).

There are of course other considerations that may contribute to this fatigue apart from a reduced dynamic range and constant level. The hyper-compression process also introduces non-linear distortion into the signal path that Lund argues can also be fatiguing because the brain is working harder to process the information. He states that ‘clipping’ (explained in section 2.4.2.1) in production and mastering causes listening fatigue (2004, p. 1) and in general ‘digital media generate increasing distortion at the listener’ and that ‘there is reason to believe that early listening fatigue is one of the consequences’ (ibid, p. 6).

## 2.4.2 Signal Processing

### 2.4.2.1 Signals and Systems

A signal is something by which a medium carries some kind of information ‘contained in a pattern of variation of some form’ (Oppenheim & Willsky, 1997, p. 1). The process by which these types of signals can be interchangeable for an appropriate application is made by a *system*. Rugh states that ‘signals are abstractions of time-varying quantities of interest, and systems are abstractions of processes that modify these quantities to produce new time-varying quantities of interest’ (2005, p. 4). Systems act upon signals in various ways, either transforming them from one form to another or changing certain properties of them (Chen 2004, p. 49).

Furthermore, a system is linear if it ‘possesses the important property of superposition’ (additivity and homogeneity) and non-linear if it does not (Oppenheim & Willsky, 1997, p. 53). Linearity is regularly used to describe whether a system introduces distortions into an audio signal path since signal purity is more often than not critical for many applications. A linear system, ideally, should have a corresponding output to the input given, maintaining integrity of the signal; ‘equal amounts of input result in proportionate amounts of output’ (Truax 2001, p. 145). Distortion within a signal can be defined as a highly complex behaviour that is both destructive to signal integrity and cannot be reversed. Another term to describe this state that is commonly used in the literature is *non-linear distortion*. Non-linear distortion can be highly desirable in certain instances as artistic intent, such as that found with electric guitars, however, in instances where signal

purity *is* required, non-linear distortion is highly *undesirable*. One of the main issues reported in nearly all of the literature concerning hyper-compression is that the process has the propensity to introduce a great deal of non-linear distortion into the signal path, exactly at a point of the reproduction chain where it should ideally be avoided - mastering (see for example: Lund 2004, 2006 and Nielson and Lund, 2003).

#### 2.4.2.2 Dynamic Range

From within the topic of signals and systems, dynamic range has a very broad definition as the difference between the highest and lowest value of some kind of changeable quantity of interest of a signal. The dynamic range of a system is, as Pohlmann highlights, ‘the amplitude range between a maximum-level signal and the noise floor’ (2011, p. 59). Vinyl has potential dynamic range of about 60dB (Truax 2011, p. 146) which is considerably smaller in comparison to that of the Compact Disc (CD) which Pohlmann asserts, ‘exceeds 100dB’ (2011, p. 189), however much of the literature quotes a range of 96dB corresponding to the 16-bit resolution of CD. This is considerable smaller than the potential dynamic range of a sound event.

In a perverse irony, despite the major advancement in the available dynamic range with the introduction of the CD compared to Vinyl, the curious events that lead to the widespread use of hyper-compression meant that only a fraction of the available dynamic range of the CD system is actually used. As mentioned, hyper-compression significantly reduces the dynamic variability of music and also tests the operational capabilities of the reproduction system by making the audio signal reside at the upper most limits of the amplitude range all the time (Lund 2004, pp. 2-3). Nielsen and Lund question the need

for such a sophisticated system for high fidelity when most hyper-compressed songs rarely take advantage of this; ‘16 bit/44.1 kHz, is becoming more and more abused. Most pop releases now get so much distortion added during reproduction that 16-bit resolution is completely overkill’ (Nielson & Lund 2003, p. 1). Milner echoes this bizarre turn of events whereby instead of capitalising on the increase of dynamic range, music went completely the other way and used less of it:

You couldn’t ask for a better symbol of the strange state of music in the last moments of the twentieth century. It was a time when the recording industry responded to the increased dynamic range that digital technology offered over analog by making records whose dynamic range was narrower than those of the analog era. When the craft of making records was locked in a death race to see who could use digital audio to its least potential. (2009, p. 239)

Whatever difference between loud and soft that was left within the music resided in the top 20% of the system’s dynamic range making the 80% below virtually redundant.

#### 2.4.2.3 The Dynamic Range of Music

The general definition of dynamic range, from the perspective of signals and systems mentioned is useful especially when discussing the manipulation of the dynamic range of signals, however, the literature indicates this broad definition is clearly problematic with analysis concerning measurement or correlation to human perception. The dynamic range of hyper-compressed music in this sense would be the range from the highest amplitude (0dBFS or over) to the lowest (silence, when the song stops or fades away), effectively only describing the dynamic range of the system, which as Vickers asserts, ‘actually tells us little of interest about such a signal,’ (2010b, p. 5). The dynamic nature of music is also commonly referred to in the literature simply as the *dynamic range* which Vickers suggests ‘has the advantage of familiarity’ (2010a, p. 2) but as Deruty and Tardieu

explain, can be confusing and incorrect:

The problem of level variation in music is often discussed using the notion of *dynamic range*, which appears to be poorly defined. It sometimes refers to micro-dynamics, and sometimes to macro-dynamics. It has no clear perceptual counterpart and no standardized way of measurement. This lack of definition leads to partially wrong or even contradictory conclusions in several publications, in which the authors confuse crest factor with loudness variability. (2014, p. 14)

Deruty believes that the term *dynamic range* should be ‘reserved for the measure of signal-to-noise ratio of a recording medium’ specifically and not used in the context of music dynamics. He suggests the term *dynamic variability* as a general overarching definition, which he believes, more correctly describes the subject (2011). The term “dynamic variability” is therefore used throughout this thesis to describe more correctly the common notion of dynamic range of music. Similarly, Vickers also contends ‘the conventional definition of dynamic range looks at signals one sample at a time and has no notion of perceptual loudness or of different time-scales or frame sizes’ (2010b, p. 5). Therefore, the terms used in this instance are *micro-dynamics* which relates to instantaneous moments in time, what Katz describes as ‘the music’s rhythmic expression, transient quality (...) which involves the music’s short-term peaks’ (2015, p. 74). *Macro-dynamics* on the other hand relates to the dynamic variance over the entire song or sections of the song (ibid).

#### 2.4.2.4 Dynamic Range Compression (DRC)

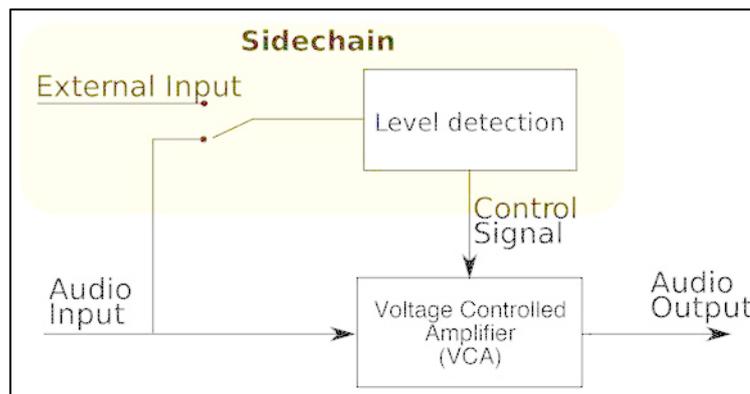
Dynamic range compression (DRC) is described by Giannoulis et al. as ‘the process of mapping the dynamic range of an audio signal to a smaller range (...) reducing the peaks of the signal level while leaving the quieter parts untreated’ (2012, p. 339). Also known more simply as *compression*, it is one of the most common tools used in audio production

with both protective and aesthetic applications (Talbot-Smith 1999, p. 2.150). DRC can be used in the recording process to prevent signals overloading the recording system if the dynamic range of the sound is greater than the dynamic range of the system (Watkinson 1998, p. 475-476). Truax points out that DRC can aid in maintaining ‘good recording levels’ throughout a recording, avoiding quiet sections falling too low into the background noise therefore establishing a good signal-to-noise ratio at all times (2001, p. 146). DRC can also be used in an artistic sense to alter the dynamic properties of an individual instrument or an entire recording of many instruments.

One of the most critical aspects to DRC is its ability to manipulate loudness ‘since its essential mechanism is to reduce the partial loudness of peaks and bring up the mid levels’ (Katz 2015, p. 87). DRC is one of the fundamental processes used in the final stage of audio production known as *mastering*. Mastering, as Rumsey suggests, ‘is a process of “finishing” in audio production that aims to unify and improve the final quality of a project’ (2010, p. 65) and seeks a ‘form of audio truth’, a mediation between client expectations and reality (ibid, p. 71). Likewise, McIntyre and Paton describe the process as ‘the stage of post-production where the overall final product is adjusted so that it is intelligible, in audio terms, across all playback systems and, in this case, may be compared to the colour grading process undertaken in film work’ (2008 p. 67). DRC can be used in this stage of production to make the music recording extremely ‘loud’, and an excessive form of DRC used to create this kind of outcome was first dubbed *hyper-compression* by audio engineer Lynn Fuston in 2000 (personal communication, 12/2/2016) in response to the trend in mastering that had been developing during the 90s. Hyper is a prefix with Greek origins meaning “over” and used in the formation of many compound words such as hyperthyroid or hyperactive.

### 2.4.2.5 The Compressor/Limiter

An audio engineer controls the level of an instrument or sound in a mix by moving a fader on a mixing console up or down which of course determines how loud that sound is in comparison to others. Sometimes engineers are faced with ‘undesirable level changes’ within a particular sound that are too fast for the engineer to react to or can’t be anticipated as these levels changes may happen within milliseconds (Senior, 2011, p. 143). A compressor or limiter is a form of automatic gain control that analyses the signal and acts on the level according to parameters set by the operator (*figure: 2.12*). There are a number of parameters that determine when and how much compression is to be applied—the *threshold* and *ratio*, and how the compression behaves temporally—the *attack* and *release* time, and the *knee* (Talbot-Smith 1999, p. 2.150).



*Figure 2.12:* The signal, once entering the system is duplicated and follows two paths. Signal A is the program path to be processed and signal B is used for analysis otherwise known as the control path or *side-chain* (Talbot-Smith 1999, p. 2.151). Signal A passes through a voltage-controlled amplifier (VCA) which regulates the gain of the signal. The gain of the VCA is dependent on a control signal that comes from either peak or root-mean-square RMS analysis of the side-chain, which in simple terms, tells the VCA “there is a loud sound here, quickly turn it down by this much, and this quickly”.

(Source: Iain Fergusson – Creative Commons)

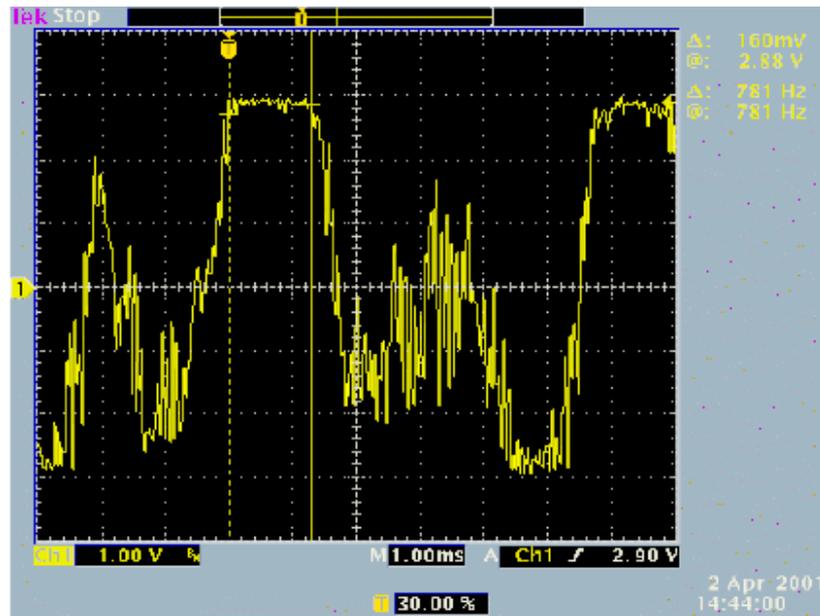
There is little structural difference between a limiter and a compressor as the two are

defined only by operating parameters that consequently delineate applications. The fundamental purpose of a limiter is to stop the signal exceeding the threshold at all times and as such has a very high compression ratio such as  $\infty$ :1 (Talbot-Smith 1999, p. 2.151). The attack and release time of a limiter are usually pre-set to be extremely fast (almost instantaneous) to quickly attenuate levels, quickly resume normal level and maintain transparency (Katz 2015, p. 86). Compressors, generally by nature of their design, cannot act fast enough to act on short transients. Limiting can also be useful to reduce transient peaks of very short duration ( $< 10\text{ms}$ ) and leave the rest of the audio signal intact if the threshold is set at the correct level.

Limiters have been used extensively in the mastering process to achieve extremely loud masters by setting the threshold level low enough to ‘cut into the body of the sound’ reducing almost every peak in the music and raising the overall level to the absolute highest digital level, 0dBFS (Shepherd 2011). The digital look-ahead limiter can achieve what is commonly referred to in the literature as “brick-wall” limiting.

#### 2.4.2.6 Clipping

It is worth mentioning a form of DRC that does not follow traditional methods of gain control known as *clipping*. When a signal exceeds full scale (0dBFS) with a digital system, the signal peaks are shaved off and become a square wave which essentially translates sonically as distortion (*figure 2.13*). Clipping could be considered a brute force form of peak-limiting by simply overloading the input circuitry, and as Katz argues, is compression ‘in the most primitive and distortion ridden way’ (2015, p. 81).



*Figure 2.13:* A clipped peak in a signal. The section that is highlighted illustrates a waveform that has been shaved off as a result of the clipping process; hence, a “square wave”. (Source: Orban & Foti 2001)

Clipping is considered an extremely contentious issue by some, however, as Senior explains, its use is widespread and can have certain aesthetic justifications:

You can find any number of textbooks that threaten hellfire and brimstone should you dare abuse your full mix in this way, but such admonitions are at odds with widespread commercial practice—examine the waveforms of the top-40 singles any week of the year and you’ll see clipping in abundance. The advantage of clipping as I see it is that it doesn’t seem to affect the subjective attack or balance of prominent drum parts as much as peak limiting, so it tends to suit styles with hard hitting rhythm parts. (2011, p. 280)

Milner reports a similar stance in that ‘even the harshest critics of the Loudness War defend the use of clipping in moderation’ and can form a large part of the Hip Hop or contemporary R&B sound; a ‘conscious aesthetic choice’ (2009, p. 254). Milner quoting engineer Kevin Gray contends that clipping is ‘being driven by the big New York mastering houses’ to get that ‘extra bit of loudness’, but it could be argued that it is rife throughout the whole industry (ibid).

#### 2.4.2.7 The Deleterious Effects of DRC and Clipping

DRC and clipping are non-linear processes that cannot be reversed, therefore any artefact of the process introduced into the audio signal is permanent. Hyper-compression introduces considerable non-linear distortion artefacts that may be noticeable and undesirable to the listening experience. Therefore, a compromise is always made between achieving sufficient loudness and audio quality (Nielsen & Lund 2003, p. 7). The negative consequences of hyper-compression have been extensively reported in much of the literature and form the basis for arguments against the practice. These deleterious effects can be broken down into three categories: those concerning the integrity of the audio signal and its reproduction; those concerning the integrity of the musicality; and those of a historical nature concerning the permanency of these artefacts (music conservation).

##### 2.4.2.7.1 *The Audio Signal*

We can locate two areas in which artefacts are introduced into the signal path; during the DRC processing, and as a consequence of this processing, during the reproduction of the signal. The former, Vickers describes as ‘equipment abuse’ in which the audio practitioner deliberately or non-intentionally introduces artefacts via DRC in which he states, ‘there are many ways to go wrong and the list of possible side-effects is surprisingly lengthy’ (2010a, p. 9). To achieve a hyper-compressed master, several stages of DRC may be required such as multiple stages of limiting and/or clipping, to achieve the required loudness. Each stage introduces subtle degrees of signal degradation which accumulates to result in wave forms that have been squared off (clipped) at the peaks throughout the recording.

Clipped waveforms within a recording not only have the immediate effect of creating distortion artefacts embedded within the signal, but it has a cascading effect of signal degradation when reproduced. Extremely high level hyper-compressed signals at or near 0dBFS containing square waves, introduces a significant problem to the reproduction chain with both digital to analog conversion and data compression encoding, introducing even more distortion artefacts on playback (see for example: Nielson & Lund 2000, 2003 and Lund 2004, 2006). Nielsen and Lund have been at the forefront of research that explores this circumstance since 2000. According to Lund, during the digital to analog conversion process, an increase in peak level of a square waved signal of up to 6dB can occur from a process known as Gibbs phenomenon (2006, p. 2). When the higher harmonics of a square wave above the Nyquist frequency are removed, it causes an increase in level of the fundamental frequency and higher harmonics remaining during the digital to analog conversion process (ibid). Therefore, even if the original signal is within operating levels such as 0dBFS or slightly below, when the signal passes through the conversion process the level is increased which overloads the system and additional distortion is output, producing what Lund describes as a ‘perceptually unpleasant artefact’ (Lund 2004, p. 2). Lund contends that ‘when peaks reach +3 dBFS, most players distort more than 10%’ (ibid). When a digital system is overloaded by signals that exceed 0dBFS—termed *overshoots*—it results ‘in the generation of high-frequency harmonics within the digital system itself (and after the anti-aliasing filter)’ which causes aliasing; whereby the laws of sampling are broken and the signal folds back on itself introducing distortion artefacts into the signal—aliasing distortion (Robjohns 2006).

Data compression codecs fare even worse. As Lund explains, the data reduction process

also was not designed to handle such high-level signals and that ‘alias distortion is completely unrelated to harmonic distortion’ which is found naturally in many musical sounds (Lund i/v, 2015). It puts a great deal of burden on the codec to decipher what is *noise* and what is part of the signal that is worth keeping, as the whole point of data compression is to remove parts of the signal that are not perceptually relevant or necessary to reduce file size. Therefore, ‘alias distortion is typically worse on lossy coders as it is in linear audio (CD)’ (Lund i/v, 2015) creating a sound that Lund describes as like “space monkeys”; a warbling sound that indicates the codec is having trouble deciding what to keep and what to remove (Lund 2016a).

#### 2.4.2.7.2 Musicality

Vickers outlines a series of negative effects on musicality from the hyper-compression process that summarise many of the complaints made in much of the literature regarding hyper-compression, under the headings of ‘aesthetic concerns’ and ‘loss of excitement and emotion’:

Hyper-compression has been accused of removing dynamics and making music sound “squashed”, creating musical clutter and reducing depth and texture, robbing music of its excitement and emotional power. (2010a, p. 5)

Vickers asserts that one of the primary criticisms of hyper-compression is that it ‘flattens the dramatic and emotional impact of the music’ (ibid, p. 6), an argument that Levine supports in an article published in Rolling Stone (2007). Common within the commentary of several high-profile music industry identities interviewed for the article, a belief emerges that with constant intensity of loudness it ‘flattens out the emotional peaks that usually stand out in a song’ (ibid). It is also mentioned that as the dynamic variability

decreases, it becomes more difficult to easily discriminate individual sounds as ‘compression smudges things together’ leading to detail being obscured (ibid)<sup>6</sup>.

In a study which explores the ‘sound quality dimension of hyper-compression’, Ronan et al. discuss that despite DRC in general being known to be useful in providing a ‘more coherent result’ due to the fact that the process ‘fuses together individual sound sources’, hyper-compression can, however, have a negative effect of sound separation (2015a, p. 10). Participants in their study found that hyper-compression caused a ‘lack of definition and separation between instruments’ that was considered to have the result of ‘smudging things together’ (ibid). They concluded that:

When components of a scene are amplitude modulated in the same way, they become fused together into a single percept and they are listened to as a whole. This can lead to difficulty perceiving individual sound sources within a complex signal [...] When source segregation is interrupted by the compression of a group of sources, a common modulation envelope is applied to all of the instruments. (ibid)

Vickers quotes perceptual psychologist Susan Rogers who believes that the removal of dynamics and instruments blending together in this fashion discourages active listening (2010a, p. 6). Levine supports this argument by stating that ‘compression loses space and realism and involvement’, and as such, reduces the sense of ‘realism’, making the music ‘hard, unnatural and unpleasant’ to listen to (2007). This relates directly to another commonly reported grievance; the lack of a ‘feeling of space’ within the music which Ronan et al. attribute to every sound being brought to the foreground due to excessive compression (2015a, p. 10). In particular, they mention from a spatial perspective, note decays and room reverberation which generally reside in the background is pushed to the

---

<sup>6</sup> Smith reports that this loss of ‘sonic detail’ was one of the major reasons why fans of Metallica made complaint of the album *Death Magnetic* (2008).

foreground filling up every ‘space between notes’ (ibid). This surely correlates with the what Vickers terms as “musical clutter”.

#### 2.4.2.7.3 Music Conservation

One of Lund’s primary concerns is that of ‘music conservation’. Lund asserts the importance of preserving high quality recordings that will extend into the future with the consideration that loud recordings may not be desirable in the future as they are now (Lund 2005, p. 6). In this he refers to a ‘musical legacy’ that is being destroyed by excessive use of hyper-compression:

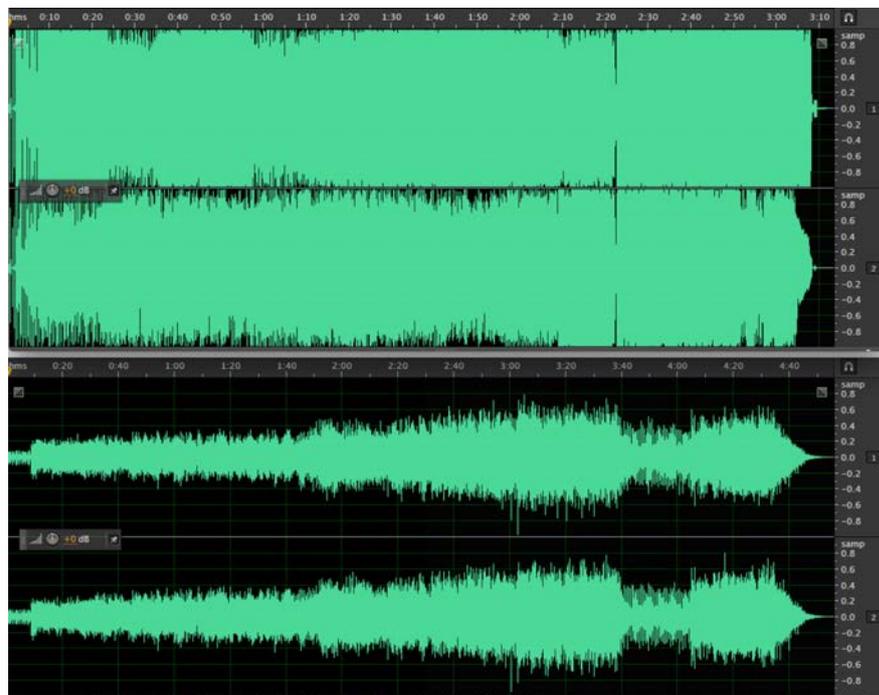
As audio professionals, we ought not only to be concerned about our immediate customers (music buyers and cinema goers), but also about conservation of talent. But, if the public doesn’t care, why should we? Because pride in our industry, craftsmanship and conservation of musical talent tell us to be concerned. If we believe audio quality makes a difference and is not just an excuse for selling new gear, the audience should have a chance of getting a non-distorted experience. (Ibid)

Lund believes the age of hyper-compression is destroying an entire musical heritage because of the irreversible nature of the non-linear distortion embedded into modern recordings; recordings that document a large part of the world’s popular music culture.

#### 2.4.2.8 Measurement of Dynamic Range

The analysis of signals is imperative in gaining an insight into how the hyper-compression process can affect both audio quality and musicality. This can be as simple as viewing the waveforms of recordings (*figure 2.14*) where the amplitude of the hyper-compressed recording is clearly higher than the non-compressed. More sophisticated measurement

methods can be employed for further detailed analysis, of which, the measurement of the perceived loudness of audio signals represents one of the most significant advancements in production practices, particularly with regards to broadcast. Considering what constitutes a signal directly corresponds with the loudness that is perceived during reproduction, the measurement of signals and loudness are highly interrelated. This section serves as a basic summary of the various analysis measurement procedures and language commonly used in the discussion on the use of hyper-compression in this context.



*Figure 2.14:* Top: an aggressively hyper-compressed music recording—note the lack of headroom representative of the dense amplitude (green colour). Bottom: a track exhibiting a large dynamic variability as evident by the presence of ample head room (black area) and intact transients.

Firstly, measuring dynamic variability enables us to examine signals and their behaviour. Furthermore, studies that have analysed enormous corpuses of music using these methods of measurement have provided a much-needed understanding of the trajectory of hyper-compression as a structure within audio production practices (see for example: Deruty

2011; Ortnier 2012; Deruty & Tardieu 2014; Deruty & Pachet 2015). Secondly, it is possible to predict how loud music will be perceived by the listener using specialised measurements based on psychoacoustic modelling. Deruty and Tardieu delineate signal descriptors concerning level and loudness into three areas: those that apply to the physical level of signal; those that based on the psychoacoustic models (loudness); and those that are energy based (2014, p. 43). Through these measurements we can then regulate audio content to be of equal loudness to the listener, which is particularly beneficial in broadcast or music reproduction; known as *loudness normalisation*.

#### 2.4.2.9 Loudness Normalisation

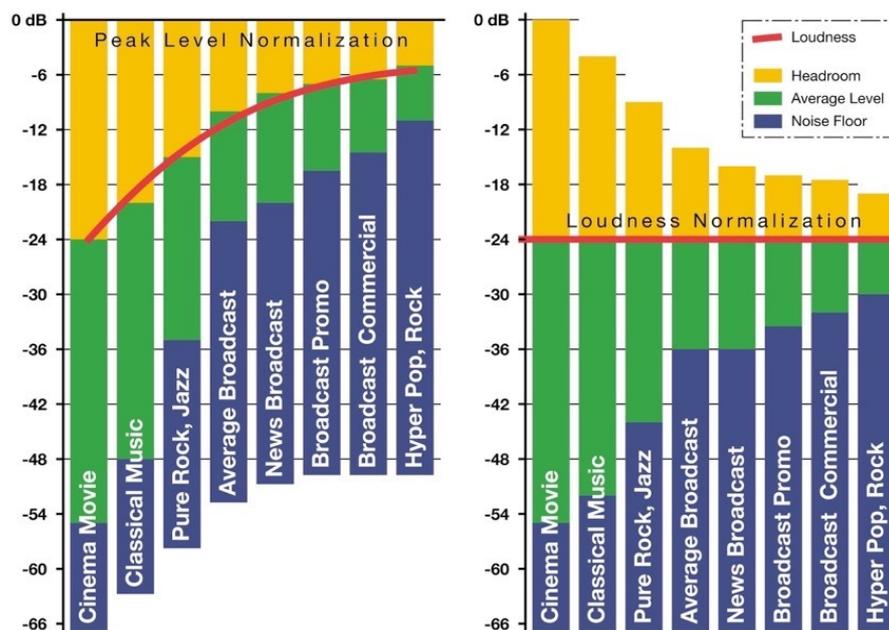


Figure 2.15: Peak normalisation versus loudness normalisation. The red line indicates perceived loudness. This illustrates that the peak level of an audio signal does not correspond to perceived loudness and the traditional method of using peak meters to regulate signal level created loudness discrepancies. Loudness normalisation which instead measures the long-term average of the entire audio signal provides a correlation with perceived loudness. (Source: Lund 2011)

Originating from television broadcast, loudness normalisation is a method for regulating

the loudness of program content which prompted the development of a new set of guidelines for standardised loudness. The catalyst for introducing such a system can be attributed to discrepancies in loudness between normal program material and advertising commercials; responsible for a large proportion of complaints worldwide in regard to television broadcast and programming (Eggerton 2014). Previously, audio levels in broadcast were regulated using *peak normalisation* in which the highest (peak) level of the signal was not to exceed a specific limit, but it is clear that peak signal level has very little to do with the way we perceive loudness (*figure 2.15*).

Loudness is perceived as an average over time and although hyper-compressed commercials technically adhered to the required peak level prescribed, they would, however, be perceived as much louder than more highly dynamic program material. In response to the concerns of viewers regarding loud commercials, the International Telecommunication Union (ITU) instigated the ITU BS.1770 standard of loudness normalisation with the aim of eventually replacing the existing peak normalisation method, seen as the root cause of the problem (ITU, 2012). The BS.1770 algorithm has the capacity to correlate audio signal levels with perceived loudness, incorporating features that correspond directly to the workings of the human hearing system. Therefore, audio signals of any type can be regulated to potentially yield the same perceived loudness by the listener.

A directive by the European Broadcast Union (EBU) in 2008 founded a technical committee (known as P-LOUD) to investigate the operational implementation of this new standard. The initial outcome of the committee was the R128 recommendations published

in 2010, of which four supplemental technical documents outlining practical guidelines for its implementation were published in 2011; EBU Tech-3341, 3342, 3343 and 3344 (EBU 2011; 2014; 2016a-d). In contrast to the European model which was largely voluntary, The United States on the other hand dealt with the problem of loudness discrepancies in broadcast via legislation. In 2012, Congresswoman Anna Eshoo of California's 14th Congressional District introduced the 'Commercial Advertisement Loudness Mitigation Act', H.R. 1084 (or the "CALM Act" as it is more commonly referred to). The regulations implemented are enforced by the Federal Communications Commission (FCC) (Powell 2009) and set out in the Advanced Television Systems Committee (ATSC) A/85 recommendations, also based on the ITU BS1770 standard (ATSC A/85, 2013), under which potential fines could apply for non-compliance (Eggerton, 2014). In Australia it is also compulsory under the 'OP59' code of practice enforced from January 2013 (Free TV 2012).

#### *2.4.2.9.1 Loudness Normalisation and music streaming*

Music streaming has created a new space within the digital realm for audiences to connect with artists and obtain access to their music. It provides an alternative to the traditional ownership of a physical musical artefact, where the audience instead leases music to be listened to on demand (Taylor 2017, p. 120). With a similar business model to video streaming companies such as Netflix and Stan, music streaming services provide on-demand access to a network database of music content either for free (with advertising) or as a subscription (without advertising) (ibid).

Music recordings from the decades since the 1950s vary greatly in their overall level and loudness (Vickers 2010a, p. 3). Modern recordings that have been subjected to hyper-compression can be as much as 20dB louder than recordings from the 1960s to 1980s (Katz 2015, p. 243). This creates a very similar problem to that which television broadcast faced with loud commercials compared to the much lower program material (Vickers 2010a, p. 3). The change in perceived loudness from song to song can be substantial and infuriating to the listener, drawing ‘comparison that the songs of today are hyper-compressed to such an extent that they function as commercials for the artists that produce them’ (Taylor 2017, pp. 118-119). Hence, loudness normalisation of some kind (e.g. Replay Gain and Apple’s Soundcheck) has been implemented on most streaming platforms to mitigate this problem. An ensuing problem became evident; no one standard was applied to any platform and “target levels”, one of the key issues in the loudness normalisation process, differed from service to service (AES 2015). The Audio Engineering Society’s (AES) technical committee on “Transmission and Broadcast” commissioned a sub-committee to investigate target levels specifically for audio on-line streaming services. The technical document, AES TD1004.1.12-10 - “Recommendations for Loudness of Audio Streaming and Network File Playback,” outlines a target level of between -16 and -20LUFS, taking into consideration many factors such as content type and playback device specifications (ibid).

#### 2.4.2.10 Perception of Dynamic Variability

Within scientific circles, hyper-compression, deemed to be contrary to audio fidelity, was automatically assumed to be not in the best interests of the consumer. However, of particular importance is determining whether listeners prefer a hyper-compressed

recording in comparison to a non-compressed. Ronan et al. highlight the need for research in the area by suggesting that ‘uncovering the effect of reduced dynamic range on consumer preference would validate music production processes used to meet that preference (Ronan et al. 2016, p. 1). Taylor and Martens lend support by arguing there should be some other justification for the use of hyper-compression other those offered as simply a commercial mechanism (2014, p. 2).

In recent years, studies have attempted to gauge listener preferences with mixed and inconclusive results. These studies have uncovered a range of difficulties in trying to ascertain preferences due to the vastly diverse subjectivity involved, and most importantly, the perceptual attributes of DRC which prove difficult for the average listener to discriminate. As a result of these problems encountered, ‘these tests provide little explanatory power as to the reasons why hyper-compression persists’ (Ronan et al. 2016, p. 1). As such, we can only ascertain so far from these studies that: moderate compression is preferred on very specific genres of music (Croghan & Arehart, 2012); the average listener cannot discriminate between even large magnitudes of DRC (Hjortkjær & Walther-Hansen, 2014); lower crest factor results in a degradation of sound quality (Wendl & Lee, 2014); and that listeners of the genre pop prefer hyper-compression, most likely due to long-term exposure (Taylor & Martens, 2014). None of which provides any clear indication of listener preferences that can be generalised. However, they do outline important issues pertaining to the way the average listener perceives hyper-compression, providing a much-needed insight, not into preferences per se, but in the factors that may influence these preferences.

Importantly, Hjortkjær and Walther-Hansen outline the average listener's inability to discriminate the presence of DRC and make mention that their results indicate that 'listeners are less sensitive to even high levels of compression than commonly claimed' (2014, p. 40). It is also worth noting that almost all other studies on listener preferences, the stimuli used for the experimental procedure were loudness normalised, thereby removing loudness bias as a perceptual cue from preference ratings. Therefore, preferences were made only from the perceptual cues evident from the hyper-compression process itself. As a result, Ronan et al. make the obvious association that 'logic dictates that if a discrimination test proves inconclusive, a preference test will likely provide the same result' (2016, p. 1). Furthermore, many of the studies mentioned above included participants who can be identified as *trained* (experts in the field of audio) and *un-trained* (the average listener with no prior training in audio). The overall ability of listeners to discriminate dynamic range was reported consistently worse for those that were un-trained who could be described as typical of the majority of the global audience. A study by Ronan et al. that specifically investigated the ability of un-trained listener to discriminate dynamic range in music concluded that:

...up to 12dB of compression limiting was not discriminated by untrained listeners above chance levels [...] Based on the experimental findings, previous inconclusive results from preference experiments on DRC and hyper-compression may be due to the inability of untrained listeners to discriminate hyper-compression. The experimental results further demonstrate that caution should be exercised when extrapolating the beliefs of expert listeners to the general public on matters of slight sound quality differences. Without training, these differences may be unperceivable. (2016, p. 7)

This result lends weight to the assumption made by those that suggest loudness normalisation may mitigate the use of hyper-compression. If music is loudness normalised – removing loudness bias from reproduction – and the listener cannot discriminate between even large magnitudes of compression, then surely this would negate the need for the use of hyper-compression as there would no longer be any

advantage to do so. There are, however, a complex array of other factors at play, stated in the research conducted in this area by Ronan et al. They assert that despite the removal of loudness bias, all ‘factors contributing to a preference for dynamic range compression have not been removed’ (2014b, p. 1). They identify four factors that are suggested to exert influence apart from loudness bias: prolonged exposure to hyper-compressed music; preference for musical genre; education and training; and perceptually salient sound quality attributes (ibid, p. 4).

## 2.5 Conclusion

The literature review presented covers a very broad range of topics that are substantially related to the topic under question. Aside from the immediate evidence regarding signal degradation that is predominately offered by Nielsen and Lund, there is also a great deal of other anecdotal evidence pertaining to the musicality of the recordings. There is also the question of listener fatigue, a subject that is so widely cited but unsubstantiated by scientific research. Vickers sums up the credibility of this argument in the following:

It is conceivable that the idea of hyper-compression causing listening fatigue may be widely believed simply because it sounds believable, allowing this meme to spread across the internet like other “urban legends”. (2010, pp. 10-11)

Apart from the mention of testing memory retention to examine this condition, Vickers suggests ‘this raises the not entirely facetious question of whether extended listening tests designed to measure fatigue might in fact corrupt their own results due to listening fatigue’ (ibid, p. 10). After a lengthy examination of listener fatigue, Vickers does, however, state that ‘nevertheless, the anecdotal evidence seems quite compelling’ (ibid, p. 11). The topic of listener fatigue and its legitimacy is an example of the many anecdotal inferences that is interspersed with that of reliable scientific evidence that is chronicled by Vickers in his 2010 opus, in which he admits the topic ‘is a rather slippery subject in between art and science [...] the topic is awash with speculation, conjecture and unstated assumptions’ (ibid, p. 2). In the years following, there has been a great deal of scholarly research on the topic of listener preferences and the perception of dynamic range reduction, particularly by Ronan et al. which attempts to substantiate justifications for the use of hyper-compression with regards to the listener. Many of these studies have revealed that in the absence of loudness bias, the average listener most likely cannot

discriminate between even large magnitudes of compression (see for example: Hjortkjær & Walther-Hansen, 2014). This of course raises the question that if an average listener that is devoid of any proclivity towards audiophilia was queried on whether they prefer a hyper-compressed recording over a non-hyper-compressed recording, would they be able to make a meaningful choice? The answer would be most likely no. This then presents the possibility that loudness may not be conducted for the *benefit* of the consumer's listening experience but used rather as a blunt mechanistic tool to take advantage of the idiosyncratic characteristics of human hearing that have been extensively discussed. Or quite possibly to exploit these characteristics to cleverly fool the consumer into thinking one product is better than another simply for commercial gain.

We can then turn to the “louder is better” paradigm for answers which the quest for loudness has been predicated upon since ‘the jukebox effect’ that Thiele maintains ‘changed forever’ the nature of recordings (2005, p. 130). Thiele's account pre-dates Vickers by five years and is arguably one of the first documented “complaints” of the hyper-compression era. Underpinning the “louder is better” paradigm is well documented and reliable scientific evidence dating back to Fletcher and Munson in the 1930s. We can therefore say with some confidence that loudness has the propensity to distinctly influence the listener. Hence, loudness as a commercial mechanism has been the pursuit of radio broadcasters and music producers alike and is founded upon something that is tangible. However, this tacit understanding that loudness can influence an audience favourably which proliferated uncontrollably into the digital technology Loudness War, has arguably transformed into something so dominant in music production practice that it has quite possibly lost sight of its original intention. It has become, as Weymouth suggests, a case of the “prisoner's dilemma” where insecurity has taken over common

sense and despite the many warnings by a very educated and distinguished community of researchers and practitioners, it seems that all involved in the production of mainstream popular music are too afraid to take a step back from the loudness cliff for fear of losing the war.

Understanding why agents engage with hyper-compression, apart from being simply a marketing mechanism, presents as a noticeable void in the literature. Much has been reported regarding hyper-compression being a prerequisite to enter the market place, but it is difficult to locate anything that may relate to it having any other kind of function. From the literature, it seems that hyper-compression is employed purely as a structural requirement in which trade-offs in audio quality are an inevitable by-product. As such, hyper-compression is regularly portrayed as contravening quality and as Milner asserts, weighing the potential benefits and disadvantages of hyper-compression ‘involves a Faustian deal with the psychoacoustic devil’ (Milner 2009, p. 256). This may not necessarily always be the case as agents have devised ways to incorporate loudness into their production practices that negate many of the deleterious artefacts of the process. It can also be argued that hyper-compression has evolved into an aesthetic intent that agents utilise in work practice to achieve certain outcomes, and it has also evolved into the structure of specific genres of music. This will be discussed in detail in later chapters and it is hoped this discussion will attempt to address this deficiency in some way.

Likewise, the media in particular has presented the subject of hyper-compression from the very narrow scope of competitiveness. From 2005, print and on-line media saw an opportunity to examine the subject as it was becoming a high-profile topic within the audio community. This was made even more attractive due to the controversy

surrounding Metallica's notorious album *Death Magnetic* (2008) which was widely and anecdotally considered to be the loudest album ever made. As mastering engineers are considered the front-line foot soldiers in the Loudness War, it was these agents who were commonly sought by the media as "talking heads" (see for example: Jones, 2005). It was also the misgivings of Metallica's mastering engineer Ted Jensen who publically commented negatively on the album's loudness which added fuel to the controversy (5.2.2). This, however, illuminates only one side of the story. Mastering engineers are essentially servants to those primary creators of music, the decision-making agents such as the artist, management or record company. Hyper-compression is reported as a distinct problem but rarely is the complex web of underlying socio-cultural issues ever touched upon in the literature. Digital audio technology and the "louder is better" paradigm are commonly asserted as obvious enablers of the Loudness War, however, another distinct gap in the literature examined overall, was the mention that it could be more of a systemic problem.

Much like the circumstance where many agents strongly believe that loudness normalisation is the potential "magic bullet" to end the Loudness War, Ronan et al. sensibly suggest otherwise. In their paper, titled *Loudness Normalisation: Paradigm Shift or Placebo for the Use of Hyper-Compression in Pop Music?* the authors maintain that according to their findings, 'that while loudness normalisation may help de-escalate the loudness wars, listener preference for hyper-compressed music may be more complex than simply a competitive advantage relating to loudness bias' (2014, p. 920). Similarly, why almost every agent that produces music as cultural works within the field of Western mainstream popular music, globally, seriously considers loudness and the use of hyper-

compression as an integral part of the outcome is arguably far more complex than what has been indicated so far.

One specific circumstance that seems to have been missed from the commentary entirely is the fact that the global recording industry suffered a highly damaging collapse in revenue of reportedly nearly 40% from \$23.8 billion in 1999 to \$14.3 billion in 2014 (IFPI 2017, pp. 10-11). This downturn can be largely attributed to the transformation from physical to digital sales, but there are also many other factors that can be identified. The internet in general has had a significant impact on distribution and communication channels as well as the digital audio technology that placed audio processes into the hands of amateurs and enthusiasts creating an influx of product that bypassed traditional networks and filters. This created an intense environment of competition and subsequent insecurity. With a diminishing possibility of return on investment, it was highly unlikely that agents would risk having a softer recording than the competitors. While the industry was trying to adapt as rapidly as it could to the changing landscape of music business, the risk of going against what had become a significant part of production practise was most likely the least important topic on the agenda. In addition, hyper-compression was also rapidly evolving as a practice it could be argued that it was no longer simply trying to be the loudest.

This set of circumstances were rarely if ever introduced into the narrative of the hyper-compression age, nor the literature, which again underlines the need for the topic to be addressed from a systemic perspective. Within this system, there are a complex set of structures and conditions that govern the action of agents. We have one set of objective conditions that predisposes action from the perspective of sound and its psychophysical

response, as well as the technology that is enabling in manipulating those responses. However, it could be argued that those structures that are broader and derived from the sociocultural and socioeconomic contexts are equally as important and causal. Agency is not dictated nor solely influenced by one or the other, it is through the complex network of conditions at an agent's disposal that action is afforded.

As a means to examine this controversy surrounding the use of hyper-compression from a systemic perspective, a framework for investigation is required that addresses both agency (subjective) and structural (objective) considerations. Hyper-compression can be viewed as both an enabling practice and a structure for creativity to occur within in the production of music as cultural works. It occurs within both a social system and a system of knowledge that makes action possible. Addressing one without the other, which has been the direction adopted by many that have tried to gain some understanding, has proven an inadequate approach. Hence, it is argued that the theoretical framework outlined in this literature review has the potential to allow an investigation from a systems perspective where there is not one singular reason for this situation to have occurred, but many, that are interlinked in sets of scalable systems.

All three theories presented, innately approach exploration into a given topic from such a systemic perspective, examining the social cultural and biopsychological system at work. Firstly, both Csikszentmihalyi and Bourdieu offer the means to deconstruct the social system into constituent elements and examine the interrelationships these have with active agents. These factors are driven by a complex set of structures that create possibilities for action. Both theorists contend that creativity and cultural production is not the product of the individual alone, but from the interactions of the socio-cultural

system that they exist within. Csikszentmihalyi's systems model of creativity underlines the notion that the agent operates as an extension of everything that has happened previously, drawing upon the knowledge stored in the domain. The agent must also have extensive knowledge of the domain to be creative, something that Bourdieu expresses as habitus. Bourdieu then expands upon this through field theory, defining how the social system operates and is structured for and by action. Agents accumulate the various forms of capital available to them and this, combined with their habitus, delineates the positions that agents can hold within the field. Within both theories new ideas or cultural works are consecrated by a field of experts who gain such authority by acquiring the correct habitus and capital. Bourdieu equates his notion of field theory with that of a football field in which each player is designated a position, and these positions are awarded according to their ability to play the game. We can utilise these two complementary theories to understand how the field of Western mainstream popular music is assembled and the processes through which music, as cultural production, is created.

Rogers on the other hand, focuses both on how an innovation interacts with the social system, and how the social system interacts with an innovation, which may or may not cause change within the system. The diffusion of such innovations is a process that is driven by special channels of communication within, once again, a social system. There is ample evidence to suggest that digital audio technology and its gradual adoption over the past three decades has caused significant changes in how music is created and has affected the field of Western mainstream popular music in general. It is also widely surmised that loudness normalisation will counteract the use of hyper-compression by instigating a significant change in the social system. Rogers' theory articulates the

processes involved in this diffusion of innovation, which affords an understanding of its uncertain and unpredictable nature and sets out the elements required to facilitate change.

With this solid theoretical framework in place, a methodology that reflects this framework providing the means to achieve the goals of the research project is required. It is suggested this would entail a multi-strategy design that places both subjective and objective concern as equal priorities.

# 3 METHODOLOGY

Within the literature review there is a noticeable distinction between causal factors of the use of hyper-compression that are positioned in applied science, and those positioned within the realms of the function of the social system of cultural production (social science). We could define these as a binary opposition between objective and subjective viewpoints. Previous research has been segregated between these two principles and approaches. The main premise of this research project, however, is to eschew polar oppositions and conduct an investigation that takes into account both objectivist and subjectivist positions, or what Bourdieu terms as the ‘outer’ and ‘inner’ (Maton 2012, p. 52). Therefore, the methodology presented reflects this intention by adopting a constructionist approach that will, as Crotty argues, ‘put all understandings, scientific and non-scientific alike, on the same footing’ (1988, p. 16). This ontological and epistemological foundation is examined and argued that it provides the appropriate substructure to the proposed theoretical framework outlined in the literature review. The methodology consists of a multi-strategy design which Robson describes as a ‘sequential transformative design’ of both quantitative and qualitative methods; ‘One method precedes the other with either the qualitative or the quantitative method first (*figure 3.1*). Priority may be given to either method. The results are integrated during interpretation’ (2011, p. 165).

The quantitative method employed was the signal analysis (artefact evaluation) of music recordings using several measurement systems; in particular, the analysis of a corpus of 210 music recordings (Appendices 2 & 3) and the output of five file-based on-line

streaming services; YouTube, Spotify, Tidal, Pandora and Apple iTunes (Taylor 2017b). The results of these quantitative methods inform the primary qualitative method, ethnography, in which 29 industry identities were observed in the field and participated in semi-structured interviews over a three-year period. This method provides a direct insight into the social formation and creative system of music production and dissemination, where it is evident that hyper-compression is a dominant structure. Lastly, these results are integrated into the computer-assisted qualitative data analysis application (CAQDAS)—NVivo, and finally examined through the lens of the proposed theoretical framework.

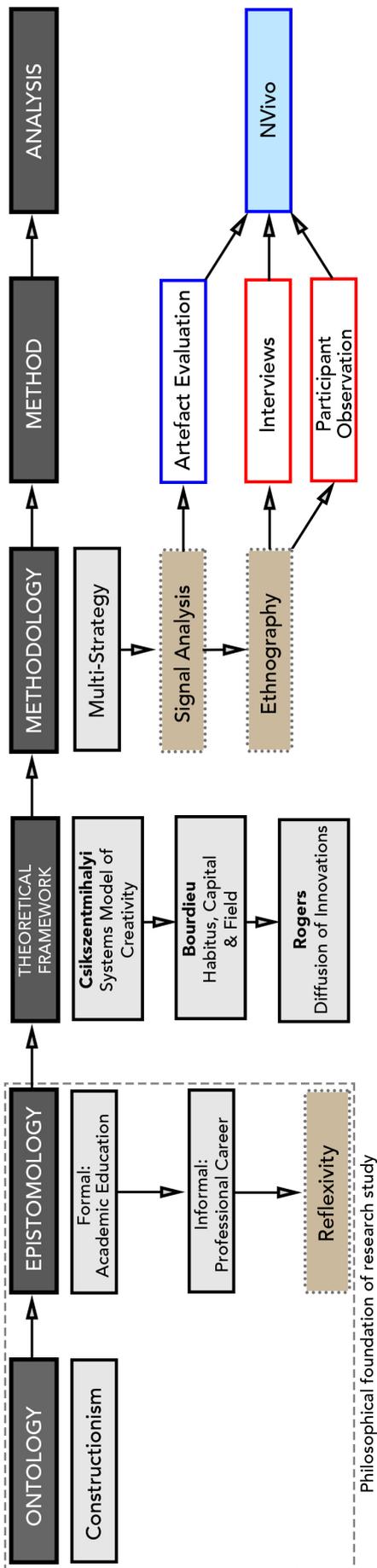


Figure 3.1: The structure of the research methodology is illustrated in this flow chart.

### 3.1 Ontological and Epistemological Foundation

Notions of ontology and epistemology provide the foundation for methodologies and define positions on reality and knowledge. Despite confusing and at times contradictory descriptions, in a general sense, ontology refers to the nature of being and reality (Sarantakos 2005, p. 430), and epistemology refers to ways of knowing what exists (Grix 2010, p. 63), or as O’Leary puts it, ‘the rules of knowing’ (2010, p. 5). This foundation directly influences the framework and construction of the research design by defining its stance within the greater realms of research; ‘it is a philosophical stance that informs the methodology, provides the arena in which the logic and structure of research are embedded, and guides the process of research’ (Farber quoted in Sarantakos 2005, p. 3). Grix describes this foundation as the ‘building blocks’ of research and states that ‘ontology and epistemology are to research what “footings” are to a house: they form the foundations of the whole edifice’ (ibid, p. 57). Therefore, the methodology and the methods used to conduct research are ‘built upon our ontological and epistemological assumptions’ (ibid, p. 58) for as Wolff argues, ‘we cannot know or even sensibly talk about any reality beyond our knowledge of reality’ (1975, p. 53). Despite a consensus that the two notions are inextricably linked, there are conflicting viewpoints as to whether these are basically saying the same thing and should be conflated into the one concept, or whether they are two very separate ideas that should be treated as such (for example see: Grix 2004; Crotty 2012). The stance taken in this research project is that there is a clear distinction between the philosophical premise underpinning the research (ontology - constructionism) and the acquired and reflexive knowledge of the researcher (epistemology - reflexive cultural capital) that provides the “way of knowing”.

To provide the necessary platform to conduct this research project, and to fulfil its aims as discussed in Chapter 1, it has been argued that an investigation from a systems approach, one that examines the topic from the perspective of the structure and interaction of the many elements associated with the use of hyper-compression is required. These elements reside on opposing ends of the ontological spectrum which Grix terms as “those based on foundationalism and those based on anti-foundationalism” (2004, p. 61). As indicated in the literature review, we can state that much of the knowledge that exists regarding loudness and hyper-compression has originated from this realm of foundationalism represented by largely positivist viewpoints. This stance is concerned primarily with the truthfulness of knowledge through quantitative scientific method; a perspective that as O’Leary suggests, has a ‘difficult time acknowledging anything that cannot be measured’ such as, for example, aesthetic preference (2010, p. 5). Despite providing a crucial understanding from the objective perspective of the audio signal, alone it has done little to provide an understanding of its use from within the system that is the music industries - what Csikszentmihalyi, Bourdieu, and Rogers all refer to as a “social system”. In addition, despite this foundationalist knowledge, the use of hyper-compression has continued regardless within this social system which should indicate that there are other factors at play. It could be argued that research that has delved into the area of anti-foundationalism (subjectivism) which predominately utilises qualitative methods has been largely overlooked. Therefore, one of the primary aims of this research project is to redress this imbalance and explore subjective responses from agents actively working within the system to gain an understanding of this apparent disjuncture between scientific knowledge and the action of agents who act in spite of it. What distinguishes this research project is its aim to conduct an investigation that draws upon all these available resources from both “foundationalism” and “anti-foundationalism” and examine it collectively as a system. To achieve this aim, this research project’s ontological

stance is therefore that of constructionism which exists in the very centre of Grix's ontological spectrum.

### 3.1.1 Ontology—Constructionism

Crotty provides one of the most coherent explanations of constructionism as the bridge between 'the great divide' of 'objectivist research associated with quantitative methods' and 'subjectivist research associated with qualitative methods' (1988, pp. 14-15). The objectivist viewpoint is the belief that 'truth and meaning reside in their objects independently of any consciousness', in contrast to the purely subjectivist point of view that it exists entirely independent of the object (ibid, p. 42). Therefore, the underlying principal of constructionism is that truth and meaning is not within or without the object, we construct meaning through our interaction with the object. We could look at this another way, as Crotty clearly elucidates that 'meanings are constructed by human beings as they engage with the world they are interpreting' (ibid, p 43). He further states that:

It is the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context. (ibid, p. 42)

Sarantakos expands upon this and further clarifies this stance by stating that:

Constructionism is about realities and relationships (Gergen, 1994, 1999). Trees, rivers, forests and mountains may exist outside people's consciousness but have no meaning before they are addressed by people. Their meaning is not fixed, ready to be discovered - as objectivists propose - but emerges out of people's interaction with the world. Meanings do not exist before a mind engages them. There is no meaning without mind (Cooper, 1998: 8-9). (2005, p. 37)

Drawing this idea back into the research paradigm presented herein regarding hyper-compression, we cannot look solely to the objective responses as much as we cannot look solely to the subjective responses to loudness for an answer to the Loudness War. As

Johnson points out:

Both subjectivism and objectivism fail to account for what Bourdieu refers to as the 'objectivity of the subjective'. Subjectivism fails to grasp the social ground that shapes consciousness, while objectivism does just the opposite, failing to recognize that social reality is to some extent shaped by the conceptions and representations that individuals make of the social world. (Johnson in Bourdieu 1993, p. 4)

It could be argued that it is the audio community and the wider music industries' failure to approach the subject of the Loudness War from such a perspective that has created such misunderstanding as to why the pursuit of excessive loudness in music recordings continues.

### 3.1.2 Epistemology—Cultural Capital and Reflexivity

The epistemological stance is again directly related to the research topic and the aims of the research project. Therefore, it is argued that without the appropriate underlying knowledge of the music industries, principals of audio and psychoacoustics, physics of sound, signal analysis, music theory, audio engineering – and also an in-depth knowledge of the aesthetics of genre - and so on, that it would be improbable that the researcher would have the necessary habitus to understand hyper-compression and related topics. As such, this *reflexive cultural capital* is the “way of knowing” that also includes an understanding of what O’Leary puts as ‘the rules of knowing’ (2010, p. 5) of a very specific and complex domain. Hence, it is accepted that the epistemological stance resides within the reflexive cultural capital of the researcher.

Furthermore, Robson believes the reflexive position that accompanies this expert knowledge of the researcher - what he describes as ‘self-awareness’ - is of particular value especially within the realms of qualitative research (2011, p. 45). Payne & Payne agree

with Robson that the reflexive position of the researcher ‘is particularly important in qualitative research, where it feeds into debates about the validity of research findings’ (2004, p. 191). They provide the following description of reflexivity as:

...the practice of researchers being self-aware of their own beliefs, values and attitudes, and their personal effects on the setting they have studied, and self-critical about their research methods and how they have been applied, so that the evaluation and understanding of their research findings, both by themselves and their audience, may be facilitated and enhanced. (ibid)

This reflexivity of the researcher is also crucial in the strategic process of investigation where the constant assessment and reassessment of collecting useful data, conducting appropriate analysis and coming to credible conclusions regarding the complex nature of the topic under investigation is required. As Payne et al. explain:

...[a]t its most basic level, reflexivity is about maintaining high professional standards of investigation, which applies to all modes of social research. It may seem obvious, but good research depends on the selection and proper, systematic application of the right methods for the task in hand. The researcher is the only person who can ensure this happens. It means keeping each step under review, setting performance standards for oneself, thinking about how informants are reacting to being studied [...], and constantly evaluating what is being achieved. (2011, pp. 191-192)

It is argued that without the embodied cultural capital as the suggested epistemological stance it would be difficult to provide this standard of reflexivity.

## 3.2 Theoretical Perspective

As outlined in section (2.1.1 – 2.1.11), the proposed theoretical framework utilises three separate but complementary philosophical theories: Csikzentmihalyi's systems model of creativity (1988; 1997; 1999); Bourdieu's field theory (1993; 1996); and Rogers' theory of the diffusion of innovation (2003). Each theory provides a specific investigative tool for the examination of corresponding factors as to why the use of hyper-compression is a significant structural element in music production. Csikszentmihalyi and Bourdieu provide a framework to examine the creative world which agents operate within and Rogers, through his understanding of the diffusion of innovation provides a method to examine what has been assumed by many as the solution to the Loudness War—loudness normalisation. Furthermore, it is argued that this theoretical framework reflects the statements of assumptions of the ontological and epistemological foundation of the research in that all three individual theories, and their inter-relationship, represent a systems approach in which the objective and subjective are inherent in their structure. The framework takes into account both 'the social ground that shapes consciousness' and the social reality that 'shapes the conceptions and representations that individuals make of the social world' (Johnson in Bourdieu 1993, p. 4).

### 3.3 Methodology

The methodology is separated into two categories of analysis - quantitative and qualitative - presenting a mixed method approach as illustrated in (*figure 3.1*). This strategy is in-line with the ontological stance of constructionism in which ‘all understandings, scientific and non-scientific alike, [exist] on the very same footing’ (Crotty 1988, p. 16). Despite the argued incompatibility of the quantitative-qualitative paradigm as outlined in Robson (2011, pp. 162-163), Howe argues that ‘there are important senses in which quantitative and qualitative methods are inseparable’ (1988, p. 10). Robson further argues against this perceived incompatibility by stating that ‘there is a greater variety of potential benefits when approaches associated with the two different paradigms of quantitative and qualitative research are brought together’ (2011, p. 166). He does, however, refer to the complexity of such a strategy and lists potential difficulties, such as the skills of the researcher to successfully transverse the two distinctly different approaches, issues of timing, and most importantly, possible lack of integration of findings (*ibid*). On the other hand, the benefits of what he terms multi-strategy designs far outweigh any difficulties such as, ‘triangulation’, ‘completeness of picture’, ‘offsetting weaknesses and providing stronger inferences’, ‘ability to deal with complex phenomena and situations’ and ‘explaining findings’ (*ibid*, p. 67). Robson specifies that in mixed method design, the strategy must ‘clearly specif[y] the sequencing and priority that is given to the quantitative and qualitative elements of data collection and analysis’ (*ibid*, p. 164). As such it is stated that the strategy employed by this research project is of a sequential transformative design;

One method precedes the other with either the qualitative or the quantitative method first. Priority may be given to either method. The results are integrated during interpretation. This

design is guided primarily by a theoretical perspective (e.g. by the conceptual framework adopted). (Ibid, p. 166; based on Creswell, 2003, pp. 213-19)

The quantitative methods are presented first, but priority is granted to the qualitative into which the former are integrated.

Quantitative - Quantitative methodology normally uses deductive logic (though this is not always the case) and from a social science perspective ‘seek regularities in human lives, by separating the social world into empirical components called variables which can be represented numerically’ (Payne & Payne 2004, p. 180). In a more general sense, knowledge that is gained through quantitative methods is traditionally categorised by three fundamental aspects; ‘it is theoretical’, ‘it is the truth’ and ‘it is systematical’ according to Bech and Zacharov (2006, p. 19). Payne et al. assert that quantitative research is ‘based on the assumption that social processes exist outside of individual actors’ comprehension, constraining individual actions, and accessible to researchers by virtue of their prior theoretical and empirical knowledge’ (2004, pp. 181-182).

Qualitative - Qualitative methodology focuses on meaning in which contexts are of greater importance than the statistical analysis of numerical data (Robson 2011, p. 19). These methods generate detailed information about human subjects in their natural environment ‘on the assumption that social interactions form an integrated set of relationships best understood by inductive procedures’ (Payne & Payne 2004, p. 175). Sarantakos maintains that in qualitative research, understanding people and their lives is not the same kind of science that quantitative methods represent, but are more common sense and therefore inductive (2005, p. 42). He states that ‘it presents reality symbolically in a descriptive form’ and presents a comprehensive description in the following:

In qualitative research, social inquiry has the purpose of helping the investigators to interpret and understand, first, the actors' reasons for social action, second, the way they construct their lives and the meanings they attach to them, and third, the social context of social action. What is important here is not observable social actions but rather the subjective meaning of such actions (ibid).

These two ideas of quantitative and qualitative methodology are integrated via the proposed theoretical framework that is based upon the ontological stance of constructionism. Within this theoretical framework, possibilities for action by agents are determined by a set of objective conditions. Through an examination of these objective conditions it is then possible to understand the agency of situated agents and their behaviour.

### 3.3.1 Ethnography

Ethnography is a broad qualitative research strategy that Fetterman describes as 'telling a credible, rigorous and authentic story' (2010, p. 1). More traditionally associated with the study of native cultures from remote places, in the 20<sup>th</sup> Century it moved to sociology and became a widely-adopted methodology; 'in many respects ethnography is the most basic form of social research' (Hammersley & Atkinson 1995, p. 2). In satisfying the aims of the research project, it is necessary to shed light on the voices of agents operating within the music industries that are involved in music production. As previously mentioned, one of the primary aims of this research project is to redress an imbalance in that much of the previous research on the topic has been predominantly of an objective nature. Exploring subjective responses from agents actively working within the system was necessary to gain an understanding of the apparent dispute between scientific knowledge and the action of situated and conditioned agents. An investigation based on an ethnographic strategy was appropriate in achieving this objective, as this method

provides a direct insight into the social formation and creative system of music production and dissemination as it operates in the musical world. LeCompte and Schensul describe ethnography as:

...a systematic approach to learning about the social and cultural life of communities, institutions, and other settings that [...] is scientific, is investigative, uses the researcher as the primary tool of data collection, [and] uses rigorous methods and data collection techniques to avoid bias and ensure accuracy of data. (2010, p. 15)

This research methodology focuses on the position of the agent within a specific setting, how they interpret the world around them, and act on those interpretations (Hammersley & Atkinson 1995, p. 11). This predominately qualitative methodology provides an insight into what Murchison describes as ‘the complexity of human lives and social interaction’ which ‘cannot be reduced to a sterile laboratory experiment with the strict control of variables characteristic of a scientific experiment’ (2010, p. 4). Ethnography is the science of observing agents and ‘collecting whatever data are available to throw light on the issues that are the focus of the research’ (Hammersley & Atkinson 1995, p. 1). As there is no single method that is prescribed, ethnographers, as Murchison suggests ‘employ a number of different research techniques and methods in a complex research strategy that matches the complexity of their objects of study’ (2010, p. 4). Due to this complexity, it is not uncommon to find quantitative methods alongside qualitative (Bryman 1988, p. 27). Ethnography also often requires field work, for ‘ethnography has involved a commitment to “being there” to conduct research’ as there is often a need to experience the subjects under investigation within their natural setting (Murchison 2010, p. 11).

The strength of an ethnographic study is that it enables first-hand access to the culture under scrutiny, allowing a deep and elaborated insight from an insider’s perspective (Robson 2011, p. 144). An ethnographic study also enables the researcher to be fluid in

their approach and ready to ‘vary according to circumstances and the exigencies of the field’ (Bryman 2001, p. xx). There are many noted limitations in the literature such as expense (Fetterman 1989), problems with obtaining access (Robson 2011), getting too involved with the subjects under observation (Bryman 2001), insufficient time in the field (Emerson 1987), small sample size (Laborsky & Rubenstein 1995), participants with particular agendas (Van Maanen 1988) and access to certain issues (Bryman 2001). These limitations however are not insurmountable and require careful preparation, tenacity, a reflexive attitude to data collection and analysis to overcome them (Karp & Kendall 1982), and finally as Van Maanen suggests, to maintain a position of healthy scepticism (1988).

### 3.3.2 Signal Analysis (Artefact Evaluation)

Signal analysis is the extraction of quantitative information from complex electronic signals – ‘a detectable physical quantity or impulse by which messages or information can be transmitted’ (Corona 2003, p. 1) – using a variety of methods that are dependent on what type of information is sought. It is also common to transform physical parameters into electronic signals via transducers so these parameters can provide necessary information regarding the entity that produces these parameters (Agilent Technologies 2000, p. 4). For example, in the medical world it is common for physical parameters such as the beating of a heart to be transformed into electrical signals which is then analysed to provide information about the heart’s condition. A speedometer in a car is another simple example which analyses the speed in which the car is traveling. The process works equally as well with pre-existing signals that have been recorded onto a medium. The analysis of signals provides information in the time, frequency and modal domains and

‘leads to a rapid understanding of the system under study’ (ibid). The most basic form of signal analysis is a plotted graph which represents some parameter as a function of time.

Signal analysis is employed in this research project to examine various modal domains of audio signals and as such plays an important role within the ethnographic component. It provides relevant information regarding the cultural artefacts produced by the culture under investigation. Despite the quantitative nature of signal analysis within what is a primarily qualitative methodological structure, Bryman suggests that it is sometimes necessary to employ other forms of analysis that ethnography is not equipped to provide that can be complementary. He states that:

...it is by no means uncommon for ethnographers to employ quantitative research methods in their work. There are several reasons for doing so, such as wanting to cross-check findings through a different research method and wanting to glean information on an issue or context to which ethnography is not well suited. (1988, p. 27)

## 3.4 Methods

### 3.4.1 Interviews

Fetterman believes that ‘the interview is the ethnographer's most important data gathering technique’, for they ‘explain and put into a larger context what the ethnographer sees and experiences’ (1989, p. 47). He identifies four general types of interview, structured, semi-structured, informal and retrospective and each approach ‘has a role to play in soliciting information’ (ibid). The interview enables the researcher to ‘access directly what happens in the world’ (Silverman 2006, p. 113) through the thoughts and opinions of participants and ‘lend themselves well to be used in combination with other methods, in a multi-strategy design or multi-method approach’ (Robson, 2011, p. 279). Robson asserts that ‘the interview is a flexible and adaptable way of finding things out’ and that face to face enquiry offers the possibility to include non-verbal communication that may change the context of what is being said (2011, p. 281). On the other hand, interviews can be time-consuming, expensive, require careful preparation, can be difficult to arrange with participants and difficult at times to rule out bias due to personal agendas (ibid). However, one of the striking benefits of the interview is the insight into the culture that the participant is part of that is gained from their account:

Accounts are also important, though, for what they may be able to tell us about those who produced them. We can use what people say as evidence about their perspectives, and perhaps about the larger subcultures and cultures to which they belong. Knowledge of these perspectives and cultures will often form an important element of the analysis. (Hammersley & Atkinson 1995, p.125)

For this research project, there is an emphasis on semi-structured interviews with identities from within the music industries that have a direct involvement with the

production and dissemination of music. These included recording engineers, mix engineers, music producers, mastering engineers, electrical engineers and a record company artist and repertoire manager. The research relies strongly on the acquisition of their insight into this social formation, the production practices that take place inside this environment and associated meanings which interviews were able to provide, and the perception each had on the use of hyper-compression. The analysis of the data procured from these interviews could then be used to develop theories as to the type of structure hyper-compression represents in music production practice. Semi-structured interviews were chosen as the primary method because as Robson argues, ‘less structured approaches allow the person interviewed much more flexibility of response’ (2011, p. 279). Considering the researcher’s considerable knowledge of the underlying principles of audio production, the interviewer and interviewee could interact using an equal understanding of complex terminology of associated practises.

<b>Travel Schedule</b>			
<b>City</b>	<b>Country</b>	<b>Arrive</b>	<b>Depart</b>
Seoul	South Korea	9-Oct-2015	11-Oct-2015
Stockholm	Sweden	12-Oct-2015	15-Oct-2015
Berlin	Germany	16-Oct-2015	18-Oct-2015
Vienna	Austria	19-Oct-2015	21-Oct-2015
London	United Kingdom	22-Oct-2015	27-Oct-2015
New York	United States	28-Oct-2015	2-Nov-2015
Boston	United States	3-Nov-2015	5-Nov-2015
Philadelphia	United States	5-Nov-2015	8-Nov-2015
Los Angeles	United States	10-Nov-2015	15-Nov-2015
San Francisco	United States	15-Nov-2015	17-Nov-2015

*Table 3.1:* Field excursion schedule

The most significant methodological concerns throughout the data collection stage of the research project were those typically mentioned. Murchison states that with ethnographic

methodology that includes interviews, ‘the issue of accessibility is probably the single most practical concern’ and that ‘geographical proximity and financial resources are both determinants of the researcher’s degree of access to field sites’ (2010, pp. 29-30). Access to key identities within the music industries was extremely difficult, at times frustrating and time consuming. This necessitated a field excursion that encompassed six countries and nine cities to conduct face to face interviews during October and November 2015 (*Table 3.1*).

Other interviews, in which the participants were extremely difficult to get a response from or had very limited available time were conducted via Skype video call. Several participants who were very generous with their time supplied ancillary personal correspondence via email. Therefore, in accordance with Bryman’s suggestion that the researcher needs to be ‘fluid in their approach’ (2001, p. xx), the approach taken to procure interviews adapted to the situation that presented itself. A total of twenty-nine semi-structured interviews, of participants from seven countries were conducted (*Table 3.2*) from March 2013 to October 2016. The interviews were recorded using a Zoom H4n audio recorder and transcribed by an Australian transcription service. The length of interviews ranged from 35 minutes to 2 hours (with an average of approx. 80 minutes) depending on the time made available by the participants.

<b>Interviewee</b>	<b>Occupation</b>	<b>Company</b>	<b>City</b>	<b>Country</b>	<b>Method</b>	<b>Date</b>
Leon Zervos	Mastering engineer	Studios 301 Mastering	Sydney	Australia	Email	4-Mar-2013
Jonathan Wyner	Mastering engineer	M-Works Mastering/Izotope	Boston	United States	Skype	25-May-2015
Don Bartley	Mastering engineer	Benchmark Mastering	Sydney	Australia	Face to face	3-Jun-2015
William Bowden	Mastering engineer	King Willy Sound	Hobart	Australia	Skype	10-Jun-2015
Michael Romanowski	Mastering engineer	Coast Mastering	San Francisco	United States	Face to face	3-Oct-2015
Scott Chae	Mastering engineer	Sonic Korea	Seoul	South Korea	Face to face	10-Oct-2015
Big Boom	Mastering engineer	Sonic Korea	Seoul	South Korea	Face to face	10-Oct-2015
Eric Broyhill	Mastering engineer	Monster Audio	Stockholm	Sweden	Face to face	13-Oct-2015
Björn Engelmänn	Mastering engineer	The Cutting Room	Stockholm	Sweden	Face to face	14-Oct-2015
Cem Oral	Mastering engineer	Jammin' Masters	Berlin	Germany	Face to face	17-Oct-2015
Florian Camerer	Senior sound engineer	ORF - Austrian Broadcasting Corp.	Vienna	Austria	Face to face	21-Oct-2015
Sean Magee	Mastering engineer	Abbey Road	London	United Kingdom	Face to face	23-Oct-2015
John Dent	Mastering engineer	Loud mastering	Taunton	United Kingdom	Face to face	24-Oct-2015
Alan Moulder	Producer/mix engineer	Assault and Battery	London	United Kingdom	Face to face	26-Oct-2015
Simon Gibson	Mastering engineer	Abbey Road	London	United Kingdom	Face to face	26-Oct-2015
Bob Ludwig	Mastering engineer	Gateway Mastering	New York	United States	Face to face	30-Oct-2015
Bob Katz	Mastering engineer	Digital Domain	Orlando	United States	Face to face	1-Nov-2015
Thomas Lund	Research and Development	Genelec	Lisalmi	Finland	Face to face	1-Nov-2015
Greg Calbi	Mastering engineer	Sterling Sound	New York	United States	Face to face	2-Nov-2015
Susan Rogers	Professor/audio engineer	Berkley College of Music	Boston	United States	Face to face	8-Nov-2015
Bob Horn	Mix engineer	Echo Bar Studio	Los Angeles	United States	Face to face	11-Dec-2015
Dave Pensado	Mix engineer	Pensado's Place	Los Angeles	United States	Face to face	25-Jan-2016
Lachlan Mitchell	Producer/engineer	Jungle Studios	Sydney	Australia	Face to face	4-Feb-2016
Scott Horscroft	Artist and Repertoire	EMI	Sydney	Australia	Face to face	4-Feb-2016
George Massenburg	Professor/producer	McGill University/GML	Montréal	Canada	Skype	21-Mar-2016
Andrew Scheps	Mix engineer	Punker Pad West	London	United Kingdom	Skype	23-Mar-2016
Tony Mantz	Mastering engineer	Deluxe Mastering	Melbourne	Australia	Skype	14-Jul-2016
Paul McKercher	Producer/engineer	n/a	Sydney	Australia	Email	2-Oct-2016
Ian Shepherd	Mastering engineer	Production Advice	London	United Kingdom	Skype	20-Oct-2016

Table 3.2: List of interviewees.

### 3.4.2 Participant Observation

As part of the ethnographic strategy in research design, participant observation played a crucial role in the multi-strategy design of the methods employed for data collection of the research project. In combination with the interviews conducted, it was preferred that the interviews were carried out in the environment which represented the agent's base of operation. This required, as previously mentioned, an extensive field trip that encompassed many countries and cities listed in *table 3.1*. As Hammersley and Atkinson explain, 'the distinctiveness of the interview setting must not be exaggerated, and it can be viewed as a resource rather than as a problem' (1995, p. 140). Quoting Silverman, they further elucidate that 'the participant understandings elicited there, may not be those which underlie behaviour elsewhere' (1973, *ibid*, p. 139). As such, the interview setting was an integral part of obtaining the best possible representation from the participants involved, augmenting the interview process in many cases with examples of work practice and first-hand experience of processes used by the agent.

Although participant observation traditionally has been associated with anthropological studies that involved 'participation in the lives of the people under study' for extended periods of time by the researcher (Fetterman 2010, p. 37), Robson believes that this form of observation 'can take on a variety of forms [and] can be used for several purposes in a study' (2011, p. 317). Robson further adds that 'observation can be used as a supportive or supplementary method to collect data that may complement or set in perspective data obtained by other means' (*ibid*). As was the case with the multi-strategy design employed, participant observation was a means to compliment the interview process and present

opportunities to accumulate greater context of interview responses that was not possible by means of the interviews alone. There are numerous ways to classify observational methods many of which tend to relate to more traditional modes. These can be summarised on a basic level as formal or informal, which reflect the level of structure in design, and the level of involvement that the observer participates in the experience of those being observed (Robson 2011, pp. 318-319; O’Leary 2011, p. 210). It could therefore be suggested that the type of participant observation engaged for this research design was informal, participant as observer and semi-structured.

Sarantakos provides a comprehensive tabulation of strengths and weaknesses which concentrate on the more traditional mode of observation in which a culture or group is engaged for an extensive period of time (2005, p. 234). These relate more specifically to an engagement in a ‘natural setting’ and therefore weaknesses describe logistical concerns in obtaining access, ‘is relatively laborious and time-consuming’, ‘is inadequate when studying sensitive issues’, ‘offers no control measures to balance the bias, attitudes and opinions of the observer’ and so forth (ibid). One of the major concerns that Robson addresses is when ‘an observer affects the situation under observation, a phenomenon referred to as reactivity’ (2011, p. 317). However, the advantages to the method are considerable and are primarily associated with providing ‘information when other methods are not effective’ and ‘offers first-hand information without relying on the reports of others’ (Sarantakos 2005, p. 234). In addition, Robson states that ‘data from direct observation contrasts with, and can often usefully complement, information obtained by virtually any other technique’ (2011, p. 316). The act of observing interview participants within their specific environments that accompanied the “face to face”

interview process, provided a wealth of information that could not have been achieved via the interview alone.

During the field trips conducted in 2015-2016, a multitude of establishments, institutions and places of work were visited to conduct interviews. These included: Sterling Sound, New York; Benchmark Mastering, Sydney; Echo Bar Studios, Los Angeles; Abbey Road Studios, London; Loud Mastering, Taunton; Monster Audio, Stockholm; Studios 301, Sydney; Sonic Korea, Seoul; Berklee College of Music, Boston; ORF, Vienna; Assault and Battery, London; The Grove Studios, Mangrove Mountain; The Cutting Room, Stockholm; M-Works, Boston; Jammin' Masters, Berlin; and Izotope, Boston. In addition, interviews were conducted at the 139<sup>th</sup> Audio Engineering Convention in New York with participants highly involved in the organisation such as Bob Katz, Thomas Lund and Bob Ludwig. The researcher was also in attendance at the 141<sup>st</sup> and 143<sup>rd</sup> Audio Engineering Conventions in Los Angeles and New York respectively.

### 3.4.3 Artefact Evaluation

An analysis of modal domains of a corpus of music recordings (210 western mainstream popular music recordings from 1955 to 2016) was conducted to examine the integrated loudness (IL), loudness range (LRA),  $L_{eq}$  or root mean square (RMS), dynamic range (DR) and high-level sample density (HLSD) of the recordings under question.

### 3.4.3.1 Equipment

- Apple MacPro Computer
- Motu 1296 Audio System
- Apogee Mini DAC
- Genelec 1031A Monitors

### 3.4.3.2 Software

- Matlab R2016b
- NuGen Audio VisLM-H loudness meter
- Nugen LM-Correct 2
- Tischmeyer Technologies Dynamic Range meter, off-line version

### 3.4.3.3 Measurement procedures

#### 3.4.3.3.1 $L_{eq}$ (RMS)

Measurements were conducted of the un-weighted  $L_{eq}$  or RMS, which measures the average signal level. This is useful in the comparison of average signal levels between recordings where loudness per se is not a requirement and represents an excellent indicator of dynamic variability. Although average signal level has some relative correlation to perceived loudness, without the K frequency-weighting which takes into consideration the acoustic effects of the head, it is unreliable for this application. This measurement procedure was conducted in the Matlab environment using a custom script. The algorithm provides a numerical output in dBFS and also a histogram of signal level throughout the program.

### 3.4.3.3.2 *Integrated loudness (IL), True peak (TP) and Peak to loudness ratio (PLR)*

Measurements were conducted of the IL (or loudness level) and TP and PLR using the NuGen Audio VisLM-H loudness meter and LN-Correct 2 within the Logic Audio DAW environment, and also batch processing utilising custom scripts in the Matlab environment.

1. Integrated Loudness (or loudness level) measures the overall loudness of the program in units named either LUFS (loudness unit full scale) or LKFS (loudness unit K-weighted) or LU (loudness unit) using an ITU BS-1770 based algorithm (EBU 2014b; ITU 2012).
2. True peak (TP) measures the ‘true peak value of a sampled signal’ by over-sampling (increasing the sampling frequency of the signal) and therefore registers every sample peak that are sometimes lost with standard peak meters. As such peak meters can provide ‘inconsistent peak readings’, ‘unexpected overloads’ and ‘under-reading and beating of metered tones’ (ITU 2012, p. 19). This measurement procedure was used to analyse signals for overloads which is a common by-product of the hyper-compression process.
3. PLR is the ratio between the TP and IL of the audio signal. It is useful in determining if a music recording has been hyper-compressed and to what extent. PLR is also useful to determine if a recording’s dynamic range is compatible with the target level of a streaming platform. A target loudness level of -16LU provides 16LU of headroom between the loudness level and true peak of a recording. If a

recording has a PLR of 15LU, we can assume that there will be 1LU of headroom available before clipping occurs. A PLR of >16 will result in clipping or the recording will either need to be lowered or limited to fit within the 16LU of available headroom.

#### *3.4.3.3.3 HLSD (high level sample density)*

HLSD measures ‘the proportion of samples above  $-1$  dB Full Scale (dBFS) after normalization’ and is a ‘a good measure of the amount of brickwall limiting applied to the audio content’ (Deruty & Tardieu 2014, p. 44). This measurement procedure was conducted in the Matlab environment using a custom script provided by Emmanuel Deruty.

#### *3.4.3.3.4 TT Dynamic Range (DR)*

The Tischmeyer Technologies Dynamic Range meter is a proprietary system to measure the “dynamic range” of music recordings that allocates an ‘official DR value’ (according to the manufacturers) that can be compared to a table which represents audio quality as a function of DR value according to genre (Pleasurize Music Foundation 2009). Measurements were conducted using the stand-alone off-line version. The algorithm calculates ‘the ratio of the peak to the RMS, but limits the RMS to those values which occur in the top 20% of the histogram’ and does not ‘accurately reflect the perceived dynamic range’ (Boley et al. 2010, pp. 2-4). It is considered to be a general measure of the dynamic variability of a music recording and widely used. This measurement procedure was used to compare DR values to the look-up table and assess its viability.

## 3.5 Data Analysis

### 3.5.1 Quantitative

The results of the signal analysis were tabularised and graphed using Microsoft Excel (Appendices 1 - 2), in conjunction with the histograms and numerical output of the Matlab scripts utilised and presented in Chapter 5.

### 3.5.2 Qualitative

All material in the research project was integrated into the computer-assisted qualitative data analysis application (CAQDAS)—NVivo, which as Robson outlines, provides a ‘single location storage system’, ‘quick and easy access to coded material’, ‘can handle large amounts of data quickly’, ‘help the development of consistent coding schemes’ and ‘can analyze differences, similarities and relationships between coded elements’ (2011, p. 472). Of particular benefit was the ability to search for key words amongst thousands of documents in a single operation. There are very few disadvantages against the use of such a system apart from a loss of data due to fire, flood, storm, earthquake or mechanical breakdown within the computer, hence multiple back-up approaches were employed including cloud storage.

# 4 THE LOUDNESS NORMALISATION REVOLUTION AND IMPLICATIONS FOR HYPER- COMPRESSION

If loudness normalisation and the removal of loudness bias in reproduction is to have any effect in discouraging the practice of hyper-compression, then it is argued that certain conditions need to be established. In the following chapter, several of the more critical of these conditions are introduced and examined. If we look to historical precedents, gains in perceived level achieved by various processes for strategic advantage were predicated upon the “louder is better” paradigm. It would seem obvious then that the removal of such an advantage via the elimination of loudness bias would easily create such a condition. This is not as straightforward as some would think. It is argued that the following are just some of the considerations that would require scrutiny: 1) Loudness bias would need to be removed from all forms of audition, therefore, a majority of reproduction systems utilised must have effective loudness normalisation; 2) Preferences of the consumer concerning hyper-compressed recordings and the ability of the consumer to discriminate between hyper-compressed and non-hyper-compressed recordings; 3) Consumer awareness of loudness normalisation so it is understood and adopted; 4) The nature of hyper-compression within audio production practises, whether they are actually a part of aesthetic intent and therefore not simply as a result of loudness bias; and 5) Hyper-

compression as a significant sociocultural and socioeconomic structure within the field of Western mainstream popular music. Therefore, it is argued that the removal of loudness bias is but one element in amongst a system of interrelated factors.

In this chapter, one factor is substantially examined. The assumption is made that music streaming in conjunction with loudness normalisation has the *potential* to create the necessary initial conditions mentioned. Music streaming as a new emergent technology is transforming the dissemination and reproduction of music to the consumer. Its trajectory in becoming the dominant reproduction medium is crucial to this potential in affecting change in the social system by reducing the propensity for agents to rely on loudness as a mechanism for entry into the market place. The basis for this argument is the removal of loudness bias in music reproduction that is recognised as one of the primary catalysts for the Loudness War. The decline in physical media that propagates loudness bias such as the compact disc (CD), although promising, still represents 50% of global revenues (IFPI 2017, p. 6). The question posed is at what level of adoption will this reproduction paradigm have an effect on the use of hyper-compression? This question is examined via the framework of Everett Rogers' theory of the diffusion of innovation. The adoption of music streaming according to global revenues is rapidly increasing every year and represents the biggest driver of growth in the global market (IFPI 2017, p. 10). Currently, revenues of potentially loudness normalised digital product, consisting of both download and streaming, have reached 50% of global revenues (ibid). Despite this growth, it has had little to no effect on the use of hyper-compression and it is therefore suggested that a far higher adoption rate by consumers is needed to initiate change in the social system.

### 4.1.1 Music Streaming and Loudness Normalisation – the Diffusion of an Innovation

The set of circumstances required for significant change in the social system, which in turn will present new possibilities of action by agents operating in the field of Western mainstream popular music concerning hyper-compression, is arguably possible via the widespread adoption of music streaming as the dominant form of music reproduction. A transformation in the way consumers procure and experience music is first needed to establish a transformation in music production practices. This adoption of music streaming by the consumer, and at a rate needed to present opportunities for change may take some time and it is unknown at what adoption rate that change will occur with use of hyper-compression. It has been thought by some that the primary catalyst for this change is the elimination of loudness bias in reproduction, which is feasible if music streaming is synonymous with loudness normalisation. This could possibly present a paradigm shift that would render the potential benefits of the “louder is better” paradigm nullified which is seen as the main objective structure behind the practice of hyper-compression. However, when technologies are introduced into systems of cultural production there is, as Rogers argues, an uncertainty that surrounds the diffusion of an innovation (2003, p. xx). It takes time for the success of an innovation to be evaluated, which is ‘gradually worked out through a process of social construction’ (ibid.).

With that in mind, considering that loudness normalisation is a concomitant technology to music streaming, and vital for such change in the practice of hyper-compression, for the moment we will ignore the fact that loudness normalisation is going through its own

process of diffusion within the arena of on-line file-based reproduction as outlined in (Taylor 2017). The bigger and more important picture of music streaming in conjunction with loudness normalisation is the primary focus of this investigation. Accordingly, the in this investigation examines the possibility of music streaming – with loudness normalisation – effectively changing what Rogers describes as the ‘structure and function of a social system’ (2003, p. 6). The trajectory of these technologies together as one technology and its adoption rate are therefore of specific concern.

In providing a background to music streaming as an expanding entity, the economic landscape of music streaming is going through a stage of volatility which could be considered a natural period of readjustment associated with the newness of the technology. A plethora of companies has entered the market vying for market share with a growing number of potential consumers and revenue. What is of some concern is that Pandora is reportedly in financial difficulty and at the time of this analysis was preparing to close its Australian and New Zealand operation as of the 31<sup>st</sup> of July 2017 (McCabe 2017). A spokesperson for Pandora is quoted as stating:

After analysis and consideration of external factors, we have decided to discontinue our operations in Australia and New Zealand and will shut down the service on July 31, 2017. While our experience in these markets reinforces the broader global opportunity long-term, in the short-term we must remain mindful and focused on the expansion of our core business in the United States. (ibid)

This may, however, indicate a change in consumer attention away from radio station style formats as compared to the “a la carte” service provided by Spotify which allows consumers to choose whatever song they wish to listen to as opposed to curated playlists. In 2014, Pandora had been rated as the number one streaming platform globally, however the following year they were overtaken by Spotify (Stutz 2015). This is part of the

diffusion process that Rogers explains as ‘a process of social construction’ (2003, p. xx). Spotify had aggressively and rapidly expanded into many new areas, accumulating the rights to an enormous library of artists and songs, presenting itself front and centre in the market place. Its rapid success could arguably be said as the result, more of a homophilous or heterophilous peer evaluation and referral social system rather than direct advertising. Spotify’s striking interface design and ease of use, coupled with the ability provide the consumer with just about any song available – current or from the past – gradually cultivated an appearance of being synonymous with music streaming. As Rogers points out, this situation could only have happened via a communication process from within the social system:

Information about an innovation is often sought from peers, especially information about their subjective evaluations of the innovation. This information exchange about a new idea occurs through a convergence process involving interpersonal networks. The diffusion of innovations is essentially a social process in which subjectively perceived information about a new idea is communicated from person to person. (ibid)

Pandora and Spotify are essentially very different products. The former could be generalised as a radio station and the latter a jukebox (on demand); Stutz describes this as ‘interactive or non-interactive’ (2015). Determining which product best suits the new paradigm of online music streaming was a process conducted by the social system via a ‘special type of communication, in that the messages are concerned with new ideas’ (2003, p. 5); ‘Information is a difference in matter-energy that affects uncertainty in a situation where a choice exists among a set of alternatives’ (Rogers and Kincaid, 1981). It is clear from various market research conducted that the “interactive” alternative is becoming disruptive to the radio style format (see for example: AppAnnie 2015).

McCabe reports that the market dominance of Spotify in these regions had a distinct influence on the decision of Pandora to cease services in this Pacific region:

Pandora claimed to have more than 1.2 million active users in Australia with 80 million worldwide, but its commercial growth hasn't matched Spotify which dominates the Australian streaming market. (ibid)

The market is seemingly at a volatile stage with many of the hundreds of platforms in financial difficulty or ceasing operations altogether. Australian company Guvera, founded in 2008, collapsed spectacularly in July of 2017 with Aaron Patrick of the Australian Financial Review running a story with the by-line; 'The product: free online music. The amount raised: \$180 million. Revenue generated: almost zero. Current value: next to worthless' (2017).

Similarly, German internet streaming giant for independent music producers, SoundCloud, 'after laying off 40% of its workforce' stated they only had revenue left for six weeks of operation before it would have to close its doors in the same month of the Guvera collapse (Feldman 2017). There has been speculation regarding a buyout by either Spotify or Google for the past year for an estimated US\$1billion (Ingham 2017), however, currently Soundcloud 'could end up being so cheap that its founders may have trouble turning a profit' (Hogan 2017). This could be viewed, however, as a natural adjustment to a crowded market in which too many players were vying for consumer revenue and interest. According to the IFPI, Spotify has a considerable market share that represents

40 million of the total 100 million paid subscribers in the music streaming market worldwide<sup>7</sup> (2017, p. 10).

This volatility in the music streaming market, it is argued, is part of the diffusion process that Rogers attests is a gradual ‘social change, one of the most fundamental of human processes’ (2003, p. xviii). Both the consumer and the music business sector are experiencing a period of transformation. Consumers are rapidly adopting music streaming and at the same time, formulating opinions on which type of service they prefer. At the same time, this new form of music delivery and associated technologies presents challenges to the recording industry in general. We can see from the trajectory of music streaming reported that physical sales are rapidly diminishing, and global revenues are now reliant upon this new technology which is viewed as the main driver of growth (IFPI 2016, p. 10-11). However, how this transformation is influencing music production practices – particularly concerning the use of hyper-compression – is less clear.

The framework for this aspect of the investigation is Rogers’ theory of the diffusion of innovation. To remind ourselves of this framework, Rogers identifies four main elements of a process where ‘(1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system’ forming the basic structure (2003, p. 11). It is also important to point out that although this process which Rogers suggests

---

<sup>7</sup> Spotify has yet to make any profit and has been suffering huge losses due to ‘the cost of growth [...] as it expands into new markets’ and is currently present in 60 countries (Shanley 2016). Despite being valued at US\$8billion, Spotify posted losses of US\$165.1 million in 2014 and US\$195.5 million in 2015 respectively (ibid). Apart from the growth into new markets, Spotify claims that the cost of attaining the rights to the music came at considerable cost but this was likely to turn around in 2017 when they expected to make their first profit: ‘[Spotify] has to pick up the initial cost for music royalties for new users and it takes time before it can generate advertising or subscription revenues from each additional subscriber’ (ibid).

may appear to be linear in the way it is presented, in reality acts more like a recursive system. The process undoubtedly begins with a problem and a solution, however, how the innovation develops is a constantly recursive one of re-evaluation and further development. Innovations must adapt in accordance with the uncertainty of the success of innovations that Rogers suggests. Considering that loudness normalisation has applications that were not intended in the original design, further consideration and development of the innovation may be required. Particular importance is placed on the social system, as Rogers explains:

Diffusion is a process in which an innovation is communicated through certain channels over time among the members of a social system. Therefore, this element is discussed first as it makes sense to identify who these members are and the roles they play within the social system before embarking on how the innovations works within this system. It is a special type of communication, in that the messages are concerned with new ideas. (2003, p.5)

The following discussion is structured according to this framework.

#### 4.1.2 The Social System

Rogers defines the social system as a ‘set of interrelated units that are engaged in joint problem solving to accomplish a common goal’ and that these “units” may be ‘individuals, informal groups, organizations, and/or subsystems’ (2003, p. 23). We can expand these units to include all those that are involved in the creation, mediation, dissemination and consumption of a given innovation. The social system, as Rogers explains ‘constitutes a boundary within which an innovation diffuses’ (ibid, p. 24) and within this boundary there are structures that define the behaviour of the social system which correlates well with Bourdieu’s concept of field. There are three basic areas that Rogers outlines here, summarised as: the effect of norms (pre-existing structures); the

influence of “change agents” on innovation decisions; and the final decision whether to adopt or reject the innovation.

Firstly, Rogers defines “norms” as the ‘established behaviour patterns for the members of a social system’ and that ‘a system’s norms can be a barrier to change’ (2003, p. 26) which also correlates well with Bourdieu’s concept of doxa – an internalised belief system. We can establish with some certainty that the use of hyper-compression is what Rogers defines as a “norm”; a pre-existing structure within the social system of the cultural production of music.

Secondly, we can identify the opinion leaders and change agents in the social group. The AES and the MLA have been at the forefront of the debate against the use of hyper-compression and in particular, members of the MLA have individually and collectively rallied against its use in music production for more than a decade. So far, they have been ineffective in enacting the necessary social change but identify an opportunity in the possible diffusion of this technology. The media to a certain degree have reported on the issue and as such have also played roles as change agents (see for example: Reiersen 2011; Colletti 2012; Resnikoff 2013; Robjohns 2014).

Lastly, we can identify the entities within the social system whose innovation-decisions are crucial to change within the structure of the social system with regards to hyper-compression; we can locate those agents as part of the field of mainstream western popular music involved in the cultural production of music, and the music consumer. It could be argued that the mass audience represents the most critical group within the

innovation-decision process considering that the field of mainstream western popular music's focus is that of large-scale production for the largest possible audience.

### 4.1.3 The Innovation

An innovation, as Rogers argues, 'presents an individual or an organisation with a new alternative or alternatives, as well as new means of solving problems' (2003, p. xx). We can identify three areas in which loudness normalisation can be viewed as a potential problem solver that are associated to its ability to regulate the loudness of audio content: television broadcast, internet streaming platforms, and a deterrent of use of hyper-compression in music production via the removal of loudness bias. As previously mentioned in sections 2.4.2.9 and 2.4.2.9.1, the international standard for loudness normalisation originated from television broadcast as a method of regulating the loudness of program content (ITU BS.1770). This innovation prompted the development of a new set of guidelines and procedures for practical implementation. The transformation from peak to loudness normalisation heralded a significant modification to broadcast practises and, as Camerer asserts, the use of this innovation was 'even more dramatic than changing from black and white to colour TV' (i/v, 2015). A new language of audio descriptors was developed, based around measurement units named Loudness Units or LU. Within the ongoing work of the EBU P-LOUD committee, it became apparent that loudness normalisation had far wider implications as Camerer explains:

After the ball went rolling and the critical mass had been reached in TV and we saw okay, this is now really going into the right direction, we naturally said the next step is [digital] radio. (2015, n.p.)

Attention was then directed to digital audio broadcast (DAB), but also to personal media players (iPhone or iPod) and digital streaming services, all of which share the common problem of loudness discrepancies with music from different eras. The change in perceived loudness from song to song can be potentially irritating to the listener. Loudness normalisation as a problem-solving technology then migrated to most digital platforms that facilitated the reproduction of audio. Several systems apart from the ITU standard were developed for personal media players such as Replay Gain<sup>8</sup> and Apple's Sound Check<sup>9</sup>. Most streaming platforms such as YouTube, Spotify, Pandora and other DAB radio stations adopted some form of loudness normalisation application that the user could choose to utilise or not (Taylor 2017).

Loudness normalisation aside, arguably the most important innovation in this discussion is music streaming itself which acts as the carrier of loudness normalisation as a technology. It is the vehicle by which loudness normalisation can cause a change in the social system. As an entity on its own it most likely will have little consequence. The rationale is that music streaming in conjunction with loudness normalisation will create an environment whereby sound quality judgement on music will be made without the bias of loudness, and therefore, negating the need for the use of hyper-compression so as to be competitive in the market place. The success of this objective hinges on the removal of loudness bias from the listening process altogether. This would require all forms of

---

<sup>8</sup> ReplayGain is a method of loudness normalisation in which a value is stored as metadata in the audio file which instructs the media player at what level the file should be reproduced, according to a desired target loudness level (Harris 2016). It predates the ITU BS1770 standard by almost a decade. ReplayGain is used in a plethora of various digital audio media players and systems for loudness normalisation such as VLC, MediaMonkey, JRiver Media Center, Neutron Music Player and so on.

<sup>9</sup> According to Apple, Sound Check works in the same way as ReplayGain by adding metadata to the sound file regarding loudness level. It is unknown what algorithm it uses to assess the loudness level. <https://support.apple.com/en-au/HT201724> Viewed: 27 October 2016.

playback to be loudness normalised, but interestingly, at what level of adoption will the innovation start to have an effect on the social system itself? This is unclear since, as Rogers argues, the uncertainty of innovation and the rate of adoption can be difficult to predict (ibid, p. 7).

It could be argued that despite a rapid uptake of music streaming, the corresponding change to production practices associated with this uptake concerning hyper-compression (or lack thereof) has been disappointing to those that are advocating this change. Although loudness normalised streaming alone is unlikely to solve the issue of hyper-compression, in conjunction with other forms of music delivery and reproduction – such as PMDs – that incorporate loudness normalisation, it *may* provide the necessary environment to do so. A key issue here is educating the social system to the potential benefit. Part of that process involves the use of certain types of communication channels to make the social system aware of its benefits.

#### 4.1.4 The Communication Channels

Rogers asserts that ‘diffusion is a particular type of communication in which the message content that is exchanged is concerned with a new idea’ (2003, p. 18) and consequently he suggests the ‘essence of the diffusion process is the information exchange through which one individual communicates a new idea to one or several others’ (ibid). In this part of the discussion we specifically address how loudness normalisation is being communicated as a potential solution to the problem of hyper-compression.

The problem that requires a potential solution concerning hyper-compression as a powerful structure within the sphere of music production, lies within the related sub-fields of the greater field of Western mainstream music and not the consumer. It could be argued that the majority of consumers are unaware of hyper-compression, and furthermore, would have little authority in determining its use. Moreover, it is the social structure of the field of Western mainstream popular music and its actions that produce musical artefacts: the artists, the record companies, the record producers etc. Considering that loudness normalisation is a relatively new technology, knowledge of its existence and any potential benefits are not widely known within the arena of music production as yet, let alone those sectors of the industry that are less technical, and more market economy based. It is therefore essential to educate audio practitioners regarding the innovation for any change in the structure of production practices to occur which may then flow on to other sectors.

Arguably the most influential and vocal group that is actively against the use of hyper-compression in music production is the Music Loudness Alliance (MLA). This group consists of some of the most highly regarded audio practitioners/scientists who are high profile members of the AES; Bob Katz, Thomas Lund, Kevin Gross, Bob Ludwig, Florian Camerer, Eelco Grimm and Ian Shepherd. Members of the MLA (in particular, Camerer and Lund) have also been instrumental in the development of loudness normalisation and its implementation in broadcast for the European Broadcasting Union (EBU R128). The MLA acting as opinion leaders and change agents, utilise Audio Engineering Society (AES) convention seminars as their main communication channel to members of the audio community. They use this platform to strongly advocate loudness normalisation as a solution to the problem of hyper-compression backed by scientific studies. Whether this

very narrow channel of communication can have any effect on the wider music industries and economies is unclear and possibly doubtful. They have, however, within this technical community, a voice that is prominent and well respected and may serve as a catalyst for discussion in other sectors, particularly in certain areas of the media (see for example: Low 2015; Robjohns 2014). MLA member Bob Katz in particular has proven to be an effective voice in focusing attention on the subject of hyper-compressed recordings and is widely considered to be one of the leading experts on the subject. As mentioned, in 2013 Katz announced in a press release on his website *Digital Domain* that the ‘Loudness War is over’, citing loudness normalisation and the rise of streaming as a newly dominant music delivery platform (2013):

I wanted to be the first to say something about that because at the time I thought that normalisation was happening, that iTunes was going to do this and it was going to change the world [...] But it was premature at that time. It was also designed to awaken more people to what normalisation could do. (Katz i/v, 2015)

Katz believes that although the technology is still in its infancy, it’s only a matter of time before loudness normalisation permeates the industry and has the desired outcome on production practices (ibid.). Bob Ludwig, another high-profile member of the MLA, agrees that the recording industry is very slow to take up the innovation of loudness normalisation and anecdotally comments that ‘oh, it’s got to be 99.9% of people’ that have little to no idea of what loudness normalisation actually is and how it could affect working practices (i/v, 2015). He also adds, ‘well for sure the broadcasters are thinking about it because it’s been put into law there’ but apart from those that attend AES conferences and read the literature on the topic, it is only slowly making its way into the consciousness of music practitioners (ibid). Apart from promoting a White Paper titled *Loudness Normalisation: The Future of Files Based Playback*, which outlines an

‘integrated solution’ (MLA 2012) to solve the issue of hyper-compression, the MLA were also instrumental in devising AES TD1004.1.12-10 (AES 2015). Surprisingly, the MLA have resorted to an on-line petition<sup>10</sup> (*figure 4.1*) with activist website *change.org* in the hope of amassing enough public support to convince music streaming companies to adopt their recommendations as they are not bound to do so. It is unclear exactly how long the petition has been running as the date of its inception is not stated, however, it can be assumed that it has been over two years according to comments left. In this time the petition has garnered only 8,644 signatures. Whether this number is sufficient to influence the decision makers of the targeted multi-national companies is doubtful.



*Figure 4.1:* The petition on change.org, commissioned by the MLA to encourage music streaming companies to comply with the suggested AES TD1004.1.15-10, Recommendation for Loudness of Audio Streaming and Network File Playback (AES 2015). (Source: [change.org](https://www.change.org/p/music-streaming-services-bring-peace-to-the-loudness-war) Viewed: 12 January 2016.)

<sup>10</sup> <https://www.change.org/p/music-streaming-services-bring-peace-to-the-loudness-war> Viewed: 12 January 2016.

Other organisations that are acting as change agents include the three internet-based activist sites Pleasurize Music Foundation, Turn me up! And Dynamic Range Day. Dynamic Range Day in particular which was founded by MLA member Ian Shepherd, is one of the more consistently high-profile site which organises a day annually to bring attention to the issue of the use of hyper-compression. On its Facebook site, it is stated that Dynamic Range Day, is ‘a day of online activity to make more people aware of the Loudness Wars and the effect they are having on the sound of the music we listen to’ and reports in excess of 25,000 contributors<sup>11</sup> and ‘a couple of years ago the reach of the event was half a million people’ (i/v, 2016). Shepherd also runs a popular blog site titled “Production Advice” where he regularly writes about developments concerning the topic (see for example: Shepherd 2009, 2011, 2015, 2016a, 2016b, 2016c).

#### 4.1.5 Time

The ‘time dimension [...] involved in diffusion’ provides the opportunity to measure the trajectory of an innovation within the social system (Rogers 2003, pp. 20-23). There are two fundamental processes that Rogers outlines, these being the *innovation-decision process* in which a decision is made to adopt or reject the innovation, and the *rate of adoption* ‘defined as the relative speed with which an innovation is adopted by members of a social system’ (ibid). Apart from educating audio practitioners on the benefits of loudness normalisation within the system, the creation of an environment that will

---

<sup>11</sup> <https://www.facebook.com/DynamicRangeDay/> Viewed: 29 July 2017.

discourage the use of hyper-compression as mentioned, largely depends upon the adoption of music streaming by the consumer. If we look to the available statistics on global sales and revenues we can see an obvious trend towards streaming which is representing a major transformation in the way the global audience obtain music.

As previously mentioned, between 1999 and 2014 there was a 40% downturn in global revenues due to the gradual shift from physical to digital sales (*figure 4.4*) in which the music business was in a state of transition between physical and digital sales (IFPI 2017, p. 10). 2016 represented the first year of significant growth (5.9%) and this growth can be explained as the result of this major transformation into digital platforms, in particular streaming (*ibid*). Initially, this transformation was led by sales of digital downloads by platforms such as iTunes Music Store. Launched in 2003, iTunes Music Store fast became the largest music vendor globally by 2011<sup>12</sup> (Dilger, 2011). The digital sector then splintered into two categories. Firstly, digital downloads whereby consumers still purchase and download the product on their hard drives and are reproduced via apps such as iTunes or Windows Media Player, or PMDs. Secondly, on-line streaming whereby consumers subscribe for an unlimited amount of streamed music that they lease for reproduction only through a proprietary application. We can further disseminate music streaming into two further platforms: radio station style formats (for example: Pandora) whereby music channels are curated and the consumer cannot select individual songs; and “a la carte” services (for example: Spotify) whereby the consumer can select individual songs. We can then further dissect music streaming platforms again into

---

<sup>12</sup> It has long been argued that the on-line stores that provide digital downloads for purchase were the direct result of the dilemma that music companies faced with the explosion of illegal peer-to-peer sharing sites such as Napster in the late 1990s (Breen 2013). This forced companies to rethink methods of dissemination in the face of the digital revolution that unfolded in the 1990 and early 2000s (*ibid*).

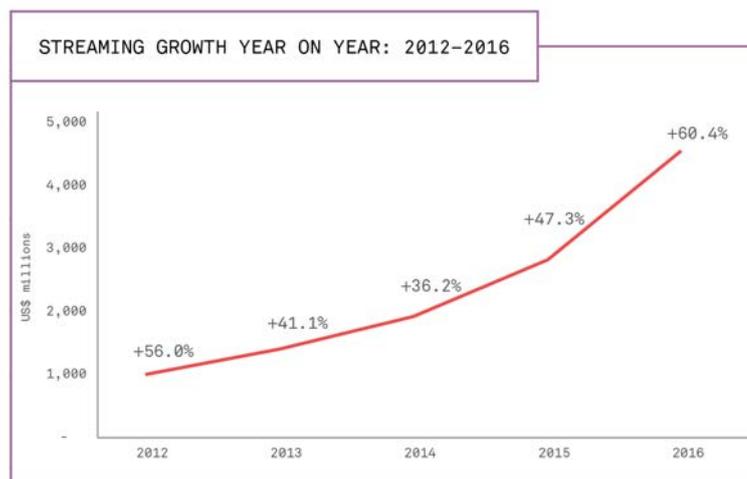
another two groups: paid subscriptions with no advertising; and free subscriptions with advertising. The platform Tidal, further differentiates itself from others by providing a selection of music reproduction based on the quality of resolution; from data-compressed (AAC) to CD quality formats (FLAC) for an extra subscription fee.



Figure 4.2: Since the launch of Spotify in 2008, there are now allegedly hundreds of digital platforms providing a variety of services and ‘licensing more than 40 million tracks’. (Source: IFPI 2017, p.7)

Pandora has been named as the first major on-line streaming radio network launching in September 2005, despite Last-FM commencing three years earlier in 2002 (Gil n.d). Soundcloud (2007) and Bandcamp (2008) then launched a service to provide independent bands the opportunity to post their music on-line, bypassing previous distribution models of music companies. However, it was the Swedish company Spotify which was launched in October 2008 – currently the world’s largest on-line streaming platform – that exemplifies the modern a la carte music streaming platform. According to a report by the IFPI regarding the Swedish market – the country from where Spotify originated – the

uptake of streaming services had reached a remarkable ‘94% of the digital market’ already by 2013 (IFPI 2013). After already having more than 10 million subscribers in Europe, Spotify launched in the United States in 2011 and then rapidly expanded globally (ibid). Since Spotify’s launch there are now allegedly more than 400 digital platforms providing a variety of services ‘licensing more than 40 million tracks’ (IFPI 2017, p.7) (*figure 4.2*). Although predominately a video streaming service, in a recent IPSOS research study, it was found that YouTube ‘is the most used music service’ where ‘82% of all YouTube visitors use it for music’, with 93% of users aged between 16 and 24 (IPSOS in IFPI 2016b, pp. 3-4). It could be argued that this is predominately because the content is free and contains the video clip as bonus content to the music. This trend has also generated a new issue with piracy in that YouTube clips and their audio content are easily downloaded using the appropriate software and on-line services – ‘stream ripping’<sup>13</sup> (IFPI 2017, p.37).



<sup>13</sup> “Stream ripping” is a method of piracy that was born from music streaming, whereby the audio from a YouTube clip is extracted separately from the video component and then used as a conventional audio recording in MP3 or AAC format. There is a plethora of readily available on-line apps that will perform this process. Alternatively, the audio from a music stream is simply recorded using an audio app such as Garage Band.

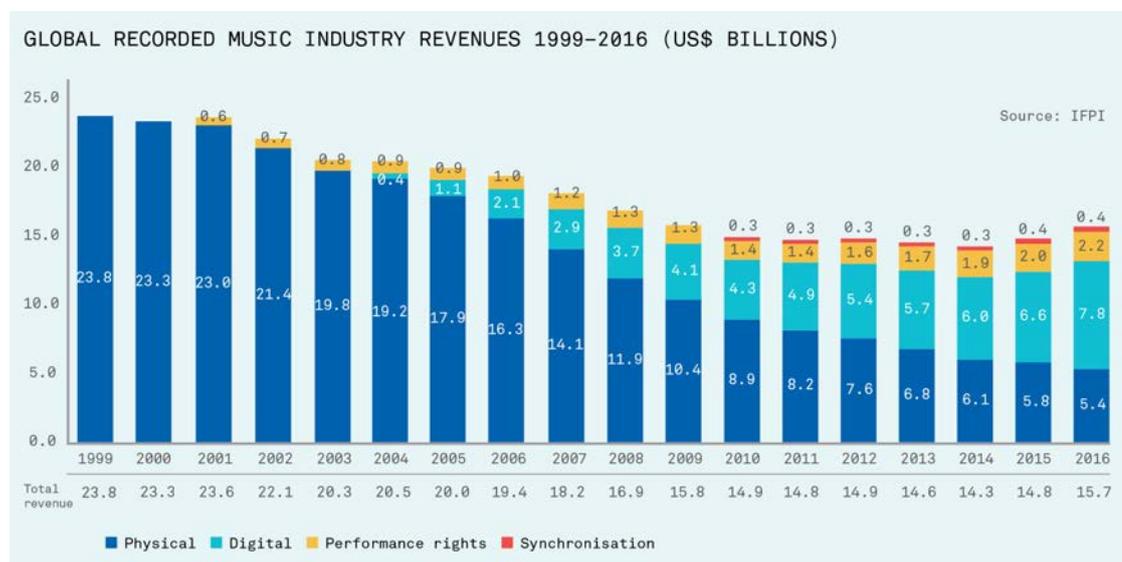
*Figure 4.3:* Music streaming growth from 2012 to 2016 presents an increase in revenue from US\$1billion to US\$4.6billion. A 60.4% increase was experienced in 2016 from the previous year.  
(Source: from IFPI 2007 p. 17)

Whereas digital downloads dominated the way consumers obtained music in the 2000s, this has rapidly shifted towards streaming services since 2011. According to the International Federation of the Phonographic Industry (IFPI), which ‘represents the interests of the recording industry worldwide’, music streaming is ‘emerging as the digital sector’s main driver of growth’ (IFPI 2016a, p. 16). This growth is typified by global revenue from streaming services increasing over a five-year period from 2012 to 2016 from US\$1billion to US\$4.6billion, with a 60.4% increase in 2016 alone (IFPI 2017, pp. 13-17) (*figure 4.3*).

According to sources reported by Resnikoff, ‘Apple is now preparing to completely terminate music download offerings on the iTunes Store’ with a ‘two-year termination timetable’ due to the growing dominance of streaming platforms ‘when paid music downloads are likely to be an afterthought in a streaming-dominated industry’ (2016). 2016 is reported by the IFPI as a pivotal year as far as the transition from physical sales to the new paradigm of music streaming. Dennis Kooker, Sony Music’s President, Global Digital Business & US Sales, is quoted as stating that ‘when we look back, 2016 may have been a tipping point for streaming and, most importantly, for paid subscription streaming’ (IFPI 2017, p. 16). Similarly, Michael Nash of Universal Music/Digital Strategy, believes that ‘this is not simply another format transition, it is a fundamental transformation that is changing everything about the business’ (*ibid*). Digital sales in general have shown a steady increase from US\$4billion in 2008 to US\$7.8billion in 2016 signalling the death of ‘shopfront physical sales’ (IFPI 2017, p. 11); in 2015 ‘digital

became the primary revenue stream, overtaking physical sales' for the first time (IFPI 2016a, p. 8) (*figure 4.4*).

Within the category of digital sales, which include both digital downloads and streaming services, streaming revenues 'have overtaken income from download sales in no fewer than 42 countries and account for 43 per cent of digital revenues globally' (IFPI 2016a, p. 17) with 968 million users. Revenue from digital downloads fell by '8% in 2014, an acceleration on the 2% drop in 2013 [...] with double digit declines in most major markets' (IFPI 2015, p. 21). This trend continued in 2016 with download revenue falling much faster by 20.5% globally (IFPI 2017, p. 12). It is clearly apparent that with faster internet speeds, greater download capacity, and increasingly sophisticated technology, consumers are turning to on-line streaming as their preferred method to obtain music.



*Figure 4.4:* Global recording music revenues from 1999 to 2016. Total revenue had fallen 40% between 1999 and 2014, with 2016 being the first year to record a significant increase of 5.9% which was largely due to revenue from the music streaming sector. (Source: IFPI 2017 p. 11)

This trend continued in 2016 with physical sales decreasing a further 7.6% (IFPI 2017, p. 6). Chief Executive of the IFPI Frances Moore argues that audiences have 'instant access,

at any time and in any place, to a vast record collection of more than 43 million tracks [...] enabling the recording industry to reach markets that it could not monetise through physical retailing' (IFPI 2105, p. 5).

It is clear from these reports that music streaming is rapidly becoming the dominant platform for music delivery globally, with a trajectory that supports the claims made by the MLA. It could be argued that the speed with which music streaming is being adopted may have a direct causal relationship to when the use of hyper-compression might be interrupted. The time factor is important in assessing the success of adoption of an innovation. Rogers asserts that 'innovations have an S-shape rate of adoption' (2003, p. 23) with variation in the slope of the curve indicating the rate of adoption. It is, however, difficult to formulate an adoption rate according to consumer numbers or number of sales considering that music streaming subscriptions may contain whole families of consumers and multiple devices. Furthermore, on-line streaming is calculated per song play and not per purchase (as with both physical and download sales) making the comparison between the two formats incongruous. It is therefore argued that looking to the proportion of global revenue received for each platform is the most likely answer to this problem.

From the statistics detailed in this investigation, we can therefore state that the adoption rate according to global revenues from all digital services including downloads and streaming services is at 50% of the total revenue received which corresponds to a 50% adoption rate (*figure 4.5*). From within this group of digital services, streaming represents 59% of global revenue of that group, representing a majority and 59% adoption rate (*figure 4.6*). Exactly what rate of adoption is required to achieve the social change required is unknown. It *may* require an adoption rate of 90% that firmly positions music

streaming as the dominant music delivery platform, where it falls within the category of “late adopters”. As Rogers argues, with the uncertainty surrounding innovation, time is the only way we can assess its potential success.

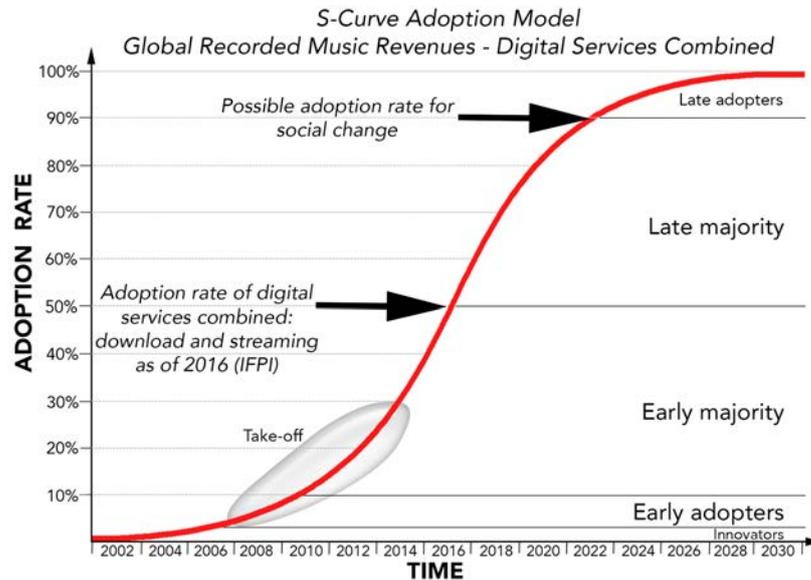


Figure 4.5: S-curve adoption model for all digital services combined (download and streaming) according to the total global recorded music revenues. The lower arrow (50%) indicates the adoption rate as of 2016 (IFPI 2016, p. 6). The upper arrow indicates a prediction where adoption rate (late adopters) for change within the social system. The actual adoption rate required for social change is hypothetical.

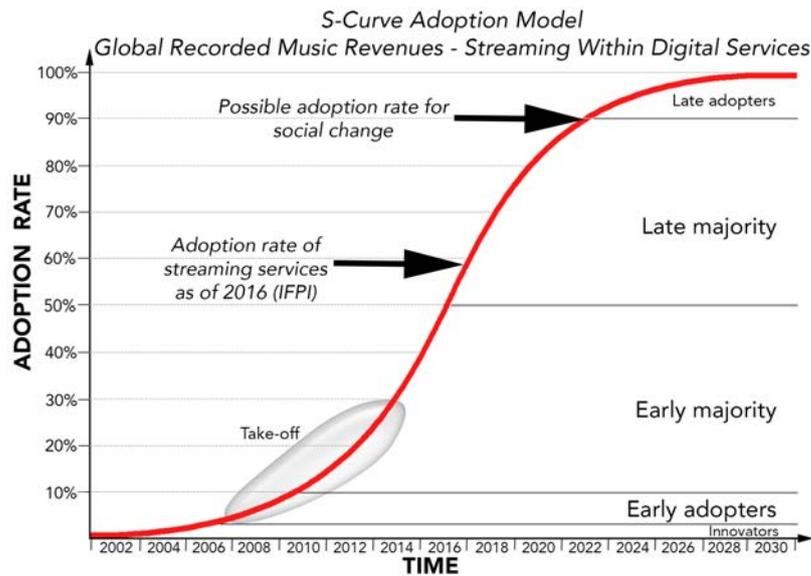


Figure 4.6: S-curve adoption model for music streaming within digital services according to the total global recorded music revenues. The lower arrow (59%) indicates the of adoption rate as of 2016 (IFPI 2016). The upper arrow indicates a prediction where adoption rate (late adopters) for change within the social system. The actual adoption rate required for social change and is hypothetical.

It is clear from the discussion that what Rogers labels the “time dimension” element of diffusion is crucial. Music streaming’s trajectory as a dominant delivery platform is seemingly highly predictable according to the statistical analysis and is increasing in dominance every year. However, we cannot look into the future for a definitive answer for, as Rogers points out, uncertainty surrounds all innovation and there are many contributing factors that cannot be fully understood until they eventuate. It is only when the entire scenario eventuates that we can fully appreciate what set of circumstances were necessary for the extent of diffusion which is responsible for an associated social change. Therefore, it is difficult to ascertain at what point of adoption by the consumer – a group that forms the most significant part of the social system in this instance – will we see any evidence that the position hyper-compression plays within the social system has changed. What we can however ascertain at this point, is that there is no evidence as yet of any change in the use of hyper-compression. This suggests that the adoption rate of music streaming has not yet reached that critical point.

## 4.2 Conclusion

As argued, it would require significant social change for hyper-compression to be removed as a structure from the field of Western mainstream popular music. Important to this discussion is the idea that hyper-compression is seen as an objective condition that currently places limitations on the action of agents with regards to loudness in a subjective sense. Considering that loudness bias is seen as the primary cause of the Loudness War, its removal is widely considered to be a possible catalyst for such a social change. Music streaming in conjunction with loudness normalisation which has the potential to remove loudness bias from the reproduction equation, in theory can provide such a solution. However, it is argued that this initially depends upon the extent to which this technology is diffused within the social system. Furthermore, to achieve such an outcome, it has been discussed that a range of conditions would need to be established since the removal of loudness bias is but one factor among these. One primary condition has been investigated in this chapter being the diffusion of music streaming and loudness normalisation as a conjoint technology.

Rogers' theory of the diffusion of innovation was utilised to gain an understanding of the processes involved in the diffusion of music streaming incorporating loudness normalisation. The four main elements to this theory are outlined as, an innovation, which is communicated through certain channels, over time, among members of the social system (2003, p. 12). This provided a framework for examination and each element was analysed according to the social system presented. Rogers asserts that innovations have the capacity to invoke change in the 'structure and function of a social system' and this

change is directly relational to the rate of adoption of the innovation by members of the social system (ibid, p. 6). There is, however, as Rogers attests ‘some degree of uncertainty’ involved in the diffusion process as it is very difficult to predict the degree to which an innovation is adopted and the change that is as a result (ibid).

Despite the global revenue of digital sales surpassing physical for the first time in 2015 and music streaming being viewed as the largest sector of growth, there is no evidence to suggest that it has had a significant influence on the use of hyper-compression. This suggests that the adoption rate of music streaming has not yet reached a critical point, and it is difficult to ascertain at what point of adoption we will see any evidence otherwise. Music streaming as a platform has, as mentioned, been in a state of volatility which could be explained as a period of natural adjustment due to rapid transformation. The expansion of Spotify who are yet to make any profit despite being valued at US\$8 billion, in contrast to the economic difficulties of companies such as SoundCloud and Pandora, and the collapse of Guevera, highlight this volatility. Compounding this volatility, both the consumer and the music business sector are experiencing a period of transformation. Consumers are rapidly adopting music streaming and at the same time, formulating opinions on which type of service they prefer. This new form of music delivery and associated technologies is also presenting challenges to the music business sector with record companies having to adapt to a rapidly changing landscape. What is clear, however, is that music streaming, despite going through this period of instability, is very quickly dominating music delivery which is evident from substantial yearly increases in global revenue. Despite an apparent concentration on the consumer who is seen here as the main driver of possible change through their adoption of music streaming, it is argued that a change within the domain itself is required which is the responsibility of the field.

Particularly relevant to the issue of hyper-compression is providing agents with alternative choices of action to what is currently in place. This requires a transformation of the structures currently in place within the domain and field of works. Hyper-compression or the loudness of a music recording is represented as a set of objective conditions or structures that either limit or enable agents in the production of music as cultural goods. This new paradigm of music reproduction could present to the agent a loudness normalised *space of possibles*, mediating the influence of objective conditions such as the “louder is better” paradigm. Music streaming, acting as a space of possibles which can be readily accessed by agents, presents the potential opportunity for agents to discover precedence in less hyper-compressed artefacts. This equates to the ‘objective potentialities’ that Bourdieu mentions in the form of a loudness normalised reproduction paradigm (Bourdieu 1996, p. 235). In theory, the removal of loudness bias will also remove the requirement to use hyper-compression as a pre-conditioning of the musical artefact to exist within the field. However, it could be argued that this is not as straight forward a process as one might logically envisage and most likely require a recursive process of change in the domain by agents who gradually introduce less compressed recordings, which will in turn influence other agents to produce less compressed recordings. Despite this process being directly relational to Csikszentmihalyi’s systems model of creativity, it is also reminiscent of Giddens theory of structuration in which he states there is a ‘duality of structure’, where structures may determine action, but it is also action that creates and reproduces structures (1984, p. 19).

As such, loudness normalisation is perceived as having the capacity to change the objective potentialities for agents within the field, but this requires the necessary

environment and conditions for this recursive process to occur. At present, with music streaming's ongoing trajectory, and the fact there is little precedence in other cultural product that displays attributes of less compression, agents are less likely to venture outside the limits of the structures they are accustomed to. It is possible that once the said environment and conditions does occur this recursive process may well begin, and change will be a gradual process through changes in the domain. Certainly, one of the necessary conditions is the establishment of communication channels to make agents aware of benefits to this new loudness normalised paradigm.

One of the more critical aspect to Rogers' theory is that the diffusion process is driven by modes of communication in which members of the social system are made aware of the benefits of the innovation. Rogers mentions that 'the essence of the diffusion process is the information exchange through which one individual communicates a new idea to one or several others' (2003), p. 18). It could be argued that certain channels of communication are more relevant to consumers adopting music streaming as their preferred method of music delivery. Communicating the benefits of this loudness normalised paradigm to an industry of audio professionals may require more specialised channels of communication. The Music Loudness Alliance (MLA) and its individual members are identified as the primary change agents and opinion leaders in this area, providing advocacy of the benefits of the innovation through Audio Engineering Society (AES) conferences. They use this platform to strongly argue loudness normalisation as a solution to the problem of hyper-compression, strengthened by scientific rationale to a focused audience.

Other communication channels are also utilised. Individual members of the MLA, such as Ian Shepherd, uses his blog “Production Advice” and internet activist website Dynamic Range Day to disseminate relevant knowledge and information which has garnered significant mainstream media coverage. Other members such as Bob Katz have used similar networks which have been largely reported in industry related media. Katz who also is in possession of a significant international profile on the topic is identified as a major advocate of loudness normalisation along with Shepherd. Other members such as Thomas Lund, Eelco Grimm and Florian Camerer utilise more industry and scientific based avenues for such advocacy.

Despite these influential channels of communication provided by the MLA and its members, and a significant adoption rate of over 50% for digital reproduction that is loudness normalised, there is little evidence of any change in practice. This also lends weight to the argument that the removal of loudness bias is but one factor and the problem is more systemic including many other relational sociocultural and socioeconomic factors. If loudness bias was the only central issue, then logic would suggest that a noticeable change in the social system would be evident, but this is not the case.

Another factor that is vitally important is the effectiveness of the loudness normalisation algorithms employed by the various music streaming platforms. This is also of considerable concern in creating the necessary conditions for change to occur. The output of five music streaming companies (iTunes, Spotify, Tidal, Pandora and YouTube) were analysed in (Taylor 2017) and results indicated a range of poor to excellent performance of the respective algorithms used. It is suggested that this lack of conformity between platforms is a contributing factor to changes in practice not occurring despite the 50%

adoption rate of digital product. Considering that YouTube has been reported as the most utilised streaming platform for music by the IFPI (2017), the loudness normalisation system implemented performed the second worst out of the five platforms analysed with a loudness differential of 9.6LU. This is obviously of some concern. Similarly, Tidal, despite professing to have implemented an ITU based loudness normalisation algorithm displayed a loudness level differential of 12.7LU which suggests otherwise. It was therefore argued that in the interests of best possible practise that the various platforms adopt the ITU standard which has been successful in regulating broadcast audio. It is furthermore suggested that these platforms consider adopting the AES TD1004.1.12-10 (AES 2015) recommendations which advise a target loudness level of -18 to -20LUFS. Adopting these target levels would not only accommodate a wide range of dynamic variability, the widespread adoption of the ITU algorithm itself would further negate residual effect of loudness bias between platforms.

Looking further afield, even if the adoption rate of music streaming reaches significantly high levels and loudness bias has been notably mediated, the audition process of the consumer is also of considerable interest. There is compelling evidence that reinforces the validity of claims made that loudness normalisation could be an incentive to remove the practice of hyper-compression. It has been reported in (Taylor 2018) that the average un-trained listener has difficulty in discriminating between even large magnitudes of compression when the audio under question is loudness normalised. This claim is supported by other studies discussed extensively in section 4.3 (for example see: Ronan et. al. 2014a; 2016). This would suggest that regardless of whether music recordings have been hyper-compressed or not, the average consumer is unlikely to perceive any substantial difference when music is loudness normalised. This in itself presents a

compelling argument that if there is no direct benefit in making loud recordings due to the removal of the “louder is better” paradigm, and the average listener is unable to discriminate between a compressed or non-compressed recording, then justifications for the use of hyper-compression should retreat to those only concerning aesthetic decisions.

# 5 DOMAIN – THE FIELD OF WORKS AND THE SPACE OF POSSIBLES

Within the domain of Western mainstream popular music is a universe of artefacts. Agents who wish to exist within the field of record production/audio engineering must internalise not only the symbol system of this domain, but also engage with many of these artefacts. These artefacts as a collective are a material manifestation of the symbol system, and therefore, represent the accumulated cultural heritage of the field at this point in time. It also represents an historical document of creative developments by all productive agents working in the field. As previously mentioned, Johnson states that ‘agents do not act in a vacuum’ and all new ideas are drawn from those that precede them (Johnson in Bourdieu 1993, p. 6). Weisberg confirms this idea by pointing out that:

...creative products are firmly based on what came before. True originality evolves as the individual goes beyond what others had done before. This might mean, perhaps paradoxically, that in order to produce something new, one should first become as knowledgeable as possible about the old. This serves to provide the background so that the individual can begin to work in an area and also serves to provide ways in which to modify early products that are not satisfactory. (in Sternberg 1983, p. 173)

According to Csikszentmihalyi’s systems model of creativity, the agent modifies the domain by introducing novel ideas which the field either rejects or consecrates: this process is what he describes as the act of creativity; ‘to bring into existence something genuinely new that is valued enough to be added to a culture’ (1997, p. 25). It is argued that Bourdieu’s notion of the *field of works* mentioned in the *Rules of Art* (1996), operates

in much the same way as Csikszentmihalyi's notion of the domain. The field of works represents all historical antecedents of cultural production of the field. What has already been created, presents agents with an understanding of what is possible; what he refers to as the *space of possibles* – 'an ensemble of probable constraints which are the condition and counterpart of a set of possible uses' (Bourdieu 1996, p. 235). For Bourdieu, these artefacts include the means by which something is created which is stored along with the actual artefact, providing an opportunity for further creation.

An understanding of how hyper-compression became such a dominant structure within the field of record production, is therefore made possible by examining artefacts within the domain of Western mainstream popular music. Such an examination should chronical moments in history where ideas were introduced into the domain which had specific influence on the loudness of recordings. The agent, the choice making entity in this sense, could be either a company introducing a particular technology and/or an individual person or group of persons who utilise this technology in a novel way. This examination can be achieved via various measurement procedures used to investigate modal descriptors of the audio signal of a recording; artefact evaluation. For example, Deruty and Tardieu introduced a novel approach to signal analysis termed 'peak to RMS regression coefficient' (PRRC) to measure the micro-dynamics of a signal, 'intended to describe the amount of dynamic processing applied to a source' (2014, p. 45). They then correlate moments along a timeline in which changes are made to the domain and the corresponding changes to the loudness of recordings at those moments in time (*figure 5.1*).

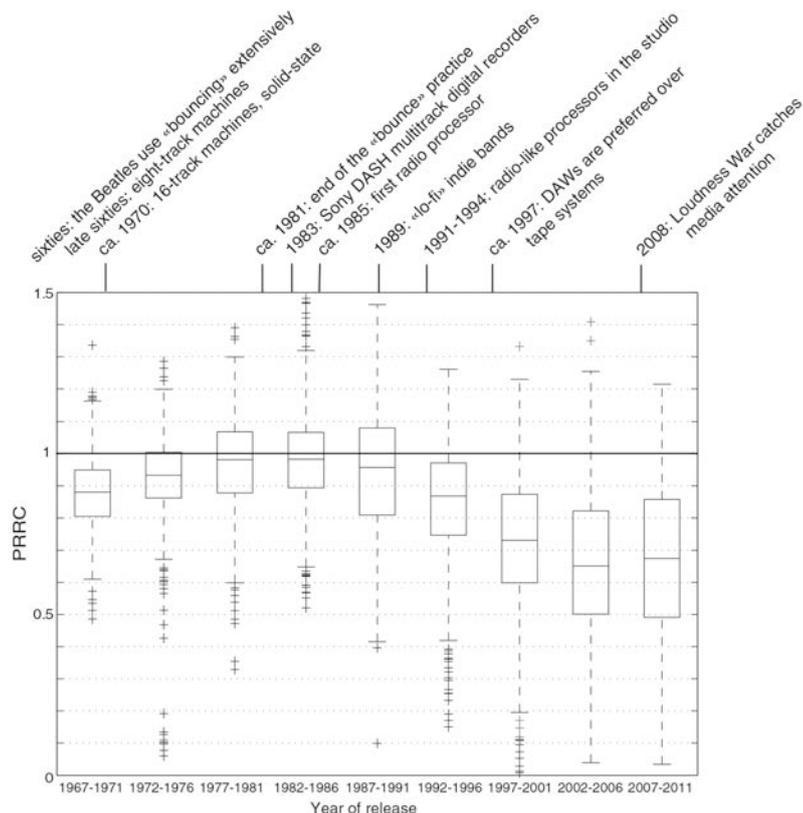


Figure 5.1: The evolution of PRRC according to technical development on a timeline between 1967 and 2011 of 4500 Western mainstream popular music recordings. A measurement of 1 signifies less DRC used and 0, more. We can see that certain technical developments and trends introduced have had considerable influence on the dynamic variability of the recordings. The introduction of “radio like processor” i.e. digital limiter in the early 90s signifies a dramatic increase in the use of hyper-compression.

(Source: Deruty & Tardieu 2014, p. 53)

In this chapter, the domain as a field of works and the subsequent space of possibles is examined via a mixed-method approach incorporating both signal and field analysis. Firstly, the analysis of various signal properties of a corpus of 210 recordings was conducted using various methods and these results compared to previous studies. A distinct correlation was identified between these findings that illustrate temporal markers with corresponding causal factors. A dramatic increase in loudness levels can be established during a specific timeframe (c.a. 1990) which corresponds with the widespread adoption of digital media and the introduction of certain loudness inducing digital technology. We can also follow the trajectory of this increase in loudness levels to

a conclusion during the 2000s. Interestingly, despite a dramatic increase in loudness levels – corresponding with an equally dramatic decrease in RMS – the average dynamic variability of music actually increased despite the extensive use of hyper-compression. Reasons for this are discussed, alongside considerations of micro-dynamic and macro-dynamic time scales.

Secondly, two examples of excessively hyper-compressed and highly influential albums which punctuate both the beginning and peak of the Loudness War – Oasis’s (*What’s the Story Glory*) *Morning Glory* (1995) which arguably started the Loudness War, and Metallica’s *Death Magnetic* (2008) arguably the most notorious album of the Loudness War – are examined from the perspective of the systems model of creativity and field theory. Notably, an in-depth examination of *Death Magnetic* from the perspective of Bourdieu’s notion of the *field of struggles* is presented as a particularly relevant investigation within this research project. This provides a framework for examining elements of the field with regards to hyper-compression that is useful for further discussions following on from this chapter.

A network of agents, fields, sub-fields, factions and hierarchies are identified within the field of Western mainstream popular music, not only in relation to the Metallica album but the field in general. Their relative positions and the structural relationships of these entities from within the field are examined in light of what Bourdieu denotes as the fields of large scale and restricted production. Here, there is a “double site of hierarchy” in which there is a battle between the principles of heteronomous and autonomous hierarchisation that delimits the sub-fields from within the field of record production/audio engineering. This is also the site where there is a struggle for authority

over the issue of hyper-compression for as Bourdieu asserts, the field of struggles is also a contest for the legitimacy to consecrate cultural products and in this instance, the legitimacy of the practice of hyper-compression. This struggle for authority is at the heart of the power system of the field. To claim a right to this legitimacy also entails the generation of the appropriate habitus and various forms of capital necessary to maintain positions of dominance. This is further discussed using Bourdieu's notion of doxa. Doxa is used in this instance to position the stance of various sub-fields and factions along a scale between orthodoxy and heterodoxy on the use of hyper-compression.

Finally, it was argued in the previous chapter that the removal of loudness bias from the reproduction paradigm, although seemingly logical in also removing the requirement to use hyper-compression as a pre-conditioning of the musical artefact to exist within the field, may not be such a straight forward process. It was suggested that it most likely would require a recursive process of change in the domain by agents who gradually introduce less compressed recordings, which will in turn influence other agents to produce less compressed recordings. Hence, it may not simply be a case of removing the need for hyper-compression but would require a gradual transformation of the domain that is similar to how hyper-compression was installed as a structure. This change in the domain that alters possibilities for action is presented as part of the circular causality of Csikszentmihalyi's systems model of creativity; action can instigate changes in the domain which in turn can instigate change in action. As the domain is transformed by acts of creativity, the agents must adapt and redefine their habitus and agency to accommodate this change. As loudness became a structure in the domain of Western mainstream popular music, the expectations of the field were accordingly reconfigured to accommodate for loudness and therefore judgements on whether or not an agent's music

was considered worthy of inclusion into the domain were arguably dependent to a large degree on whether it was loud enough.

We can identify the introduction of various forms of digital technology mentioned that punctuate change in the domain, which in turn caused changes in practice. This is evident in the field of works and space of possible within the domain. This is examined by an analysis of the trajectory of this technology correlated with views from the respondents interviewed. It is further proposed that an examination of how hyper-compression came into being as a structure may also provide an understanding of how it might also dissipate as a structure. Such an examination, it is suggested, will also provide support for the argument made that a recursive process of change in the domain is most likely needed to instigate change in the use of hyper-compression.

## 5.1 Analysis of Music Corpus 1955-2016

There have been several studies that have examined the trajectory of hyper-compression via the analysis of signal properties of extensive music corpora from the 1950-60s to recent years<sup>14</sup>. Three are worth mentioning due to the comprehensive nature of the studies and also due to the strong correlation between data presented. The first of these was that of Ortnner whose study involved ‘a representative body of over 10,000 successful titles selected from more than 60 years of [Western] popular music history’ with three-year frequency distribution (2012, p. 2). The second is that of Deruty and Tardieu, whose study involved a corpus of ‘4,500 tracks released between 1967 and 2011, each year corresponding to 100 tracks’ with five-year frequency distributions (2014 p. 43). The third and final is that of Deruty and Pachet which involved ‘a diachronic analysis on 7,200 [Western] mainstream tracks released between 1967 and 2014’ (2015, p. 722). The findings from these studies represent moments where changes were made to the structure of the domain and hence are reflected in the artefacts themselves. We can summarise these findings by the following:

- i. A dramatic increase in loudness levels above those previously experienced started sometime around 1989/1990 and corresponds directly with the introduction of digital look-ahead limiters.

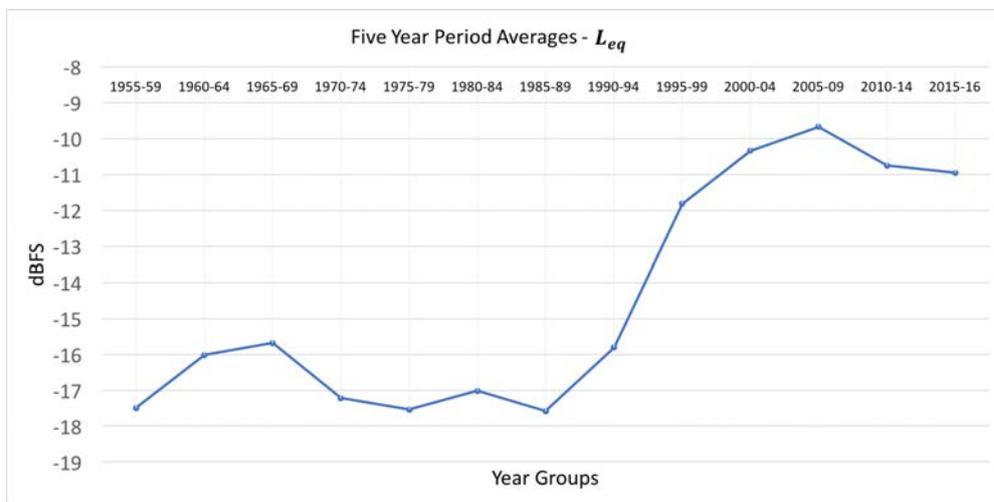
---

<sup>14</sup> Typical measurement procedures performed in these studies include: (RMS); Program loudness (also referred to as integrated loudness); Crest factor (CF); Peak to loudness ratio (PLR); Loudness range (LRA); True peak (TP); Peak to RMS regression coefficient (PRRC); and high-level sample density (HLSD) (For further explanation see section 3.4.2).

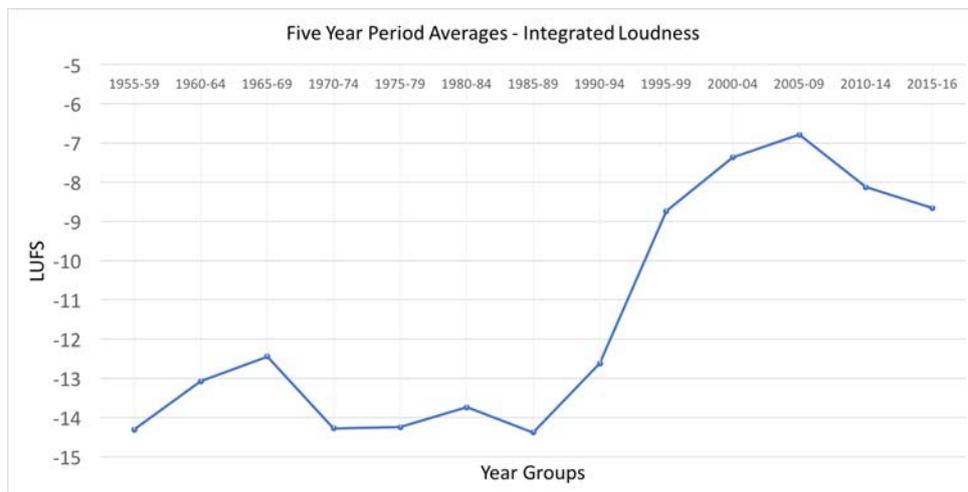
- ii. A sustained increase in loudness levels in the 2000s is strongly related to the introduction of digital audio workstations (DAW).
- iii. This increase in loudness levels peaked sometime between 2004 and 2007 and levels have marginally decreased thereafter.
- iv. Although the data presented varies to a small degree, it indicates that the median increase in loudness levels overall was approximately 6-9 LU and similarly, 6-9 dB RMS.
- v. Although this loudness increase had a direct effect on the micro-dynamic timescale (instantaneous) of recordings, it had no effect on a macro-dynamic timescale, meaning the long-term (integrated) dynamic variability of recordings did not decrease, but in fact increased.
- vi. Loudness in Western mainstream popular music, specifically, is related more to the year of release rather than any specific genre or sub-genre that it belongs to.

To further confirm and also possibly add validity to these studies, a similar analysis was performed as part of this research project on a much smaller corpus of 210 western mainstream popular music recordings from 1955 to 2016 (Appendix 1 & 2). The measurement procedures conducted were  $L_{eq}$ , integrated loudness, DR, LRA, and HLSD. A summary of the results from this analysis are reported in *figure 5.2* as averaged five-year frequency distributions. A comparison between the results of this analysis and that of both Ortner (Appendix 3) and Deruty/Tardieu (Appendix 4) illustrate a striking correlation in the results of all measurement procedures undertaken. Despite representing a much smaller corpus of recordings, the results would suggest that the measurement

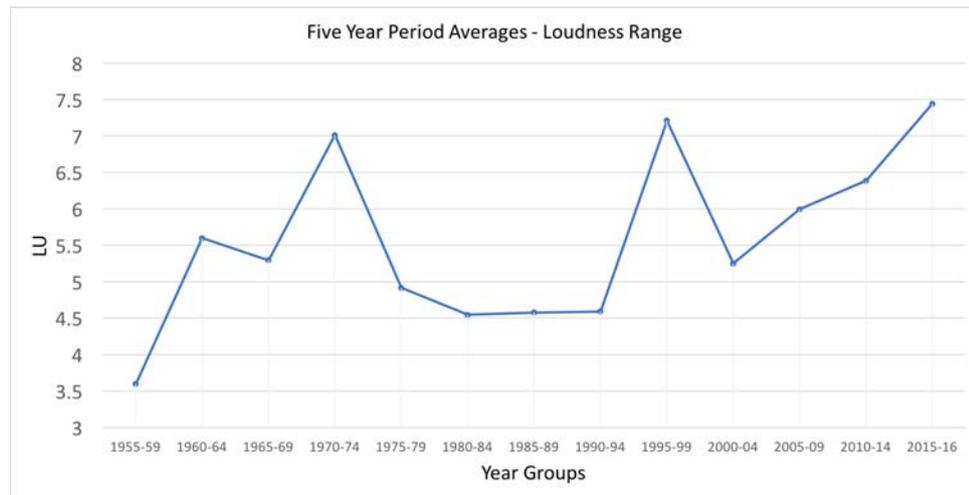
procedures used are robust and that results are repeatable between sample groups regardless of size. Firstly, we see a distinct increase in both median  $L_{eq}$ , integrated loudness and HLSD that commences in the early 1990s and a subsequent reduction around 2005-6 of just more than 1dB or 1LU. Secondly, it is evident that the loudness range, or the dynamic variability of recordings has simultaneously not decreased. This would indicate that the use of hyper-compression has had a distinct effect on the recordings on a micro-dynamic timescale, but not macro-dynamic.



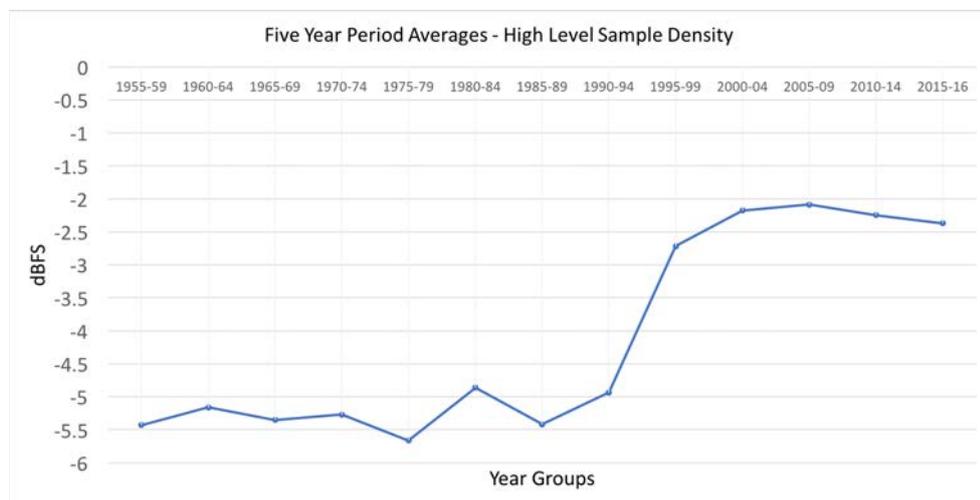
i)



ii)



iii)



v)

Figure 5.2: The 210 music recordings contained in the music corpus, assembled into five-year averaged groups. The five measurement procedures are then averaged and the median plotted: i)  $L_{eq}$  (dBFS); ii) integrated loudness (LUFS); iii) loudness range (LRA)(LU); and iv) High Level Sample Density (HLSD)(dBFS). Red dotted line is the overall trend.

Considering that these results are consistent between the various studies that incorporate a range of corpus size from exceedingly large to very small, it could be argued that possible causal factors to this increase in loudness levels are global in their effect on the domain of record production. It is widely accepted (as mentioned earlier) that the introduction of various technologies is seen as the primary cause of increases in loudness, in particular, digital look-ahead limiters for the dramatic increases due to hyper-

compression (see for example: von Ruschkowski 2009; Vickers 2010a; Katz 2015, p. 249). Deruty and Tardieu, however, believe that apparent trends in production practices just prior to the influx of digital look-ahead limiters are also influential to an acceptance of degraded signal quality (indie low-fi). Furthermore, that the Loudness War was further exacerbated by the widespread adoption of DAWs from around 1997. Deruty and Tardieu provide a chronology of the evolution of loudness as correlated to the introduction of various technologies and associated trends in production practices:

These observations are consistent with the technical timeline [figure 5.1], according to which there was an increasing use of limiting between the beginning of the 1990s and 2004. The existence of “lo-fi” indie bands near 1989 suggests that the growing taste in degraded audio signals that can be observed after 1984 may not be solely the Loudness War’s responsibility, but also the result of an underlying stylistic tendency. This strongly suggests that the Loudness War is a DAW-related phenomenon (easy plug-in instantiation) that adds up to an underlying, legitimate, stylistic/technical trend (low fidelity). (2014, p. 53)

From 1967 to 1984, Deruty and Tardieu assert that production practices were more concerned with ‘high-fidelity and transparency’ in an effort to overcome the limitations of the recording/playback media of the time (2014, p. 54). Technological innovations were in line with this trend during this period, but after 1984 this changed with a trend towards low fidelity, acting as a primer for the acceptance of signal degradation that was a by-product of the “Loudness War”:

This tendency appears to be starting as a purely aesthetic issue, then turns near the end of the 1980s into the Loudness War, in which limiters play a very important role’ (ibid).

We can therefore track distinct changes in production practices as consistent across the domain of Western mainstream popular music, according to the technology introduced. It is also noted that the increase in loudness levels transcended genres within this specific domain as ‘its influence has been important enough to override the impact of genre on

dynamics. In other words, dynamics in mainstream music are primarily related to a track's year of release, rather than to its genre' (Deruty & Pachet 2015, p. 722).

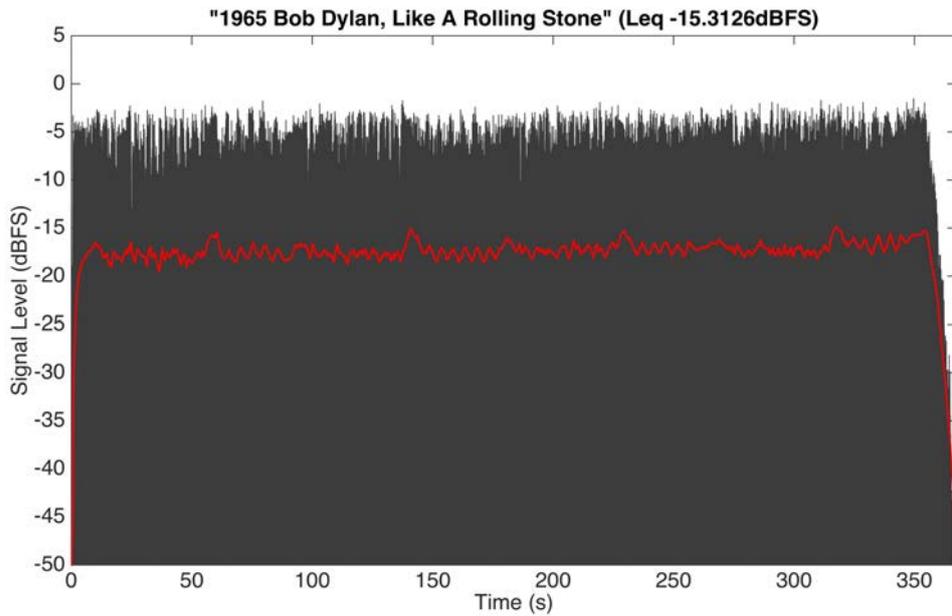
These changing trends in production practices may also provide an explanation as to why the data from the analysis presented herein, and also those previous, reveals that the long-term dynamic variability or loudness range of recordings has not decreased (*figure 5.1*, iii). Deruty, in an earlier magazine article asserts that 'music from the last decade seems to exhibit as much dynamic variability as music from the 70s or the 80s', despite the widespread introduction and proliferation of hyper-compression in the 1990s (Deruty 2011). He further suggests that the dynamic variability of recordings prior to the mastering process increased during the Loudness War era making recordings more resilient to the hyper-compression process on a macro-dynamic level. The use of level changes within a song as a featured compositional structure in music of the 1990s onwards is most likely the cause.

In a later study with Pachet, Deruty notes that dynamic variability on a macro-dynamic timescale had consistently increased during the post-2006 era – the supposed height of the Loudness War - and attributes this trend to an aesthetic counter reaction to the excessive use of hyper-compression:

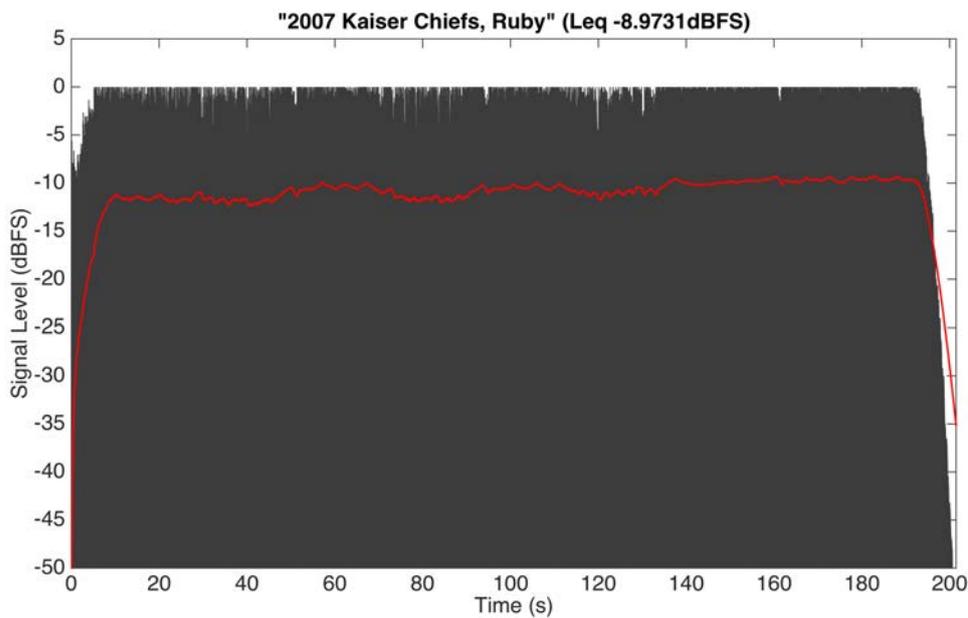
Since 2006, macro-dynamics have increased consistently, and are higher in 2014 than they have ever been during the time-span covered by the corpus. This increase can be put in relation with a demand for more dynamics combined with the confusion that's often made between micro and macro-dynamics [...] Musicians and producers may be trying to counter the effects of the Loudness War by raising macro-dynamics, whereas raising micro-dynamics would be more productive in that respect. (Deruty & Pachet 2015, p. 724)

A graphic example of this is illustrated in *figures 5.3* and *5.4* with RMS histograms of recordings from the 1960s and 2000s that were included in the signal analysis for this

research project. Out of the 210 recordings analysed, four were chosen that exhibited the characteristics required to illustrate the following dilemma.



i)



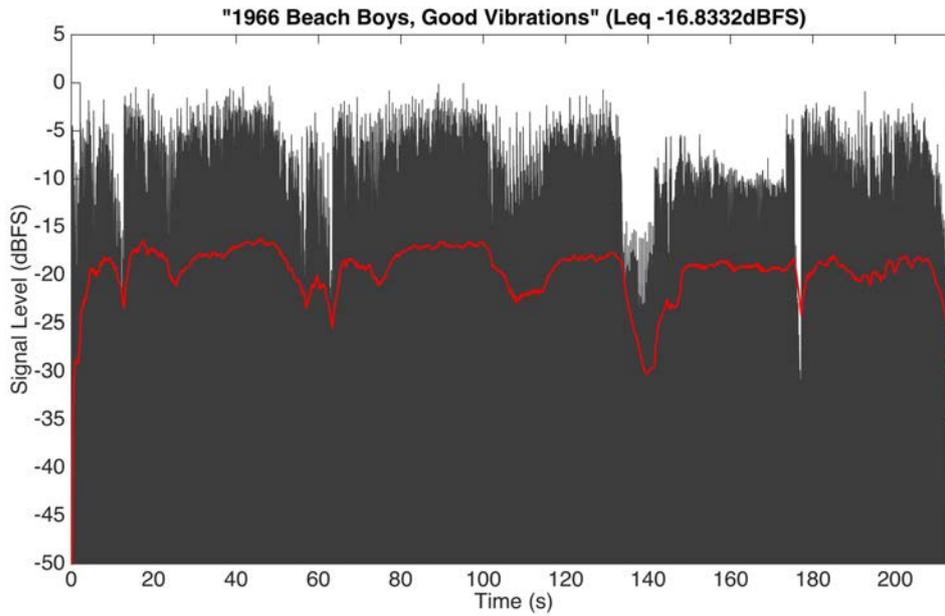
ii)

Figure 5.3: RMS histograms of i) Bob Dylan *Like a Rolling Stone* (1965), ii) Kaiser Chiefs *Ruby* (2007)  
The red line indicates the signal level average as a function of time.

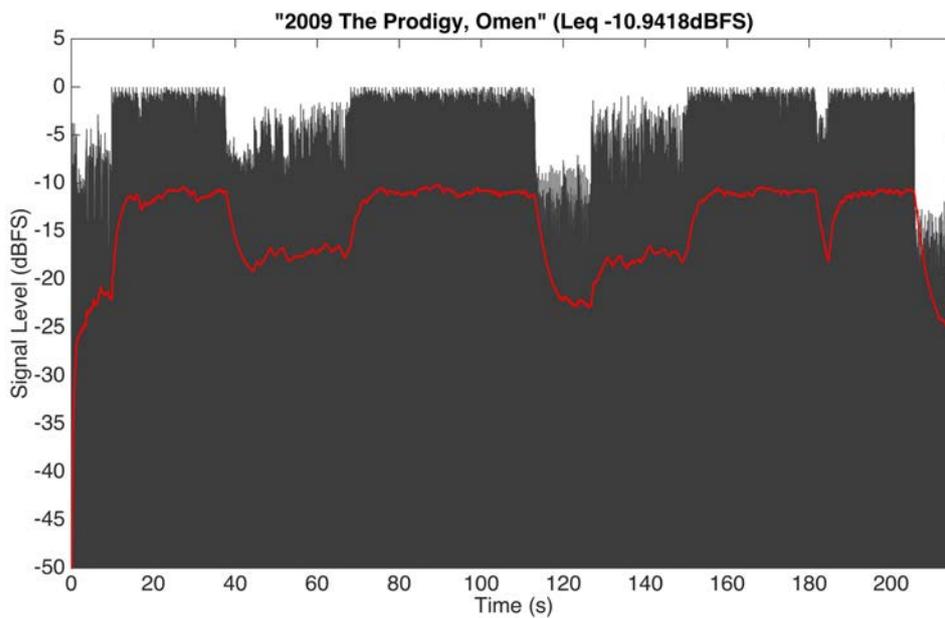
Considering that the macro-dynamics of western popular music has not decreased since the 1950s according to measurements of LRA (in fact Deruty and Pachet state the LRA has increased post-2006 (2015, p. 276)) it poses the following question; is more recent modern hyper-compressed music more dynamic overall than the older un-compressed recordings? The answer depends upon which timescale you are referring to.

If we compare Bob Dylan (1965) and Kaiser Chiefs (2007) we can see little difference in macro-dynamic variability between the songs (*figure 5.3*). The red line which indicates the RMS as a function of time is virtually linear on both recordings meaning there is no significant dynamic variation between compositional sections on a macro-dynamic timescale. There is, however, more variation on the Bob Dylan recording on a micro-dynamic timescale in that the red line is more uneven or irregular. This indicates that the transients within the music are intact and no hyper-compression has been applied. In comparison, the red line is much smoother on the severely hyper-compressed Kaiser Chiefs recording indicating the transients have been removed. It's important to note that transients are only measurable on a micro-dynamic timescale that is generally much less than 1s. The micro-dynamic variation between the two recordings is significant; 6.3dB RMS ( $L_{eq}$ ), or 5.38 LU for integrated loudness with the Kaiser Chiefs being the much louder recording (Appendix 7). However, on a macro-dynamic timescale which is generally the length of a musical section such as a verse or chorus, there is very little difference between either recording. Hence, both exhibit very little macro-dynamic dynamic variability despite a large micro-dynamic differential between the two. Which recording is therefore more dynamic?

In contrast, if we then consider the Beach Boys (1966) and the Prodigy (2009), both recordings exhibit significant dynamic variability on a macro-dynamic timescale (*figure 5.4*).



i)



ii)

Figure 5.4: RMS histograms of i) Beach Boys *Good Vibrations* (1966), and ii) Prodigy *Omen* (2009). The red line indicates the signal level average as a function of time.

The Prodigy's *Omen* which could be considered another heavily hyper-compressed recording has an RMS that is higher than the Beach Boy's recording by 5.89dB, yet it has a *greater* loudness range of 2.16LU. The red line depicting RMS as a function of time is highly non-linear in this case. What is noticeable with the Prodigy's *Omen* is the significant level changes within the song between verse and chorus which is a featured compositional structure, as Deruty mentions. Which recording is more dynamic?

What has caused the ire within the audio community on the topic of the Loudness War is the reduction of dynamic variability on a micro-dynamic timescale. This timescale is also directly responsible for loudness increases due to a truncation of transient peaks from which it is then possible to increase the average level of the recording. Therefore, to answer the question of which recording is more dynamic, regardless of macro-dynamic variability, it is the recording with the larger RMS or integrated loudness and not the larger LRA. It is also this timescale that one would assume is the cause of listener fatigue. Therefore, songs like Kaiser Chiefs *Ruby* that show little to no macro-dynamic *or* micro-dynamic variation where loudness level is high and constant, are seen as the primary issue of criticism.

Despite recordings that exhibit little macro-dynamic or micro-dynamic variation which usually receive the most negative attention, as Deruty and Pachet mention, the LRA of recordings actually increased to the highest level in 2014. Therefore, there is of course a sizable portion of current hyper-compressed music that has considerable dynamic variation on a macro-dynamic timescale despite the hyper-compression process. Consequently, the myth that hyper-compression removes *any* variability in level throughout a recording is unfounded. Calls then for more dynamic variability within

Western mainstream popular music, or an end to the Loudness War, are therefore more specifically focused toward the micro-dynamic timescale.

Katz, believes that is it wrong to conclude ‘that there was no loudness race’ by referring to the consistent and then increasing LRA during the Loudness War and believes ‘the real smoking gun is in the insane reduction in PLR’ which would seemingly correspond directly with micro-dynamics (2015, p. 246). Deruty and Tardieu, however, believe that micro-dynamic timescales are poorly defined as opposed to macro-dynamic timescales which are more easily defined as LRA:

...this is a concept that is so poorly defined, that it seems a long way before one can find solid relations between the notion of micro-dynamics, a precise set of audio descriptors, and a well-defined percept. (2014, p, 54)

PLR may be a good indicator of the presence of hyper-compression in a broad sense, but according to Deruty and Tardieu, there is no one descriptor that adequately defines the micro-dynamic timescale:

Indeed, whereas substantial effort from TC Electronics and the EBU’s part makes it possible to use standardized descriptors in relation to macro-dynamics, no such work exists in regards to micro-dynamics. In our opinion, this is a concept that should be clarified. More generally, when it comes to music level variation, we think that the very concepts should be defined much more carefully than they currently are. This is particularly urgent in the case of the “dynamic range,” which we believe should be put aside altogether. (2014, p. 54)

A question must be asked at this point, that even if we have a well-defined descriptor for micro-dynamics that corresponds directly with the amount of dynamic range compression (DRC) used, will that correspond with the subjectivity of aesthetic response to a music recording? Most likely not. We can use descriptors to ascertain the dynamic variability of a recording for mechanistic purposes. For example, PLR is an essential measurement

of recordings to ascertain whether the target level of a loudness normalisation system is compatible with the dynamic variability of the music recordings to be reproduced. We also know that if the PLR is very small, then it is most likely that the recording has been hyper-compressed using a digital look-ahead limiter. But how does this relate to aesthetic concerns subjectively? Arguably, it doesn't. For this reason, in the following section, two albums that exhibit demonstrably low macro-dynamic and micro-dynamic variation are analysed subjectively; Oasis's (*What's the Story Glory*) *Morning Glory* (1995), and Metallica's *Death Magnetic* (2008). Both are examined as case studies.

## 5.2 ‘The Golden Square Wave Awards’

It’s sideways, but we were sitting there with Gavin Lurrsen, Ryan Hewitt, Andrew Scheps, and Vance Powell... and we’re all in Austin at South by South West. We were sitting there talking about things, and we decided that we would try to give away every year a “Golden Square Wave Award” [...] Andrew said ‘I won!’ We asked, “what do you mean?” and he goes, “I did the Metallica record!”

Michael Romanowski

The mythical ‘Golden Square Wave Awards’ is a humorous concept that was the musings of a group of well-known industry figures at the South by South West conference in Austin Texas in 2015. The idea, as mastering engineer Michael Romanowski describes, is ‘like the Razzies or whatever [...] for the worst movies’, but the Golden Square Wave is for the loudest records, named after the type of distortion (square wave) introduced by the hyper-compression process (i/v, 2015). Despite the comical notion of such an award, it does however highlight that there are certain albums that stand out as exemplars of the excessive use of hyper-compression. Two albums are presented herein as case studies that demonstrate two entirely different scenarios which therefore afford two methods of examination; Oasis’ (*What’s the Story*) *Morning Glory?* (1995) which was arguably the catalyst for the Loudness War and Metallica’s *Death Magnetic* (2008) during its peak.

Oasis’ (*What’s the Story*) *Morning Glory?* was arguably the loudest album in the world to date upon its release in 1995 and its extraordinary success and considerable critical acclaim is accredited by some to the use of excessive hyper-compression which was unprecedented at the time. The album has also been said to have had a significant influence on loudness levels within the global recording industry in general and viewed as a catalyst for the subsequent Loudness War. (*What’s the Story*) *Morning Glory?* is analysed through the lens of Csikszentmihalyi’s systems model of creativity in which the

band and producer, acting as a creative collective, presented a novel idea to the field of Western mainstream popular music, resulting in a significant change to the domain. It is argued, however, that Oasis cannot be attributed with sole responsibility for initiating this phenomenon as some inspirationalist act of a genius, but rather an action occurring within a system; ‘as the research literature into creativity also tells us, each new idea is firmly built on a set of antecedent ones’ (McIntyre 2012b, p. 7).

Metallica’s *Death Magnetic* (2008) is also considered one of *the* loudest commercially released albums of all time. In stark contrast, however, despite being a huge commercial success, the album caused significant controversy and criticism amongst fans and the audio community due to the excessive hyper-compression and residual artefacts present. The scenario surrounding *Death Magnetic* provides an opportunity for an analysis that translates to the field of record production/audio engineering concerning the use of hyper-compression more than a decade later. This analysis highlights what McIntyre labels as the ‘arena of contestation’ that exists within the Bourdieusian mechanisms of this field (2012c, pp. 151-152). With hyper-compression firmly in place and acting as a structure within record production practice, there is a distinct tension between what is considered aesthetic intent and what is considered acceptable practice by various factions within the field. Before examination, the relevant background and context to concerns surrounding each album is provided.

### 5.2.1 Oasis — (*What's the Story?*) *Morning Glory*

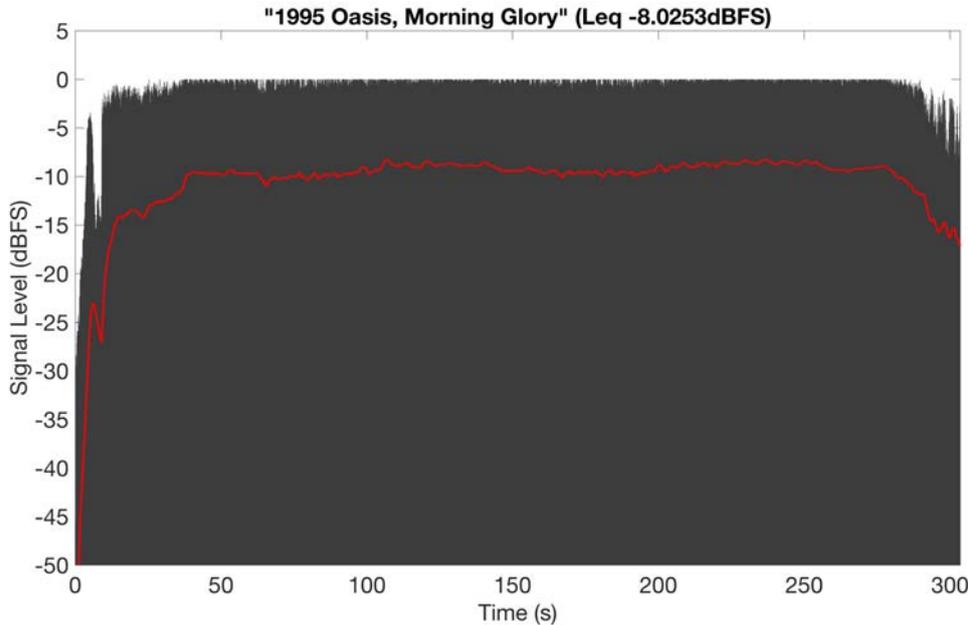


Figure 5.5: RMS histogram of Oasis (*What's the Story*) *Morning Glory?* (1996). The red line indicates the signal level average as a function of time.

The original contender for the “Golden Square Wave Award” most certainly must be the album (*What's the Story*) *Morning Glory?* by UK group Oasis (1995). It was arguably the first commercially successful album to employ extreme hyper-compression as an aesthetic choice and a marketing mechanism. Selling 22 million copies worldwide (Capstick 2014), the album remains the fifth highest selling UK album of all time (Copsey 2016). Southall (2006) and Weymouth (2012) both position this album as one of the catalysts of the hyper-compression age, but unlike the controversy surrounding Metallica’s *Death Magnetic*, the Oasis album was lauded for its excessive loudness. For example, a [BBC report](#)<sup>15</sup> described it as ‘the loudest album in the world’ and ‘breaking

---

<sup>15</sup> “BBC News Story about Oasis and the Mastering Engineer behind the BRITs “best album of the past 30 years”. Uploaded to YouTube on Feb 22, 2010. <https://www.youtube.com/watch?v=n8Wtfv5GExk> Viewed: 13 February 2015.

new ground at the time’. Southall attests that the album was a “‘jump-the-shark” moment as far as CD mastering goes’ and adds that it arguably ‘became so successful in the UK precisely because it was so loud; it’s excessive volume and lack of dynamics meant it worked incredibly well in noisy environments like cars and crowded pubs, meaning it very easily became a ubiquitous and noticeable record in cultural terms’ (2006)<sup>16</sup>.

Barry Grint, who by his own report had mastered the album at London’s Abbey Road Studios (although who actually mastered the album is of some conjecture), claims that the album was almost rejected when it was sent to the United States for release due to the unprecedented distortion (clipping) used to achieve said loudness. The album’s producer Owen Morris refutes Grint’s account, providing his own of the production processes and mastering on the website “Oasis Recording Information”<sup>17</sup>. In an interview, Morris divulges that the album’s loudness was achieved via a Neve 1081 EQ and digital clipping via an Apogee analog to digital converter which was relatively new at the time:

I hired in an Apogee A/D which I’d read had a “soft limit” feature. Given that I had no confidence in the sonic integrity of my mixes I had decided that I would attempt to use VOLUME (i.e. quantity rather than quality!) as my rather blunt tool. The soft limit feature on the Apogeess allowed me an extra 6db or so gain before distortion. I used a pair of Neve 1081 EQ’s [...] This gives the album its distinctive sound. I just got lucky with the Apogee A/Ds [...] With both Definitely Maybe and Morning Glory, I used mastering as a tool to help my not very great sonically mixes to sound OK in the outside world. (Morris quoted in Huggins 2011)

---

<sup>16</sup> As an indication of how much of an increase (*What’s the Story*) *Morning Glory?* was on average levels, according to the corpus analysed in this research project, the average RMS level in the five years prior (1990 – 1994) was -15.80dBFS. This album introduced an astonishing 7.78dB immediate increase, almost 2dB more than the entire averaged increase between 1990 and the peak of the Loudness War c.a. 2006-8.

<sup>17</sup> Oasis Recording Information: “Owen Morris: How I Mastered Morning Glory”: [http://www.oasis-recordinginfo.co.uk/?page\\_id=6](http://www.oasis-recordinginfo.co.uk/?page_id=6) Viewed: 13 February 2015.

However, in an article in Sound On Sound (SOS) magazine titled “25 Productions That Made History”, Sam Inglis presents an entirely different account quoting Grint. Inglis does, however, lay full responsibility on Morris for the idea of making the album so loud, proclaiming he ‘introduced a devastating new weapon’ (Inglis 2010):

As mastering engineer Barry Grint recalls, Morris had mixed hot to a DAT recorder with a built-in peak limiter. "See how the top three LEDs only light up sometimes?" he told Grint. "By the time you've finished, I want them lit up ALL the time!" In the days before Finalizers, this required plenty of resourcefulness. Grint eventually achieved the requisite loudness by passing tracks repeatedly through the compressor on the Abbey Road cutting desk, before applying the finishing touches with a Junger digital processor. When the masters eventually made their way to the US, they were almost rejected. "They said, 'It looks like a square wave. Does this guy not know what he's doing?'" laughs Grint. "Two weeks later, they were all doing it." Fifteen years later, they're still doing it. Despite protestations from audiophiles and mastering engineers alike, few major labels since have been brave enough to release albums that don't look like a stick of rock when loaded into Wavelab. They haven't all gone four times platinum in the UK alone and sold millions more worldwide, though. As Barry Grint was later told by Creation Records supremo Alan McGee: "You mastered that? You're a bloody genius!" (ibid)

From this account, we can assume that Morris was deliberate in this use of loudness, and not solely for attempting to cover up his lack of ‘confidence in the sonic integrity of [his] mixes’ as suggested (Huggins 2011). The mechanism used to achieve this type of hyper-compression was also much more than simply clipping as Morris attests, and according to Grint, a series of processes with the calculated aim of making the album extremely loud for a wider purpose. Important to understanding this motive, UK mixing engineer/producer Alan Moulder recalls that ‘Owen [Morris] told me that with Oasis, that summer, any pub you were in and Oasis came on the jukebox it was so much louder than everybody else that it had an effect on people. But it kind of suited that kind of music’ (Moulder i/v, 2015). This would indicate that Morris had a full understanding of the “louder is better” paradigm and the “jukebox effect” which, according to Moulder’s account, Morris had been witnessing firsthand.

Therefore, this was most likely a calculated move on Morris’ part, using a method of

attracting audience's attention that had existed since the 1950s, particularly by Motown. It was also a method used by Morris to differentiate the album from all others in the marketplace. It could be argued that techniques adopted to achieve this loudness and their implementation, despite appearing crude by today's standards, exhibit a high degree of creativity. It was, as Inglis suggests, a 'devastating new weapon' in record production that had an immediate and lasting impact on the domain (2010). Furthermore, as a result of this creative act by Morris, further technology was developed that refined the process in achieving loudness, fuelling the Loudness War. But was this an act of "genius" that can be attributed solely to Morris?

If we look to the systems model for an explanation, it would suggest that Morris introduced a novel idea that the field of Western mainstream popular music recognised as valid, bringing forth change in the domain. Morris had intimate knowledge of the domain as 'you cannot transform a domain unless you first thoroughly understand how it works' (Csikszentmihalyi: 1997 p. 90). Using compression to achieve louder recordings had already existed within the knowledge base of the domain, hence this was not an inspirationalist act of a genius as Alan McGee of Creation Records suggests, but an action occurring within a system. We can ignore the romantic view of creativity that Kant embraced as 'a unique and spontaneous act that introduces a leap in ordinary natural processes' (Rothenberg & Hausmann 1976, p. 29) and look to Csikszentmihalyi's proposition that 'creativity does not happen inside people's heads, but in the interaction between a person's thought and a sociocultural context. It is a systematic outcome rather than an individual phenomenon' (1997, p. 23).

Considering that the loudness paradigm had been deeply rooted in radio, advertising and

music for decades previous, it could be argued that Morris, enabled by new digital technology, simply reconfigured an existing idea in a novel way to gain a competitive edge. This myth of genius that ‘pervades our society’ and ‘assumes that truly creative acts involve extraordinary individuals carrying out extraordinary thought processes’ is misguided (Weisberg in Sternberg 1999, p. 148). Oasis may have just been the first *successful* band brimming with symbolic capital to employ hyper-compression on an album, heralding the process to the world’s attention, but were utilising something that had been developing for decades. They were most likely responsible for instigating its widespread use but cannot take full responsibility for its uniqueness. Regardless of any criticism that audiophiles may have for (*What’s the Story*) *Morning Glory?* its legacy continues. In 2010, the album won Best Album of the Past 30 years<sup>18</sup> at the UK Brit Awards. Similarly, the single *Wonderwall* from the album was voted the #1 position in the Australian Triple J Hottest 100 of twenty years<sup>19</sup> in 2013. It was also the fifth highest selling album of all time in the UK (Copsey 2016). Metallica managed to beat Oasis in the loudness stakes by a small amount but the reception of *Death Magnetic* by both the public and the audio community was vastly different.

---

<sup>18</sup> UK Brit Awards—Best Album of the Past 30 years: <http://www.brits.co.uk/history/shows/2010> Viewed: 13 March 2016.

<sup>19</sup> Triple J Hottest 100 of the past twenty years in which Oasis’ *Wonderwall* was voted #1 position: <http://www.abc.net.au/triplej/hottest100/alltime/20years/> Viewed: 4 April 2016.

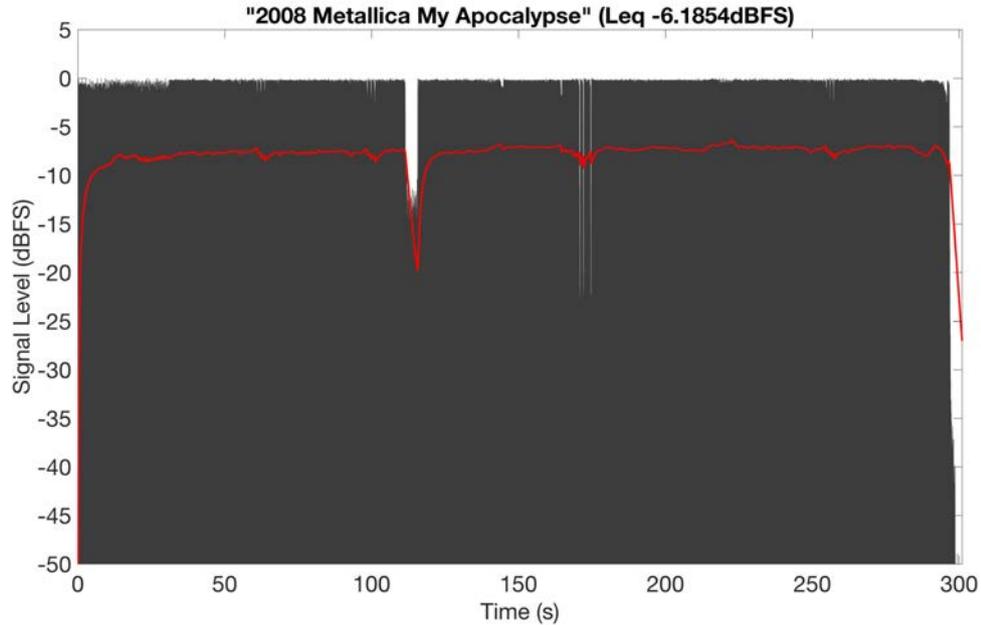
5.2.2 Metallica — *Death Magnetic*

Figure 5.6: RMS histogram of Metallica *My Apocalypse* from the Album *Death Magnetic* (2008). The red line indicates the signal level average as a function of time.

Many proponents of the movement against the Loudness War regularly use *extreme* examples of hyper-compressed recordings in their arguments against the use of the process; none more so than Metallica's *Death Magnetic* (2008). The album has been routinely mentioned in Audio Engineering Society (AES) seminar presentations<sup>20</sup> and various media reports as a prime example of the hyper-compressed state of music production in general since its release in 2008. Its mention, however, could now be considered tiresome and misrepresentative of the wider industry, and an exemplary

---

<sup>20</sup> AES San Francisco, Workshop W5. Saturday October 27, 2012: Loudness Wars: The Wrong Drug? <http://www.aes.org/events/133/workshops/?ID=3246> Viewed: 21 November 2016.

example of confirmation bias in some discussions. Quite simply, it is not indicative of the wider corpus of mainstream popular music and exists more so as an anomaly that has attracted an unusual amount of attention because of the high-profile nature of the band. Within the analysis of the music corpus presented in this research project, the track *My Apocalypse* from the album (winner of the Best Metal Performance at the 51<sup>st</sup> Grammy Awards) is representative of an outlier and not the majority of the music corpus examined<sup>21</sup>. It must be noted, however, that its extreme loudness has become folklore in the audio community and for good reason.

Released on September 12<sup>th</sup> 2008, *Death Magnetic* immediately caused controversy within both the Metallica fan base and the audio community for its overt loudness and apparent clipping. This controversy was exacerbated by one of the production team for the album publically speaking out about their personal dislike for the extreme hyper-compression used. Ted Jensen, a senior mastering engineer from New York's Sterling Sound mastering facility<sup>22</sup> credited as mastering engineer on *Death Magnetic*, is seen as trying to distance himself from the album and the ensuing criticism. Since the mastering engineer is recognised as the agent that oversees the final production process before public release, they are also the one that is typically blamed for excesses in hyper-

---

<sup>21</sup> Of the 111 recordings analysed from between 1990 – the noted start of the Loudness War – to 2016, the median loudness level was -8.84LUFS and -11.7dBFS RMS respectively. Metallica's *My Apocalypse* (figure 5.5) recorded the highest loudness level (-3.24 LUFS) and RMS (-6.18 dBFS), an astonishing 5.6LU (IL) and 5.51dB (RMS) above the median. There are only three other recordings (The Vines, Skrillex and Oasis) that were close to the loudness of Metallica (Oasis' *What's the Story*) *Morning Glory* (1995) at -4.11 LUFS, 0.87LU lower than *My Apocalypse*).

<sup>22</sup> Sterling Sound mastering facility website: <http://sterling-sound.com> Viewed: 31 January 2015.

compression. Here, Jensen is trying to protect his status, his symbolic capital, within the field of record production/audio engineering. Jensen purportedly responded to a fan's complaint of the sound quality of the album, asserting that the master mixes came to him already hyper-compressed leaving him no alternative. The fan then re-posted the response on a popular audio community forum known as [gearslutz.com](http://gearslutz.com)<sup>23</sup> under the moniker "Krid":

I GOT A RESPONSE FROM TED – Metallicabb.com

RE: Death Magnetic mastering job

mailed-by sterling-sound.com

hide details 10:34 AM (44 minutes ago)

Reply

Thanks for writing.

I'm certainly sympathetic to your reaction, I get to slam my head against that brick wall every day. In this case the mixes were already brick walled before they arrived at my place. Suffice it to say I would never be pushed to overdrive things as far as they are here. Believe me I'm not proud to be associated with this one, and we can only hope that some good will come from this in some form of backlash against volume above all else. (Krid in Gearslutz forum 2008)

Jensen's response was subsequently reported in various media outlets which fanned widespread interest in the album for its apparent poor sound quality due to excessive hyper-compression, allegedly angering both the band and their management (see for example: Smith 2008). A petition on [gopetition.com](http://gopetition.com) titled "Remix or Re-master Death Magnetic!"<sup>24</sup> garnered 22,654 signatures of fans demanding a 'better version' of the album. The local debate, however, on [gearslutz.com](http://gearslutz.com) continued with many pages of comments condemning the sound of the album, fuelled by Jensen's comment. The following comment made by forum member "Melodisio" illustrates a typical response:

---

<sup>23</sup> <https://www.gearslutz.com/board/mastering-forum/327786-death-magnetic.html> Viewed: 23 November 2017.

<sup>24</sup> Re-mix or Remaster Death Magnetic! <https://www.gopetition.com/petitions/re-mix-or-remaster-death-magnetic.html> Viewed: 23 November 2017.

Yep, listened to it today on CD. I won't talk about the music, you like it or don't, it's your opinion. But the sound quality is a catastrophe. The snare and toms distort like hell, as do the guitars. Noise. It's awful and distracting, to the point you begin to focus more on the clipping than the music. Isn't it ironic though? They must have recorded the album with kick ass slutty gear. But none of it shines. What a shame! It's almost insulting. (Melodisio in GearslutZ forum 2008)

Other well-known mastering engineers such as Ian Shepherd (Production Advice), and most notably, Chris Athens, a colleague of Jensen's at Sterling Sound came to Jensen's defence on the informal forum; 'I think everyone posting here gets that TJ didn't enjoy mastering this and that this kind of distortion was not his choice [...] Both parties are 800 pound gorillas in the music industry. These guys are smart and in control [...] Only Metallica and Rick know why it sounds like it does' (Athens in GearslutZ forum 2008).

The fact that Athens, another high-profile mastering engineer from Sterling Sound, weighs in to defend Jensen further fuelled the debate, criticising the aesthetic integrity of the band and Rubin. There is no question that the mixes were exceedingly hyper-compressed prior to mastering as there is ample evidence from other high-profile members of the recording industry that corroborates this assertion. This would indicate that Metallica and Rubin had a definite idea about how the album should sound prior to mastering and this was built in to the mixing process. Greg Calbi, another venerable mastering engineer from Sterling Sound states that 'he [Jensen] didn't distort that record [...] it did come in like that. I know for a fact it came in like that' (i/v, 2015). Bob Ludwig from Gateway Mastering also claims he heard the masters that were given to Jensen to work with and suggests that mixing engineer Andrew Scheps was possibly responsible. However, as Athens alludes, responsibility for the way the album sounded would have ultimately been down to Metallica and Rubin:

I had a chance to hear the original masters that were sent to him. They're that hot. It seemed that Ted hardly did anything to it in mastering. Plus, that was Andrew Sheps who did the

mixing. He's a wonderful mixer and a good guy, but, for my tastes, that project got out of control with compressors. (Ludwig i/v, 2015)

Australian mastering engineer Leon Zervos from Studios 301 in Sydney spent six years based at Sterling Sound during the period when Jensen mastered *Death Magnetic*. His reflection of the episode articulates the dilemma mastering engineers are faced with when masters are hyper-compressed before the mastering process. He also believed that Rubin was instrumental in the album being presented as such. Importantly, Zervos also makes note that the high-profile nature of the band contributed to the controversy that surrounded the sound of the album:

Yes, I know that album did come in that way. That's a rare case for a top professional artist. Most professional mixes come in sounding pretty good. This was a singled-out case, and unfortunately it was such a high-profile band [...] Unfortunately, mastering engineers get blamed as everyone thinks we must have done it [...] With that particular album, the sound was driven by the producer. (i/v, 2014)

Athens brings up an important point in that the way the album was presented was the decision of the band who were simply exercising aesthetic license. If they wanted to present an album to the field of Western mainstream popular music with this much hyper-compression, it was their right to do so. The negative response by some localised areas of the field, however, prompted Metallica's drummer Lars Ulrich to respond and defend their aesthetic standpoint on the album's production:

Listen, there's nothing up with the audio quality. It's 2008, and that's how we make records. Rick Rubin's whole thing is to try and get it to sound lively, to get it to sound loud, to get it to sound exciting, to get it to jump out of the speakers. Of course, I've heard that there are a few people complaining. But I've been listening to it the last couple of days in my car, and it sounds fuckin' smokin' (sic). (Ulrich quoted in Yarm 2008)

Andrew Scheps, the mixing engineer on the album, is guarded in his response concerning *Death Magnetic* and for good reason. It was Ted Jensen's comment as an insider that

ignited the debate in both the forums and the media. Scheps stated categorically that he refuses to weigh into the loudness debate ‘other than to say that I like the way it sounds and I like the way it feels [...] It's an exciting record, and there you go’ (Scheps i/v, 2016). He is, however, perplexed by the intensity of the controversy surrounding the album and agrees with Ulrich that Metallica fans are very demanding of the band and that ‘if you look at the history of Metallica records, their fans have hated every album they’ve brought out since *Ride the Lightning*’ for all sorts of reasons, and in this case, ‘it was just something [else] to pick on’ (ibid). Philosophically, he finds the over the top militancy of some detractors of the album and hyper-compression in general difficult to comprehend:

And we move on. You know? And the weird thing is, it's not like it hurts people. Like, who cares? Why is this an issue? [...] It's not like we're using the wrong scalpel, and everybody has bigger scars because of it, or something like that. Like, I don't understand why - if people think that we're destroying the art, then all you have to do is ask the artist, “Was your art destroyed on this?” and Metallica publically said, “We like this record”. (Scheps i/v, 2016)

Reflecting upon Rubin’s vision for the album and the aesthetics employed, Scheps comments that the rationale was to strip layers of production away from the sound and present the band as if you were in the room with them performing:

That's exactly what we were subconsciously going for the whole time. Is just to sound like you're with them. And part of it was the limited number of tracks. I mean, there are two guitars on almost every one of those songs, and that's it. It's a simple record because it's supposed to be [just] the band. (ibid)

This stripped back approach seems to be a common thread in Rubin’s production as reported by Jared Paul in the thesis *Reduced by Rick Rubin: Production Process, Pitfalls, and Impacts*:

Rick Rubin is often described as favouring a stripped-down sound. Many of his most notable records emphasize performance and live authenticity, seeking to recreate the feel of an artist playing for you in your own living room. They avoid excessively dense arrangements and effects like reverb. (2011, p. 7)

Paul also points out that Rubin had a tendency to produce very loud albums prior to *Death Magnetic* and makes mention of other notable albums that push the loudness envelope:

There is a noticeable pattern of heavy brickwall limiting on some of Rubin's biggest albums. The Red Hot Chili Peppers' *Californication* (1999), as well as System of a Down's *Mezmerize/Hypnotize*, were limited to the point of occasional audible digital clipping. Whether or not Rubin is encouraging such heavy brickwalling (sic), he is certainly allowing it to happen. (ibid, p. 40)

Red Hot Chili Peppers' *Californication* (1999) is another album that gets almost as much attention at AES seminars on the Loudness War as *Death Magnetic* and arguably another worthy contender for a "Golden Square Wave Award". It's an album that senior mastering engineer, Sean Magee from Abbey Road Studios simply describes as, 'sounds awful' (i/v, 2015). Magee is incredulous that someone within the production chain actually approved the album to be released in this state of loudness and distortion:

Someone approved it, you know, that was someone's vision. Whether it's the producer or whether it's the A&R people, or it's just been made loud for radio pluggers, it's just like someone thought that that was a good idea? And it's their music, so you can't really say, "well, shit, that's terrible." It's just like, "well, no, that's how we wanted it." (i/v, 2015)

At the heart of Milner's account of the album is the claim that the aim was to achieve 'an explosive, attention-getting sound' on radio (2009, p. 237). According to Milner, this plan backfired spectacularly as the extreme loudness level of the recordings purportedly reacted badly with the radio station's own heavy output processing, with the lead single *Scar Tissue* sounding distorted and *lower* in level than other tracks (ibid, p. 238). Milner attests that:

*Californication* had been mastered at such a high level that there were times when the signal was too "hot" for the CD system to handle. At these moments—too brief to hear consciously—the signal ceased to exist. (ibid).

Scheps, in defence of Rubin and his production aesthetic, suggests that Rubin was not consciously thinking of loudness as a specific outcome during the production of *Death Magnetic*. He believes that the album's sound naturally gravitated towards being extremely loud to achieve the necessary excitement in the recording:

You know, he works on something until he likes it [...] And if the artist was unhappy, then he would go back and make the artist happy. You know, Rick isn't forcing anybody to have a record sound a particular way. So yeah, there's just a weird idea that we're all sitting around forcing these loud things down people's throats. And it's never about that. (i/v 2016)

Scheps also makes the valid point that EDM relies heavily on extreme loudness as part of the aesthetic of achieving a sense of excitement and never receives any undue attention because of it. Similarly, with *Death Magnetic*, Scheps believes that loudness was equally important in creating the necessary excitement, but this approach became immediately controversial due to some within the field of record production having sweeping and possibly unfounded negative opinions of its use:

I mean, no one's complaining about how loud EDM is. Those records are square waves, and they're awesome because they're so exciting. But it's because they're nothing but distortion. So you know, there are no dynamics in it, but when you go hear that stuff played back on a club system it's incredibly exciting. So, it's very hard to really make these blanket arguments about how loudness kills dynamics which kills emotion. And if that were true, nobody would like it. (i/v 2016)

Despite the apparent degradation in sound quality due to hyper-compression which incited the controversy around the album, it appears that the issue had little effect on its success. If we look for the *signs* of success through the lens of Bourdieu's field of large-scale production, in which Metallica is positioned well, their sales success and chart positions worldwide indicate that despite negative reactions from certain areas of the field, the album was still a considerable triumph. This is related to the various forms of capital that the band generated as a result that further strengthened Metallica's position

within the greater field of Western mainstream popular music. As Athens had commented, Metallica were already ‘800 pound gorillas in the music industry’ that were ‘smart and in control’ (Athens in Gearschutz forum, 2008), and after *Death Magnetic* they continued to be so, for as Bourdieu asserts, the positions that agents occupy are relational and determined by the amount of capital (either economic or symbolic) generated or acquired (Johnson in Bourdieu 1993, p. 6). We can therefore take *Death Magnetic* as a prime example of an “incident” within the Loudness War for it serves as vehicle for analysis to unwrap the many facets of this “arena of contestation”. This can then be extrapolated to a larger scale.

Using Bourdieu’s field theory, we can gain an understanding of the relational aspects of certain sub-fields that lie within the greater field of Western mainstream popular music, including the agents that occupy positions within the space of position takings within these sub-fields. In other words, we can map out the field and shine a spotlight on the players within this incident to get an understanding of the roles they play and their individual and group agendas. There are several immediate questions: why was *Death Magnetic* so successful despite the protestations of the members of certain sub-fields?; who are the agents within these sub-fields and what was their agenda for these protestations?; and what are the structures and relationships of these sub-fields both internally and externally? Before this is ventured into, it is reasonable to first start with Csikszentmihalyi’s systems model of creativity to understand the album as a creative act.

### 5.2.3 *Death Magnetic* as an Act of Creativity

The systems model of creativity that Csikszentmihalyi elucidates has a tripartite framework; ‘creativity results from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings novelty into the symbolic domain, and a field of experts who recognise and validate the innovation. All three are necessary for a creative idea, product, or discovery to take place’ (1997, p. 6). Using this model, we can identify that Metallica, as an agent (a collective, comprised of band, management and production personnel), utilising and referencing the knowledge, symbolic structures and artefacts of the domain, presented to the field a novel variation in the domain (album). Through various forms of recognition, *Death Magnetic* was consecrated by the greater field of Western mainstream popular music and included as part of the domain. Despite the negative response from some sectors of the field, *Death Magnetic* was a hugely successful album<sup>25</sup>. As part of this consecration process, there is a scalable system of fields at play. We can locate three main sub-fields within the greater field of Western mainstream popular music, being the audience, the music industries and the media. Within these sub-fields we can locate more sets of sub-fields and so on. We

---

<sup>25</sup> According to Wikipedia, [Death Magnetic](#) apparently sold over 5 million copies worldwide, received multiple gold, platinum and multi-platinum sales awards world-wide, held the #1 charting position in 23 countries internationally and received three Grammy Awards in the U.S. directly and three indirectly for production and artwork. It was also awarded many other accolades including Best Album at the UK’s 2009 Kerrang! Awards. Ironically, Rick Rubin received the Grammy Award for Producer of the Year - Non-classical, despite the controversy around the sonic quality of the album. The information indicated here cannot be verified. Viewed: 23 November 2017.

can postulate that all of the three main sub-fields were involved in this consecration process.

On a fundamental level, we could regard this in the following way: the audience buys the product or ignores it; the music industries administer accolades or criticisms; and the media give the album either critical acclaim or criticisms. Each field and sub-field within this scalable system has its own domain; the sum of all knowledge, symbolic structures and artefacts pertaining for that particular field which intersects with a number of other domains. When Metallica and their production personnel were creating *Death Magnetic*, they were utilising and referencing the knowledge, symbolic structures and artefacts of the domain of record production/audio engineering, a sub-field of the field of music industries. This subfield includes knowledge about music theory and performance, composition, genre specificities, audio engineering and so on. This ‘creative collective’ (Hennion 1990) were also bound by one controversial but powerful structure that all who create utilising this domain must currently adhere to; the use of hyper-compression and loudness. Hyper-compression was a factor that Metallica and their production personnel could not ignore in this creative process. No-one in the chain of production and subsequent dissemination would allow the album to be released for appraisal by the greater field of Western mainstream popular music without the album being “competitively loud”. The risk of being rejected in the consecration process would be considered too high. How much hyper-compression was used, however, was entirely their aesthetic choice. How this choice was received by certain sub-fields is of obvious interest here. We need to now examine how this system works though the interaction and relational factors of the various fields and sub-fields, the agents who hold positions within

these fields and the habitus required of these agents to maintain those positions; what Bourdieu terms the *field of struggles*.

#### 5.2.4 *Death Magnetic* and the Field of Struggles

There is more irony to be found here apart from Rick Rubin being awarded Grammy Award for Producer of the Year - Non-classical. We can clearly appreciate that those who reacted positively to *Death Magnetic* by purchasing the album or presenting Metallica with awards were necessarily implicated in the album's consecration. However, those who reacted negatively and were part of the ongoing discussion regarding the controversy over the use of extreme hyper-compression, were also complicit in this consecration despite their rejection of it as a legitimate cultural product from their standpoint of sound quality. The notoriety achieved via the album's loudness made *sure* that it became recognised as part of the domain of Western mainstream popular music. As Oscar Wilde writes in *The Picture of Dorian Gray*, 'the only thing worse than being talked about is not being talked about' (1998). Considering how difficult it can be to "break" an album and maintain its presence in people's minds – which is arguably the end-game of the music business – this controversy meant that whenever the subject of the "Loudness War" was brought up, even years later, so was *Death Magnetic*. This arguably extended the life of the album far longer than it would have been normally possible, by default. Scheps looks at this philosophically and states that 'simply the fact that they're talking about something I did eight years ago - that's awesome. They're not talking about anything else I did eight years ago' (Scheps i/v. 2016).

It is apparent from what has been discussed already, that there are competing opinions at play from within three main fields (and their respective sub-fields) of audience, music industries and media – all vying, consciously or unconsciously, to consecrate or reject the cultural product that is *Death Magnetic*. The important outcome of an investigation into this particular instance of cultural production and its subsequent reception, is that Bourdieu's field theory provides a framework for examining hyper-compression on a much larger scale. We can locate the network of scalable systems, agents, fields, sub-fields and hierarchies that exist within the greater field of Western mainstream popular music concerning hyper-compression.

Within Bourdieu's field theory is the notion that the field is a *field of struggles* where agents, whether they be individuals or collectives – or entire fields for that matter – jostle for dominance. A significant part of this process is acquiring the authority over the consecration of cultural products. For Bourdieu, this contest for the legitimacy to consecrate cultural products is the heart of the power system of the field of struggles. To claim a right to this legitimacy also entails the generation of symbolic, cultural, social and economic capital which is necessary to maintain positions of dominance.

Bourdieu localises three distinct areas that are 'competing principles of legitimacy' that when reconfigured to relate specifically to Western mainstream popular music as cultural production, are represented by: the producers of music; the authoritative sub-fields of the music industries who believe they have the right to comment on the music; and the "popular" choice of ordinary consumers, the "mass audience" (Bourdieu 1993, pp. 50-51). Bourdieu believes that the mass audience interferes with and threatens the hierarchy of other sub-fields that may consider themselves more qualified and therefore more

legitimate (ibid, p. 116). In other words, five million sales carried more weight in the consecration process of *Death Magnetic* within the greater field of Western mainstream popular music than the opinions of sub-fields of “experts”. To Bourdieu, this represents ‘the disjunction between its [experts] own principles of evaluation and those that the “general public” bring to the game (ibid). Each group is looking at the cultural object from a different perspective. As Bourdieu theorises, cultural objects represent a ‘two-faced reality, a commodity and a symbolic object [...] their specifically cultural value and their commercial value remain relatively independent’ (ibid, p. 113). In the case of albums such as *Death Magnetic*, the commercial value of the cultural product remains paramount, for the field of Western mainstream popular music is deeply rooted in the structures of the field of large-scale production and affected by the associated heteronomous forces:

The field of large-scale production, whose submission to external demand is characterized by the subordinate position of cultural producers in relation to the controllers of production and diffusion media, principally obeys the imperatives of competition for conquest of the market. The structure of its socially neutralized product is the result of the economic and social conditions of its production. (ibid, p.125)

Cultural production is viewed as being segregated into two categories: those whose focus is that of either large-scale production for the largest possible audience; and those of restricted production for other cultural producers only (Bourdieu 1993, pp. 125-131). Bourdieu determines that the field of large-scale production is heteronomous in that it is influenced by forces outside of the field, whereas the field of restricted production is autonomous, which ‘more completely [...] fulfils its own logic as a field’ with less outside influence (ibid, p. 39). However, outside and more influential than both of these types of fields is the *field of power* which can be categorised as government and government policy, law, physics, market forces and so forth. This creates, as Bourdieu asserts, ‘the site of double hierarchy’; a battle between the principals of heteronomous and

autonomous hierarchisation which determines the degree to which fields are autonomous from outside influences such as those mentioned (ibid, p. 38).

It is possible to consider the “mass audience” that Sawyer articulates as consisting of intermediaries, connoisseurs, amateurs and the public (2006, pp. 126-127) as not only as part of the field of Western mainstream popular music, but also a part of the field of power in this instance for they wield extraordinary commercial and economic power:

...the “average viewer” very realistically designates the field of potential action which producers of this type of art and culture explicitly assign themselves, and which determines their technical and aesthetic choices. (ibid)

The boundaries of fields are often fluid and difficult to demarcate, hence the influence of some fields may stretch across many other fields. Since the field of Western mainstream popular music is deeply rooted in the field of large-scale production, it takes into serious consideration the potential power of loudness – by way of the physics of audio – exploiting the characteristics of the human hearing mechanism via the use of hyper-compression. In this way, it is trying to take advantage of a supposed biological predisposition in the mass audience. This situation dominates the technical and aesthetic choices made by agents because of a belief that the “louder is better” paradigm will mean that the cultural object has a greater chance of consecration once it has been presented to the mass audience.

This “double site of hierarchy”, the battle between the principals of heteronomous and autonomous hierarchisation that Bourdieu mentions, delimits the sub-fields from within the field of record production/audio engineering. There are groups within this field that could be described as sub-fields, but it is argued here, act more like “factions” when it

comes to attitudes towards hyper-compression – akin to factions of a political party (the left/right and centrist). They are all governed by the same structural formation and make reference to the same domain. However, what differentiates these sub-fields is their degree of autonomy and particular belief systems regarding the use of hyper-compression. Three sub-fields of the field of record production/audio engineering are presented: the professional producer/engineer, the amateur music producer (prosumer) and the established “authority” of which the Audio Engineering Society (AES) is a prime example. All three present various levels of autonomy. Although the function of the field of record production/audio engineering is primarily to produce artefacts for large-scale production, this is not always the case. Depending upon which sub-field you are addressing, each may act more like the field of restricted production. Here, there is a struggle for authority over the issue of hyper-compression. According to Bourdieu, autonomy is closely linked with the acquisition of the various forms of capital, but this is not necessarily the case within the greater field of Western mainstream popular music.

In Bourdieu’s world of cultural production – which in his study was directed to the fine arts – the ‘bourgeois’ heteronomous cultural producers are seen to have the least symbolic capital because they ‘can offer the least resistance to external demands’ (ibid, p. 41). The autonomous “disinterested” producer who sees economic reward as a sign of failure, ‘as in a generalized game of “loser wins” [...] a systematic inversion of the fundamental principles of all ordinary economies’, sees the generation of symbolic capital only through the lens of autonomy (ibid, p. 39). Therefore, in this sense, success is gauged by the degree of autonomy they possess. However, it could be argued that in the field of record production/audio engineering, this situation is reversed. The most valuable form of capital generated is that through large-scale production, in which agents in this field

amass “production credits” from commercial successes where they have little autonomy. The more credits they have, the more famous artists they work with and successful projects they work on, directly influences future opportunities for work and their position in the field.

However, this may not always be possible to achieve, and agents may have little choice but to seek far less value in the authenticity of the symbolic object rather than the commodity – in other words, they refute hyper-compression and loud recordings as a matter of principle, intentionally making softer recordings which in turn limits their choice of positions in the space of position takings and ability to generate capital. In most cases this is highly unlikely. As we will discover later, even the most principled mastering engineer, *the* agent usually responsible for the *act* of hyper-compression, will almost always defer to the clients wishes, despite being vocally active against the process. They will hyper-compress masters because they are aware that if they refuse to do so their business and reputation could be adversely affected. Despite his protestations after the fact, Ted Jensen still allowed his name to be associated with *Death Magnetic* as it was highly unlikely he would have asked Metallica, one of the most successful bands in the world, to seek another mastering engineer because making an album that loud was against his principles. Therefore, mastering engineers have very little autonomy like others in the sub-field of the professional producer/engineer.

Therefore, within the field of record production/audio engineering, the three sub-fields mentioned is where the ‘two-faced reality’ – the commodity versus the symbolic object – that Bourdieu asserts, becomes apparent (1993, p. 113). The commodity is hyper-compressed and designed for the field of large-scale production with its inherent flaws in

audio quality. Then there is the symbolic object that has wide dynamic variation and pristine audio quality designed for the field of restricted production – other producers. Depending on which sub-field you address depends upon which is “correct”, either for the sake of suitability for the market or its auditory excellence, of which, the two are seemingly incompatible.

The three sub-fields can be described as:

Firstly, there is the professional producer/engineer that capitulates to the mainstream by working with “famous artists” and this sub-field inevitably gains the most economic and symbolic capital. Their symbolic capital is gauged by the number of famous artists and successful projects they are “credited” with. This sub-field is arguably the most dominant within the field of record production/audio engineering, but they have the least autonomy. They are controlled by the imperatives of the artists they work for, who are in turn controlled by external influences – the field of large-scale production and the field of power. This sub-field in most cases is not concerned about the use of hyper-compression and may even defend its use as an aesthetic choice and not as a structure that is imposed on them; even though it most likely is.

Secondly, there is the autonomous amateur music producer (prosumer) who produces for other music producers and receives the least economic and symbolic capital, predominately because there is no space or position for them in the mainstream. Although they do try to exercise a legitimacy of consecration via internet forums and the like as witnessed on [gearsllutz.com](http://gearsllutz.com) concerning *Death Magnetic*, their power is very limited

within the field. This sub-field has a large degree of autonomy but the least symbolic capital – this is the field of restricted production in this particular paradigm. This faction can be polarised to be either affirmative or militantly against regarding hyper-compression and its use.

Thirdly, there is the established “authority”. A prime example of this kind of authority is the Audio Engineering Society (AES)<sup>26</sup>. It could be argued that although the AES’s charter is predominately science based and therefore supposedly objective, the “trade-show” exhibition, tutorials, seminars, workshops and tours that accompany conference programs acts as a conduit between objective and subjective positions with regards to audio production. In doing so, the AES’s relevance to the wider audio community is preserved by attracting thousands of members and attendees to these conferences thus maintaining its authority. Despite the AES being an umbrella for many sub-fields related to audio including broadcast, film and radio, it could be said that the sub-fields that are directly and indirectly involved with the cultural production of music also constitute a dominant presence. By providing a platform for manufacturers to showcase available audio technology, services and wares, this act also provides a platform for the professional producer/engineer to showcase novel uses for this technology. Put simply, the AES is a platform for the creation, trading and exploitation of the various forms of capital on many levels. As an example, it is common for famous music production personnel (producers, mix engineers, mastering engineers) to attend the conferences either as guest speakers,

---

<sup>26</sup> Audio Engineering Society’s website: <http://www.aes.org/about/> ‘... is the only professional society devoted exclusively to audio technology. Founded in the United States in 1948, the AES has grown to become an international organization that unites audio engineers, creative artists, scientists and students worldwide by promoting advances in audio and disseminating new knowledge and research.’ Viewed: 25 July 2017.

endorsing products or presenting seminars. In this way, both the organisation and the “celebrity” agent trade legitimacy.

The AES can be viewed as its own social universe and field of struggles for positions, position takings and legitimacy in consecration. As such, the AES works within the framework of the field of restricted production with a significant degree of autonomy within its own boundaries. However, outside its boundaries, within the greater field of Western mainstream popular music, it could be argued that the AES has very little legitimacy in the consecration of cultural artefacts. Furthermore, although it may have considerable influence over some structural frameworks within the field of record production/audio engineering in the form of “recommendations”, on a sociocultural level their influence appears minimal. As an example, despite the AES having an apparent resolute stance against the practice of hyper-compression, there is arguably no evidence of this having any significant influence on production practices in Western mainstream popular music. This stance is evident in the AES student recording competition rules where students are strongly discouraged from the use of hyper-compression:

Judges frequently criticize student mixes for excessive peak limiting and inadequate dynamic range. Therefore, contestants should resist the temptation to maximize loudness to the detriment of tonal balance and musical dynamics. (AES 2017)

By placing boundaries concerning the use of hyper-compression on students in this way – who are new to the field – it could be viewed as a form of indoctrination to the institution’s own social structures.

In addition, one highly influential group that exists within the AES community is known

as the Music Loudness Alliance (MLA) mentioned in (4.1.4). The MLA have been at the forefront of the debate against the use of hyper-compression and collectively rallied against its use since the late 1990s. Individual members and collectives from within the MLA have been presenting seminars at the AES against the practice of hyper-compression for more than a decade and a half. One notable seminar was held at the 133<sup>rd</sup> AES Convention in San Francisco (2012) titled *The Loudness Wars: The Wrong Drug* in which *Death Magnetic* by Metallica and *Californication* by the Red Hot Chili Peppers were heavily featured. The abstract aptly sums up the agenda of the seminar that included Thomas Lund, John Atkinson, Florian Camerer, Bob Katz and George Massenburg:

Newly produced pop/rock music rarely sounds good on fine loudspeakers. Could it be that the wrong mastering drug has been used for decades, affecting Peak to Average Ratio instead of Loudness Range? With grim side effects all around—and years of our music heritage irreversibly harmed—the panel provides a new status on the Loudness Wars and sets out to investigate the difference between the two from a technical, a perceptual, and a practical point of view. In a normalized world, bad drugs will no longer be compensated by a benefit of being loud. Learn to distinguish between a cure and quack practice, and save your next album. (AES 2012)

It could be argued that the agenda brought forward by the MLA concerning the use of hyper-compression in this seminar abstract, could be viewed as representative of the greater AES community's hierarchy.

The three sub-fields outlined above, therefore, represent a scale that ranges between affirming and condemning the use of hyper-compression, with corresponding opinions on *Death Magnetic*. In fact, as an aside, many responses from professional audio engineer/producers (including many mastering engineers) interviewed for this research project put the *Death Magnetic* controversy down to “bad luck”, or a symptom of the bands fame and not due to the excessive hyper-compression itself. The MLA – and the AES – on the other hand, see *Death Magnetic* as being symptomatic of a crisis within the music industry; a chronic dependence on hyper-compression much like a *drug*. Despite

having differing views, all three sub-fields are interrelated, behave as a social universe, trade various forms of capital and struggle for the legitimacy of consecration. The space of positions that are held within the field are arenas of contestation where agents vie for position takings which are relational and determined by the amount of capital generated or acquired. A particular stance on hyper-compression can be seen as a requirement to be part of the particular position that is desired. The positions that agents hold is of course determined by the agent's habitus. It could be argued, however, that this stance on hyper-compression transcends the usual definition of habitus and is more aligned with Bourdieu's concept of doxa; a shared set of unquestioned beliefs that determines the limits of the agent's habitus (Deer 2014, p. 115).

We could therefore view the position of the MLA as orthodox and that of the professional producer/audio engineer as heterodox, with competing belief systems with regards to the use of hyper-compression. A suitable doxa is needed to acquire a position within each sub-field of the field of record production/audio engineering concerning hyper-compression. For example, it could be argued that the more orthodox the agent, the more pertinent capital the agent could generate and acquire, and therefore be more suitable for a position of dominance within the MLA. Likewise, by being in possession of this doxa regarding hyper-compression – which befittingly aligns with the doxa of the AES – the MLA as a group have established significant symbolic power within the boundaries of the AES. As Deer explains, 'doxa takes the form of symbolic power which is mediated by various forms of accumulated capital' within established institutions:

Symbolic power lies within established institutions, as well as within institutionalized social mediations, that have the ability to establish categories and allocate differential values on the market of symbolic goods legitimizing themselves further in the process (education, religion, art). (ibid, p. 116)

The MLA legitimise themselves within the field of restricted production that the AES exists within – ‘a system producing cultural goods (and the instruments for appropriating those goods) objectively destined for a public of producers of those goods’ (Bourdieu 1993, p. 115) – by doing just that. They ‘allocate differential values on the market of symbolic goods’ by rejecting the idea of hyper-compression.

In contrast, an orthodoxical position within the sub-field of the professional producer/engineer most likely would render an agent unemployable by artists who need to compete in a completely different arena – the field of large-scale production; ‘specifically organised with the view to the production of cultural goods destined for non-producers of cultural goods, “the public at large”’ (ibid). To attain and maintain a position within the space of position takings within this field, they must be heterodoxical in embracing hyper-compression.

This situation therefore forms the main argument. A particular stance on hyper-compression is the manifestation of the agent’s doxa, which creates suitability to exist within a particular field or sub-field. Neither orthodoxy nor heterodoxy can be considered right or wrong, it is simply a requirement to enter a field or sub-field as part of an overarching habitus. As noted in section 5.2.1, Oasis’ producer Owen Morris introduced to the field a creative act that by all accounts, substantially transformed the domain. Hyper-compression became a structure within the field of record production/audio engineering. Over a period of time between this particular creative act in 1995 and the peak of its use around 2004 to 2007, opposing doxical stances were developed by agents operating in the field. Those of the professional producer/engineer largely transcended the scientific rationalism offered by those that became orthodoxical against the practice.

In the following chapters the responses from agents interviewed will be examined that illustrate this opposing doxical positioning. We can therefore place agents and their respective fields along a scale from orthodoxy to heterodoxy.

Apart from the field of record production/audio engineering and its three apparent factions, there are other sub-fields of the greater field of mainstream western popular music that are involved in the *Death Magnetic* confabulation. We can of course add the mass audience, the media, Metallica the band, their production team and management/record company. All these groups have their own doxa that can be located somewhere along this scale between orthodoxy to heterodoxy concerning hyper-compression or cover the entire spectrum. For example, Metallica believe that they have the artistic right to produce music in whatever form they wish, and this could be viewed as heterodox, or “heresy” to the MLA as was the case with *Death Magnetic*. Their production team would have a similar doxa based upon the needs of their client as they are largely heteronomous to these needs. The mass audience would cover the entire spectrum: from those listeners that just like what they like subjectively and don’t care about hyper-compression; to “hard-core” Metallica fans who interpret the music as a specific sound; to audiophiles who believe that hyper-compression is gravely damaging to their own concept of audio quality (the last two what Sawyer would describe as “connoisseurs” (2006, pp. 126-127)). All have adopted or developed a particular doxa that represents their belief systems. *Figure 5.7* illustrates the various fields and sub-fields involved in the issue surrounding *Death Magnetic* and their relative doxic position on a scale between orthodoxy and heterodoxy. Their position on this scale would correspond to their acceptance or non-acceptance of the use of hyper-compression. It is argued that this framework could be extrapolated to other acts, albums, and to the wider issue of the

use of hyper-compression in the field of Western mainstream popular music.



*Figure 5.7:* This figure illustrates the various entities involved in the controversy of *Death Magnetic* by Metallica (2008) due to its excessive loudness. Each entity can be located on a scale between orthodoxy (opposing hyper-compression) and heterodoxy (embracing hyper-compression). Global audience, media and prosumer can be located as possibly part of either end of the spectrum due to the wide variation in the doxa of agents within these groups.

### 5.3 Action and the Transformation of the Domain

In the previous chapter, it was argued that the removal of loudness bias from the reproduction paradigm, although seemingly logical in also removing the requirement to use hyper-compression as a pre-conditioning of the musical artefact to exist within the field, may not be as straight forward a process as one might envisage. It was suggested that it would most likely require a recursive process of change in the domain by agents who *gradually* introduce less compressed recordings, which will in turn influence other agents to produce less compressed recordings. This conception of gradual recursive change in the domain that alters possibilities for action is part of the circular causality of Csikszentmihalyi's systems model of creativity; action can instigate changes in the domain, which in turn can instigate change in action. This process can start at any of the three moments of the systems model being agent, field or domain. It is, of course, up to the field to determine what modifications are made to the domain in their role as gatekeepers. According to Csikszentmihalyi, this modification or change to the domain is what is considered to be a creative act.

It has also been argued that Bourdieu's notion of the field of works – mentioned in the *Rules of Art* (1996) – operates in much the same way as Csikszentmihalyi's notion of the domain. The field of works represents all historical antecedents of cultural production of the field. What has already been created, presents agents with an understanding of what is possible; what he refers to as the *space of possibles* (Bourdieu 1996, p. 235). As such, music streaming represents a *loudness normalised space of possibles* for agents in the field of Western mainstream popular music. With this in mind it is suggested that an

examination of how hyper-compression came into being as a structure may also provide an understanding of how it might also dissipate as a structure. Such an examination, it is hoped, will also provide support for the argument made that a recursive process of change in the domain is likely needed to instigate change in the use of hyper-compression.

How agents achieve loudness in recordings has been in a constant state of recursive development ever since the first examples of hyper-compressed recordings in the early-mid 1990s. Much of the changes in the domain's structure concerning loudness can be correlated to the introduction of various technologies as outlined in the analysis of music corpuses (5.1) and how these technologies are utilised; highlighted in the research conducted by Deruty and Tardieu (2014). Changes that are evident in the domain artefacts or field of works are directly relational to changes in the technology available at the time, which in itself signifies a system at play.

We can identify two distinct periods in which digital audio technology was causal to changes in the domain that initially created the scenario for loudness in the 1990s and then later anchored it in production practices a decade later. In the early 1990s, the first digital limiters became available to a select group of agents who could afford access to them. This access was subsequently democratised after the release of the more affordable TC Electronics Finalizer in 1996 and similar products. In the 2000s, the digital audio workstations (DAW) alongside an associated enthusiasm for plug-ins became ubiquitous in music production. We could also label this as a disruptive technology to the expensive and inferior analog technology, which provided agents with access to an unprecedented ability to manipulate audio signals and the associated affordability. These changes to the domain that are signified by this technology also correspond to changes in practice, which

in turn is signified by the artefacts produced as creative acts. It represents a gradual recursive process of change in agency and structure – a system.

To briefly recap the trajectory of loudness inducing practice, we could begin with the AD-500 and DA-1000 converters that were released in 1991 by the company Apogee. Australian mastering engineer from Studios 301, Leon Zervos, marks this as a major turning point regarding the quality and level that was achievable on a CD:

Early CD's have very low level and were mastered using primitive digital converters and digital equipment- you can hear that. The big change was when Bruce Jackson created the Apogee converter and suddenly digital sounded much better and we could improve on level as well. (i/v, 2013)

A particular function on this AD converter was the “soft limit” which according to Apogee ‘can be heard on countless platinum selling records around the world’<sup>27</sup>. Apogee describe the soft limit function as:

This superior analog design prevents the digital clipping that causes distortion by instantaneously rounding off transient peaks before they hit the analog-to-digital converter. Soft Limit allows several more decibels of apparent level to be recorded while subtly providing an analog-like warmth to the sound. (ibid)

Australian mastering engineer from King Willy Sound, William Bowden states that it was something ‘you used to kind of slam it in to’ and this would create the type of loudness representative of Oasis’ *What’s the Story? Morning Glory* (i/v, 2015). However, the Apogee converter was ostensibly a method of converting analog signals to digital and the soft limit function was merely an adjunct to its primary function.

---

<sup>27</sup> ‘What is Soft Limit?’, Apogee Knowledge Base. <http://www.apogeedigital.com/knowledgebase/duet-2-usb/what-is-soft-limit/> Viewed: 28 January 2017.

At the same time, the release of digital limiters occurred and these were specifically designed to hyper-compress signals. One such unit was the SPL Electronics “Loudness Maximixer” (Model 9632) in which its manual claims was ‘designed to maximize subjective loudness and to exploit effectively up to 99.9% of the available headroom with guaranteed clip-free performance’ (SPL 1999, p. 4). According to Bowden, this unit was the first of many loudness inducing pieces of equipment to be released during the 1990s and in combination with the Apogee converter he describes as being extremely effective:

The first thing that we got was a thing called an SPL loudness maximiser. And it was a big red box [...] this was before the Waves L2. That and the Apogee were a pretty lethal combination. (i/v, 2015)

UK mastering engineer from Loud Mastering, John Dent, suggests that a lot of the loudness inducing technology from the 1990s was crude in the way the audio signal was processed and that processes have subsequently been developed that are much more advanced, alleviating many of the associated unpleasant artefacts with this early equipment:

I think what’s happened is that the cruder equipment in the 90s was quite crude to use [and] it did tend to give you something that wasn’t very pleasant to listen to. Nowadays actually we are using equipment that is more subtle and you still can get away with quite a lot of levelling but it doesn’t have a lot of those artefacts. (i/v, 2015)

Dent adds, that ‘I think what I’ve learnt is how to give people a decent volume but without a lot of those horrible artefacts’ (ibid).

There were other developments that are significant to this timeline such as the TC Electronic TCM M5000 which as American mastering engineer from M-Works, Jonathan Wyner suggests, was a marked improvement on loudness inducing processes. According

to Wyner, when released in 1995 this caused an overall increase in the level of recordings within the domain. Wyner explains that the TC Electronics M5000 was:

...really the first affordable look ahead DSP based limiter, and multi band compressor, you know, there was generally a shift towards, on the meter where the RMS level rose a little bit because you could apply more dynamic range control and the artefacts weren't as obvious and so we all heard that and we said "wow". (i/v, 2015)

Swedish mastering engineer from The Cutting Room, Björn Engelmann, also makes mention of the Neve Digital Transfer Console as being a turning point for him personally, in which a highly specialised piece of equipment for mastering engineers pushed the boundaries even further with an in-built digital limiter. Engelmann explains:

There was a console, which we also had; it was a Neve Digital Transfer Console and in that period something happened. It had a good limiter in it for that time. Which made it possible to get very loud masters. I know Howie Weinberg - when I was in New York - he had that mastering console. I was a little bit flashed by the levels he could actually get out of it, at that time. But that was nothing, nothing in levels compared to today. (i/v, 2015)

If we return to the analysis of music corpuses, it was stated that one of the generalised findings was that a sustained increase in loudness levels in the 2000s was strongly related to the introduction of the digital audio workstation (DAW) (5.1). Acceptance of this assumption correlates well with reports by those interviewed for this research project. This most significant change in the domain structure had a profound effect on the action of all agents working within the field concerning loudness either in a professional sense or as a prosumer. Senior mastering engineer at Abbey Road Studios, Sean Magee, maintains that it wasn't until the era of the DAW in the 2000s that loudness became firmly established in the dispositions of all agents and the process of hyper-compression was democratised (i/v, 2015). As such, anyone with a laptop could, in effect, attempt to record, mix and master their own product. By the end of the decade of the 2000s, loudness had

reached a point to which it had completely permeated the production of music on every level including the prosumer. Magee believes it was at this point where the more negative aspects of hyper-compression became apparent with inexperienced prosumers extraneously hyper-compressing recordings:

When the Pro Tools thing really took off, it's about 5 or 6 years ago, everyone had Pro Tools on their laptop and they all used the big limiting plug-in that comes with it. And then there's L2 and then there's umpteen other ones to fuck up your music. (ibid)

During this time, particularly among the growing number of prosumers who had access to this technology, all agents understood the benefits of loudness in the presentation of a recording. General Manager of A&R at EMI Australia, Scott Horscroft, recognised that many of the agents he began dealing with were becoming privy to the plug-ins that were available to them. He believes that peak limiting, in a way, compensated for a lack of specialist knowledge by controlling the output of the master bus of the digital console within the DAW to stop the signal overloading – something that required significant understanding of audio principals. At the same time the agent is learning how effective loudness is with the overall mix and how relatively easy it was to achieve with a simple plug-in with few controls:

No one's really looking at their master bus on a pro tools rig when they can just whack a plug in on it that brings it back down out of the red and compresses it more and then you put on a limiter. After a while you've got 12 plug-ins on your master bus! And you click one off and it sort of goes back a bit. You put it back on and it leaps forward again and it's like, more presence. (i/v, 2016)

On another more professional level, dealing with the issue of loudness in the 2000s and 2010s had become a much more complex scenario for high-level agents within the field who were well aware of the presence of loudness in the domain structure and had a decade

or more to hone their habitus to achieve the loudness required of the field. As eminent American mix engineer Dave Pensado suggests, it is better to work within this paradigm and find superior ways to express loudness in a “musical way” than fight against it (i/v, 2016). According to Pensado, achieving loudness on this scale was not anything difficult to for him to achieve, it just required adjustment to his habitus so it was in-line with the changes happening in the domain. This is understandable given that Pensado has many decades of experience stretching back to the 1980s and is arguably the most successful mix engineer in the world. This provided him a long period of inculcation of the domain properties and any transformations that occurred. As such, Pensado states that:

It’s something in my world that you need to master in a musical way. You can’t fight it, it’s not going away so try to make it... try to get the skills to make it musical. I don’t see what’s so hard about that. Everything that we do in our careers as engineers is taking technical issues and problems and converting them into musical concepts. (ibid)

In contrast, American mix engineer from Echo Bar Studios, Bob Horn who is arguably one of the up and coming, next tier engineers, considers achieving this kind of loudness as something that was more challenging. Having had less experienced and exposure to the domain, Horn states that:

Loudness is an issue for engineers because it’s hard to do. If there was a plug-in out or technique, that every day gave us the loudness of the loudest record and still sounded good, We would just be like ‘Loudness War’?? I obliterate the Loudness War every day. I’d win them. I’d have the loudest mixes. And so would the next guy. Because, it would be easy. But because it’s hard, and people ask us and tell us it’s not loud enough, ‘can you make it louder?’ You cringe because it’s like, I tried to make it as loud as I can, but your song doesn’t want to be loud. Cause musically some things can be loud and some things can’t. It depends of the production, the composer, the key of the song, the genre. Especially the genre. (Bob Horn i/v, 2015)

Both Horn and Pensado both agree that genre has a great deal to do with the sort of loudness that is achievable in a recording and this requires the acquisition of specific habitus. Different genres are inherently easier to make louder, largely due to the

instrumentation and frequency distribution of associated instrumentation. It has been commonly stated in interviews conducted for this research project that genres containing significant amounts of low frequency are more difficult to make loud. Horn asserts that from his experience, top-40 songs are designed from their inception to be loud, to compete on *that* playing field. He argues that this is reflected not only in the structure of the composition, but the type of instrumentation that is selected. Jonathan Wyner, concurs by suggesting that ‘if we’re thinking about the loudness or loudness potential of a record it has much more to do with the craft that’s gone into making the record’ (i/v, 2015). According to Horn, there is a conscious decision-making process concerning loudness that the producers of this music have acquired and understand, and this is applied at every stage of production:

For the guys that are in tune with it and the guys that know. The guys that are doing the top-40 hits, you know they sit down to make a Katy Perry track. They know it has to compete on radio. They know it has to compete with the next song being turned in. To get on the actual album. They’re stuff is going to be loud before it gets mixed. They’re going to pick the right sounds in the production, the right drums. The right instruments to make it so. (i/v, 2015)

What is evident here is that within the creative process of this type of music (top-40), loudness as a singular element had managed to significantly alter the domain to such an extent that agents working with the field were required to redefine their habitus and agency to accommodate this change. From the point of view of Csikszentmihalyi’s systems model, the expectations of the field had accordingly reconfigured itself to accommodate for loudness and therefore judgements on whether or not an agent’s music was considered worthy of inclusion into the domain were arguably dependent to a large degree on whether it was loud enough. Subsequently, the acquired knowledge of how to make music effectively loud also became part of the domain which agents such as mastering and mix engineers had to include as part of their habitus. These top-40

producers that Horn mentions, immersed themselves in the domain of Western mainstream popular music, and in particular, top-40 popular music to understand how it operates. As such, loudness had also become an essential part of their ability to be creative. On a broader scale, loudness had become a powerful structure in the creative process which influenced how many genres of music were made to satisfy the requirements of the field and the domain. Whereas hyper-compression was considered only the realm of the mastering engineer in the 1990s, by the end of the 2000s, it had become ubiquitous in all stages of production which meant that mix engineers in particular had to adapt their practice to satisfy this new paradigm. This will be discussed later in Chapter 8.

Bob Horn saw evidence that at the end of 2000s, loudness had become a structure in music production practices where ‘all they [agents] could talk about was having a loud mix’ (ibid). Horn associates this era with *himself* having to adapt his own practice to accommodate for this change in the domain. Therefore, it was crucial for Horn make adjustments to his habitus to remain relevant to the field:

When it really started to become a thing. Maybe 2008, 2009 and 2010, when it really was, everyone, all they could talk about was having a loud mix. I definitely still had mixes that were on the quiet side when you compare them to other guys. So I really had to work, you know, the first couple of years, my loud mixes, I wasn’t happy with and I would definitely prefer my quieter mix, and hope that the mastering guy could make the loud version better than I could. (ibid)

Furthermore, an example of Horn immersing himself in and referencing the domain is illustrated in the following in which he states that an inspection of certain types of music rendered valuable lessons on how to create successfully loud recordings. He again refers to those composers involved in top-40 music who create music that inherently has the ability to be loud due to their expertise:

A better composition with loudness in mind, helps engineers so much. You listen to the genres that are always loud like top 40 pop or electronic. Everything's really tight. There's not an immense amount of loose low end. It's a tighter sound, a brighter sound. From mastering to mixing, to when they made the beat, it's not a heavy sort of a production in regards to bass frequency information. It can be very dense in the mid-range and the high end, but again that stuff has so much room. A lot of the time it starts with the composer doing things wrong, and maybe it's not wrong but it goes against loudness. And it prevents us from getting things loud. (ibid)

Horn continues to describe in detail how his methods to achieve loudness had changed over time in accordance to a transformation in the domain as he sees it. He also describes how his professional interaction with mastering engineers had changed as a by-product of this transformation. Horn maintains that it is better to address the issue of loudness during the mix process as opposed to leaving it solely to the mastering engineer at the end. Maintaining the integrity of his mix through the mastering process is a critical issue that he expresses, and this is very similar to many of the other mix engineer's responses:

If you just mix and you don't spend any time trying to get your mix musically loud, it's going to turn out all distorted and crunchy with all kinds of artefacts. I mean, a mastering engineer can only do so much you know. So, I think, I really prefer my take now on how I'm handling loudness and I would suggest that for anyone. That is, don't ignore loudness. Be the guy that tries to make it loud, so the mastering guy doesn't have to do it all on his own. If you leave it all to him, it could get ruined. So, if you work hard on it yourself, even if you turn it off later, drop the mix, make sure things have the potential to be loud. When it's finally made loud it will be a much better product. (ibid)

Horn's overall account illustrates that there are considerations concerning loudness that could be addressed throughout the entire process of music production, starting at the compositional stage. This continues through the mix stage in creating a master that has the propensity to be loud, and then finally at the mastering stage where concluding processes take place at another level of refinement and expertise. To maintain the original aesthetic intent, to alleviate possible degradation and unwarranted artefacts due to the loudness processes, and to create something that the field deems worthy of inclusion into the domain, careful consideration is required at each stage. All of these considerations

require specialised knowledge that is embedded within the domain which the agent must immerse themselves in to acquire as an appropriate habitus. Horn had access to the field of works which presented him with a space of possibles. He adapted his habitus and agency accordingly. If we consider Horn to be representative of other agents from within the field, what we observe here concerning loudness in music production overall is a system at play; a recursive process where changes in practice create changes in the domain, but also the domain then continues to create changes in practice. As such, it seems logical that the same process would be required if hyper-compression is to be removed as a structure.

## 5.4 Conclusion

It has been argued that Csikszentmihalyi's notion of the domain correlates effectively with what Bourdieu terms the field of works, which in turn presents agents with a space of possibles. It is suggested here that the two theorists are basically describing the same thing; the sum of all artefacts created, historically, provide the necessary knowledge and structures for agents to either operate in the field and/or be creative. What has already been created, presents agents with an understanding of what is possible. Embedded in these artefacts is also the knowledge of the domain, what Toynbee describes as the 'established techniques and codes of production' (2000, p. 38). An examination of the domain therefore provides an opportunity to understand the historical trajectory of loudness in recordings and the existence of hyper-compression as a practice amidst the complexity of the field it operates within. A multi-strategy approach to this examination was utilised incorporating both objective and subjective positioned procedures, illuminating the multifactorial background to the use of hyper-compression.

This examination was initiated via a quantitative analysis of the objective properties of a music corpus of 210 recordings from 1955 to 2016 which was then compared against three other major studies. Through this analysis, an understanding of how hyper-compression became such a dominant structure within the field record production was confirmed. The results reported illustrate a distinct correlation to the other studies presented that incorporated vastly larger corpuses of recordings. This correlation suggests that the methods of analysis are robust, and it could also be argued that causal factors to this increase in loudness levels are dominant in their effect on the domain of record

production. We can therefore position the start of this increase in loudness levels in the early 1990's with a subsequent peak in the mid to late 2000s, followed by a modest reduction. Markers along this timeline correspond with the introduction of various forms of digital technology during a period in which the methods of reproduction available at the time, actively encouraged the use of hyper-compression through loudness bias (predominately the CD). Within this corpus, two specific albums that had been subjected to excessive amounts of hyper-compression were identified that punctuate key moments in the timeline mentioned. This identification presented a cogent opportunity to gain an understanding of the creative process involved and the structure of the field with regards to the practice of hyper-compression, and as such was treated via individual case studies.

The case of Oasis's (*What's the Story?*) *Morning Glory* (1995) presents, by definition, an act of creativity in which a novel idea (hyper-compression) was introduced to the field, transforming the domain. This did not constitute an act of genius which some might consider but represents an example of Csikszentmihalyi's systems model of creativity at play. Owen Morris, the producer of the album, enabled by new digital technology, reconfigured an existing idea into a novel way to create what Inglis described as a 'devastating new weapon' in record production (2010). To which, the field of Western mainstream popular music recognised as valid, bringing forth change in the domain. It was reported that the album's loudness had a significant influence in its positive reception and critical acclaim becoming the fifth highest selling album in the UK's history.

In contrast the case of Metallica's *Death Magnetic* provided an illustration of the function of the *field* in terms of the systems model of creativity, and also in terms of Bourdieu's *field of struggles*. This analysis contributes a necessary framework for examining hyper-

compressed recordings and their reception on a broader scale. A network of scalable systems, agents, fields, sub-fields, factions and hierarchies were identified within the field of Western mainstream popular music in relation to hyper-compression. Despite being rejected by specific elements of the field who considered the album's loudness as an affront to audio quality, *Death Magnetic* was a huge commercial success apparently selling more than five million units and garnering many awards.

This examination of the domain in this way highlights that within this network, there is a distinct tension between what Bourdieu theorises as 'the two-faced reality' of cultural objects that represent a commodity and a symbolic object (1993, p. 113). It is this tension that is argued is at the core of the issue of hyper-compression. There exists a struggle for authority over the use of hyper-compression between sub-fields of the field of record production/audio engineering. The commodity is hyper-compressed and designed for the field of large-scale production, as opposed to the symbolic object that may have wide dynamic variation but more suitable for the field of restricted production – other producers. Currently, the two are seemingly incompatible and more so considering that the field of Western mainstream popular music is deeply rooted within the field of large-scale production.

Present within the field of record production/audio engineering are agents with corresponding and opposing doxa to this "two-faced reality". Bourdieu sees doxa as an intrinsic element of an agent's habitus representing a shared set of unquestioned beliefs that agents must also possess in order to exist within the field's own set of logic. It is argued that within the field of record production/audio engineering there are three sub-fields; the professional producer/engineer, the amateur music producer (prosumer) and

the established authority – i.e. the AES/MLA. These sub-fields have contrasting doxic stances concerning the use of hyper-compression, which can be positioned on a scale between orthodoxy (firmly against hyper-compression) and heterodoxy (affirmative to hyper-compression). It is here that the struggle for authority over the use of hyper-compression exists between these opposing ends of the doxic scale. It is further proposed that this doxic scale can be applied to the greater field of Western mainstream popular music and relevant sub-fields which are identified as mass audience, band, band management, record company, music institutions (such as the Grammy's), the media and so on.

To maintain positions within these sub-fields it is necessary for the agent to have the appropriate doxa that is representative of the field not unlike requiring the correct habitus. In this way, doxa delimits an agent's habitus. With specific regards to the field of the professional producer/engineer, which facilitates the cultural production of music for the field of large-scale production of the greater field of western popular music, the agent must be heterodoxical in their stance on hyper-compression. Likewise, the agent who wishes to maintain a position in the established authority must be orthodox. This tension between sub-fields is the result of the practice of hyper-compression establishing itself as a dominant structure within the domain.

How hyper-compression became a structure in the domain can be examined by following the trajectory of digital audio technology. As McIntyre points out:

The artist's ability to make artistic choices, that is their agency as creative individuals, is seen to be bounded by the institutional constraints of the cultural field they work within, which includes, amongst other things, current technology and the techniques needed to utilise that technology. (2012, p. 53)

The introduction of various forms of this technology punctuated change in audio production practice which in turn can be identified as changes in the domain and symbolised as artefacts. For example, the Apogee AD-500 arguably made possible the loudness of Oasis' *What's the Story? Morning Glory* by use of the soft limit function. Subsequent technology introduced during the 1990s presented agents with further possibilities for action which in turn was stored in the domain as symbolic structures within the artefacts themselves – what Bourdieu terms as the space of possibles. A dominant structure of the magnitude that hyper-compression represents today required a process of gradual recursive change in the domain over time. As stated, how agents achieve loudness in recordings has been in a constant state of recursive development and refinement ever since the first examples of hyper-compressed recordings in the early-mid 1990s. By the 2000s with the infiltration of DAWs and a vast array of plug-ins, this situation meant that loudness was democratised throughout the entire field. Hyper-compression had become ubiquitous within production practice.

As such, action is transformative of the domain, while in turn, the domain is transformative of further action. This could be recognised as the circular causality of Csikszentmihalyi's systems model of creativity. Agents must immerse themselves in the domain in order to have the skills and knowledge required to be creative, to submit to some novel idea that is worthy of the field. The field then plays the role of gatekeeper to the domain. But once an idea is consecrated by the field as worthy of inclusion to the domain, it influences further possible action by agents. This new knowledge is also transformative of the field's expectations of what further novel ideas are acceptable or worthy. The example was given of top-40 music producers. Due to the circumstance where loudness had managed to significantly alter the domain, agents working with this

field were required to redefine their habitus and agency to accommodate for this change. In turn, the expectations of the field had accordingly reconfigured itself to accommodate for loudness and therefore judgements on whether or not an agent's music was considered worthy of inclusion into the domain were arguably dependent to a large degree on whether it was loud enough.

The important point to note from this circular causality of the creative process is that it presents the possibility of understanding how hyper-compression as a structure may be reversed. With the possibility of music streaming introducing a *loudness normalised space of possibles* for agents in the field of Western mainstream popular music, the opposite effect of diminishing the role of hyper-compression as a commercial mechanism may occur. It was suggested that it would most likely require a recursive process of change in the domain by agents who gradually introduce less compressed recordings, which will in turn influence other agents to produce less compressed recordings. Such a change in the domain's structure could instigate this circular causality in the opposite direction depending on many factors such as the adoption rate of music streaming. As mentioned, it is most likely that loudness normalisation and its removal of loudness bias is but one factor among many that represent a system at play. Whether or not the removal of one factor can stimulate enough change in the domain to influence the action of agents is difficult to predict.

The field, of course, plays a significant role in determining what novelty gets introduced in to the domain. As McIntyre suggests, popular music 'requires constant novelty in order to maintain its commercial base' and this most likely aided the process of loudness becoming a structure which may have taken considerably longer to mature if there

wasn't as much novelty introduced (ibid, p. 79). It could be said that the democratisation of the technology enabling hyper-compression, in conjunction with a breakdown of the field – insofar as what will be discussed in the next chapter as the “devaluation of the music industries” – where Csikszentmihalyi's notion of the role of a field of experts was effectively bypassed. This opening of the door to arguably too much unassimilated novelty was, it is argued, also represents a major cause of hyper-compression proliferating like it did during the 2000s.

## 6 THE FIELD – THE SPACE OF POSITIONS

In previous chapter, the album *Death Magnetic* by Metallica was discussed ostensibly as a case study in which the reception of this album was examined through the lens of Bourdieu's concept of field as the field of struggles, with respect to the album being a part of the field of works. As a commodity, the cultural objects being examined here are subject to the forces of the field of large-scale production in which the consumer has extensive power to consecrate these objects. However, as a symbolic object, it is the authoritative sub-field of experts who believe they hold the legitimacy to consecrate these objects and this sub-field behaves, in Bourdieu's terms, as the field of restricted production. In the specific case of *Death Magnetic*, five million sales of the albums far outweighed its rejection by the authoritative sub-field of experts in the consecration process. This example illustrates the disconnect that may exist between the mass audience and the field of experts.

In the eyes of Csikszentmihalyi, 'the easiest way to define a field is to say that it includes all those who can affect the structure of a domain' (in Sternberg 1988, p. 330). There are thus power relationships being enacted within the field. While power within the field can be problematic at best because, in the specific case of hyper-compression, power is taken away from the field of experts who may be better equipped to determine which novel ideas enter the domain (1999, p. 324). This is discussed in what has been termed "the devaluation of the music industries" where the field, in terms of Csikszentmihalyi's

notion of field, underwent a period of transformation. The introduction of the internet and digital audio technologies are seen to be largely responsible for this transformation. From this perspective, there was a shift in power away from the record companies – considered a major part of the field of experts in the recording sector of the music industry – to both the artists themselves, the consumer and the prosumer, who used this technology to reconfigure the field. As such, the field failed to operate successfully in filtering much of the music that entered the domain and this resulted in too much unassimilated novelty.

A field can affect creativity and innovation in a number of ways. One that is important to this argument is the idea that fields can, at various times, choose a broad or narrow filter to select novelty. As Csikszentmihalyi argues, some fields are conservative and allow only a few new items to enter the domain at any given time. They reject most novelty and select only what they consider best. Others are more liberal in allowing new ideas into their domains, and as a result these change more rapidly. ‘At the extremes, both strategies can be dangerous: It is possible to wreck a domain either by starving it of novelty or by admitting too much unassimilated novelty’ (Csikszentmihalyi 1997, p. 44).

It could be argued then that this admission of too much unassimilated novelty, due to the introduction of affordable and widespread adoption of digital technologies, had a somewhat devastating effect on the domain. A combination of circumstances due to the introduction of these technologies caused the music industries to lose ‘nearly 40% of its revenues’ globally between 1999 and 2014 and experience an almost threefold increase in product released (IFPI 2017, p. 10). The domain was essentially flooded with unfiltered product or in the terms being used here, unassimilated novelty. As Csikszentmihalyi asserts from the outset, ‘in the domains of movies or popular music, which are much more

accessible to the general public, the specialized field is notoriously unable to enforce a decision as to which works will be creative' (1999, p. 326). This foundation of the field mentioned by Csikszentmihalyi was somewhat exacerbated with the introduction of these technologies and the transformation that occurred. A by-product of this transformation that is significant to the discussion of hyper-compression, is the level of insecurity that it caused to agents operating within the field. Due to diminishing returns on investment, and a corresponding diminishing chance of success due to dramatically increased competition, hyper-compression became all the more entrenched in production practises due to this insecurity. Seen even more so as a pre-requisite for entry to the market place, agents were less willing to risk not having a loud product for fear it may contribute to potential failure. In particular, this has had a distinct impact on the gatekeeping process which is an integral part of the operation of the field.

In conjunction with this insecurity, there are the traditional gatekeeping processes that have been impacted by this transformation. Despite the fact that all agents who operate in the field act as gatekeepers in some way, two specific groups of gatekeepers that have traditional origins in the dissemination of music are important to this discussion, that is, radio program directors and artist and repertoire (A&R) personnel. The loudness of recordings has long been associated with influencing these gatekeepers dating back to the origins of rock and roll music in the 1950s. Here it is discussed how loudness and its psychophysical influence is still an integral part of the audition process where many recordings may be in competition with each other for limited spots on either a radio station playlist or a record company roster. Despite the new and constantly evolving methods of dissemination and promotion offered by the internet, more traditional platforms such as

terrestrial radio still play a vital role in bringing new artists to the attention of the consumer.

The audience/consumer is both a considerable part of the field that selects what is novel and worthy of inclusion in the domain, and a considerable force that influences the way the field operates. Csikszentmihalyi makes the important point that because the ‘general public’ are highly involved in the consecration of music, this may be one reason creativity is seen as ‘more ephemeral in the arts than in the sciences’ (1999, p. 326). These technologies that caused a transformation in the music industries have also changed the way that the audience listens to music. In particular, the internet and the culture that it has developed alongside of has exacerbated this “ephemeral” nature of creativity in music making it even more momentary. As will be discussed, the release of music that is largely promoted via internet platforms has also made the process temporally fleeting in comparison to older methods that relied on more traditional methods of distribution such as print and terrestrial broadcast. The amount of information that is available via the internet and the decreasing attention span of the consumer can be attributable to the shift from albums to singles. Singles therefore act as a mechanism to sell the artist to the consumer which leads to another major factor in the propagation of hyper-compression – the playlist.

The consumer is able to create their *own* albums which consist of a number of songs from favourite artists that reflect a mood or interest in genre. As we know, it has been argued that the playlist instigated the use of loudness in recordings as a mechanism to attract the attention of the listener which dates back to the jukebox era. In this way, loudness as a means of attracting attention has retained its importance as no agent wants their song to

appear softer in a playlist which could be potentially construed as inferior. Despite loudness normalisation being incorporated into many platforms, some like iTunes do not have it activated by default. Notwithstanding, the concept of loudness normalisation has not as yet reached the consciousness of the consumer.

Another factor that is discussed concerning the audience is the reproduction systems they possess that have, in their turn, had a significant impact of the way they listen to music. Also, the method of delivery to those reproduction systems has seen the widespread use of miniaturised headphones and laptops which further confounds the issue by decreased audio quality through limited bandwidth which, it is been argued, has influenced the production and reproduction of music and in some ways has justified the use of hyper-compression.

Taking all these factors into consideration, it is therefore argued again that there is no one single cause for the continuing use of hyper-compression; it is systemic in that it is the result of many interrelated circumstances. If loudness normalisation is not having the desired effect in curbing the use of hyper-compression, then it is obvious that the removal of loudness bias in the reproduction paradigm is but one of many overarching factors in the continuing deployment of hyper-compression. These factors, seen from the perspective of the field, are now discussed in detail through the lens of the responses from subjects interviewed.

## 6.1 The Devaluation of the Music Industries

It is necessary to first examine the transformation that has occurred within the overall structure of Western mainstream popular music due to the diffusion of digital and internet technologies. It is easy upon first examination of the reported loss of global revenue, to conclude that something major went wrong with the music industries after the turn of the century (IFPI 2017, pp. 10-11). Most of what has been reported has revolved around the collapse of an outdated mode of operation that has been disrupted by advancing technologies. There has been a raft of issues that have arisen as a result of this technology, starting with piracy that initially devalued music as a commodity. This issue of piracy led directly to a rapid transformation of music delivery from physical sales (CD), initially to downloads, and then streaming. This transformation presented further challenges concerning the monetisation of these on-line platforms (see for example: Strasser 2009).

Essentially, steady revenue streams that were achievable through the sales of a physical product that was not readily copied<sup>28</sup>, provided the record industry with a solid financial infrastructure that flowed onto the whole music industry. Post 1999, when internet technologies became readily available to the consumer, this revenue quickly diminished to a low in 2014 of almost half globally (IFPI 2017, pp. 10-11). This not only had an effect on the record companies and artists, but also support industries such as those involved in record production. Théberge uses the example of the closure of the iconic

---

<sup>28</sup> The music industries enjoyed a fortuitous period where CDs could not easily be copied directly to another CD without considerable expense. By approximately the year 2000 this period had ended. CD burners became standard inclusions in personal computers making it very easy to make exact replicas of a music CD for the price of a blank CD (a few dollars).

Sony Music Studios in New York as a prime illustration of this downturn:

So, in the new industrial context of shrinking profits, the imminent demise of the CD as a commodity form, and the triumph of the MP3 file and the internet as the primary format and medium of music distribution, the demise of many large-scale recording facilities, at a purely economic level, was not surprising at all: as a kind of institutional corollary to the record industry. A recording facility like Sony Music Studios had come to be regarded as an appendage that had lost its *raison d'être*. (2012, p. 89)

Théberge also mentions here another major catalyst for this collapse; the ability for agents who wished to enter the field, to almost completely bypass established institutions, gatekeeping and processes. The large-scale recording studio had been rendered virtually obsolete with the miniaturisation and affordability of computer based digital recording equipment. In addition, artists could self-publish to a vast on-line global community, bypassing a century of foundational structures built by multinational companies to maintain power over the field and take advantage of the revenue streams available there. As such, these companies lost this power and suffered significant financial losses resulting in cut-backs and mergers (ibid, pp. 77-78).

But the important question to be asked here; was this really the demise of the music industries as some commentators reported it, or was it merely the demise of an outdated business model and the introduction of a new paradigm of music production and dissemination? The latter is strongly argued. As the new technologies began to stabilise in the form of on-line streaming platforms, global revenues increased in 2016 by 5.9% and this increase correlates strongly with an adoption of these platforms by consumers (IFPI 2017, p. 10). This situation would suggest the industry is rapidly adapting to this challenge and developing new strategies for increasing revenue.

What is also evident from this transformation is a dramatic shift in the structure of the field itself concerning power relations and the ability of the field to function. During the

downturn, there was a large increase in music releases accompanied by a largescale reduction in monetary returns. The global market became increasingly competitive during this period with a corresponding level of insecurity around job tenure that correlates directly with the increase in the use of hyper-compression. The more insecure artists became regarding the release of their product in such a competitive market, the more they resorted to hyper-compression as a mechanism to enter the market.

According to Csikszentmihalyi's systems model of creativity, the field consists of 'experts' who must have an acute knowledge of the domain to be able to 'recognise and validate [an] innovation' (1997, p. 6), that is, to know what is truly novel or of some importance to the domain. Another way of looking at this is that the field acts as a protector of the domain, and the domain functions only as well as the field can operate. Csikszentmihalyi argues that 'at times fields become unable to represent well a particular domain' (ibid, p. 45). He also adds that 'when a field becomes too self-referential and cut off from reality, it runs the risk of becoming irrelevant (ibid, p. 89).

An example of this can be identified in the diminishing position of power that the major and independent record companies held within the field of Western mainstream popular music, particularly in the decade between 2000 to 2010; the initial decade of the downturn mentioned. Many believed that the multi-national companies were too slow to adapt to the changing face of music production and dissemination and were obdurate in clinging onto the old business model of record contracts and physical sales. If we examine this from the perspective of Csikszentmihalyi's notion of the field within the creative process, we can say a number of things. Before the introduction of this technology, the field's role was largely performed by a field of experts from *within* the music industries, as this field also had a tight control on what was produced (see for example: Hirsch 1970). Major and

independent label record companies would pick the artists they deemed worthy and would supply the necessary resources to produce music recordings since the underpinning technology required was confined to expensive recording studios and economically beyond the reach of either the artist or the consumer. This was also the case with the publishing and marketing of music before the internet. In following this procedure, the consumer was largely supplied a *filtered* selection of music chosen by the record companies (field of experts); which certainly was the case from the 1950s to 1990s.

The pernicious increase in piracy (file sharing) during the late 1990s and early 2000s, followed by the increasing popularity of on-line publishing platforms (such as Myspace, SoundCloud, Bandcamp<sup>29</sup>, Beatport and YouTube), coupled with the democratisation of digital audio technology for music production, meant that the consumer (and the artists themselves) could effectively bypass the record companies, making them increasingly irrelevant to the field. As a result, their presence within the field diminished considerably, along with physical sales and the revenue these brought. Instead of these record companies, who solely governed much of the music that was available to the consumer, the consumer could go directly to the artist who could self-publish via the internet. In this way, the consumer became a dominant force within the field.

However, this change in the structure of the field also presented another problem that Csikszentmihalyi mentions. Without the role performed by the record companies, as a field of true experts that act as a filter to the *amount* of novelty introduced into the domain, the domain was flooded with music. Csikszentmihalyi asserts that this situation can be

---

<sup>29</sup> According to Bandcamp's website, the platform has been instrumental in fans paying US\$237million to artists directly for music purchases. <https://bandcamp.com/artists>

dangerous to the domain; ‘in order to survive, cultures must eliminate most of the new ideas their members produce. No culture could assimilate all the novelty people produce without dissolving into chaos’ (1993, p. 41). If we consider economic revenue as an indicator of the health of the domain of the Western mainstream popular music, the damage done by this unrestricted influx of “novel ideas” to the domain is illustrated in the number of releases compared to revenue received. In the United States alone, Lunney points out that ‘SoundScan estimates that the number of new albums released increased from just under 40,000 albums in 1999 to a peak of over 100,000 albums in 2008’ (2014, p. 292). However, in the same period the decline in revenue was astonishing; ‘music sales have fallen from a peak of nearly US\$20 billion in 1999 to just over US\$7 billion in 2011 - a decline of roughly sixty-five percent’ (ibid).

Michael Romanowski takes a position that directly agrees with Csikszentmihalyi concerning the performance of the field. Romanowski believes the removal of the experts who filter the novel ideas that enter the domain has caused considerable damage to the domain. One of the biggest problems he states is the increased competition in an overcrowded market with little oversight on who really should be in attendance (i/v, 2015). This then of course created the situation whereby loudness becomes the veneer of legitimacy.

Therefore, as a consequence of this influx of music into the market place, coupled with decreasing revenues, an atmosphere of intense competitiveness was created within the industry amongst agents who now had to struggle harder to have their product heard above the now crowded playing field. This competitiveness then developed into a deep sense of insecurity about the maintenance of their positions for both artists and the

associated agents involved in music production and dissemination. To get heard, they turned to hyper-compression to make their product as loud as possible so that during the first moments of the audition process they had the best possible chance of attracting attention. However misguided this insecurity had become, it had manifest itself in the peak of the “Loudness War”. Similarly, however neurotic agents had become regarding loudness – what colourful Melbourne mastering engineer Tony Mantz had termed as ‘loudness anxiety’ (i/v, 2016) – the “louder is better” paradigm still led to some degree of legitimacy for these concerns.

## 6.2 Gatekeepers

Gatekeeping plays an integral role in the field. Sawyer describes gatekeepers as ‘the intermediaries of the field that legitimize certain works as creative and deny that status to others’ (2012, p. 215). Furthermore, what Sawyer depicts as intermediaries is extensive, encompassing just about anyone who is involved in the decision-making process of whether something is worthy or not worthy of interest (*ibid*). In other words, he is talking about the field. Sawyer also ties the concept of the intermediary neatly into Rogers’ diffusion of innovation process by maintaining that Stein, ‘who was one of the important first-wave creative researchers’ incorporated the adoption rate of an innovation by the social system into this definition; early adopters – early majority – late majority – late adopters (see *figure 4.5*). It could be presumed that Stein considered this adoption rate as being commensurate with the field’s ability to function, that is, their ability to communicate an idea, or the degree of interest that the novel idea has generated within the field. Rogers himself looks at gatekeeping as ‘controlling the flow of messages through a communication channel’ since restricting the flow of communication would undoubtedly restrict the flow of information that informs the field of the novel idea (2003, p. 155).

It could therefore be argued that this broader scenario provides a much fuller interpretation of the notion of gatekeeping than Bourdieu who looks rigidly at this role as a form of consecration – agents who hold positions of power (cultural legitimacy) within the field to perform this function; and then of course Csikszentmihalyi, who believes normatively that the field must be a field of *experts* whose decisions should be in the best

interests of the domain (1997, p. 45; 1999, p. 315). It could be considered that within the field of Western mainstream popular music, the levels to which gatekeeping occurs is expansive and not limited to either Bourdieu or Csikszentmihalyi's understandings.

For example, it will be argued that the program directors of commercial radio stations act as powerful gatekeepers to one of the most essential forms of dissemination of music and yet their priorities may not in the best interests of the domain of music, but their own economic agenda in the field of radio. Similarly, the transformation from record companies occupying a key position in the filtering of music that enters the market – a role that is based upon its own economic risk assessment (Frith, 2001, pp. 46-47) – to a broader role played by the prosumer and consumer, has enabled new emerging genres of music that *have* benefited the domain. This has of course come at some considerable cost as previously discussed in section 6.1. What is evident, is that whoever makes up the field, whatever their function and their agenda within Western mainstream popular music, it is difficult to place a boundary around, especially considering that the audience also plays a significant role. Csikszentmihalyi recognised this problem and highlighted that the 'public at large' can override the field of experts (1999, p. 324). He uses the analogy that 'if New Coke is not a part of the culture, it is because although it passed the evaluation of the small field of beverage specialists, it failed to pass the test of public taste' (ibid).

As enticing as it may be to expansively explore the role consumers play as gatekeepers – who arguably hold the most powerful role within the field of Western mainstream popular music – to remain within the scope of this research project, the role played by radio and record companies as gatekeepers remains the primary focus of this section. As mentioned above, these gatekeepers do not necessarily have the domain's best interests at heart. They

traditionally operate at a strategic economic level and loudness has always been used as a mechanism to influence decision-making processes. They also represent two primary gatekeeping roles that have operated since the inception of Western mainstream popular music in the early 20<sup>th</sup> Century.

### 6.2.1 Radio Program Directors

McIntyre states that ‘one significant constituent form of cultural and symbolic capital occurs in the intersection between the fields of radio and popular music production’ (2006, p. 450). It is well documented how critical this symbiotic relationship is, particularly to the exposure of artists and their music to a broad audience (see for example: Frith 2001; Strasser 2009 and Théberge 2012). Negus contends that radio stations:

...provide one of the most important promotional outlets for popular music, setting agendas for record companies and radio stations throughout the world, and exert a further influence on the type of music recorded and the way in which artists are acquired, developed and presented. (1992, p. 101)

Wikstrom argues that ‘record labels which are producing music aimed for the top-40 music industry are heavily dependent on commercial radio stations for the promotion of their artists and music’ despite the transformation the industry is undergoing as far as internet technologies and the changing media for delivery (2013, p. 53). This dependence on radio stretches back to the early days of radio broadcast and the inception of the top-40 format after the golden age of radio in the thirties and forties, and the introduction of television in the USA. Though, as McIntyre points out, a shift from the “taste setting” celebrity DJ to the all-powerful program/music director occurred during the 1970s when radio stations adopted a rigidly formatted style. With this shift of power in the field of radio, these new agents became the ‘central decision makers’ in what music a radio station

would play (2006, pp. 451-452). To say that radio airplay is crucial to the possible success of song, particularly with new artists, is a distinct understatement:

On the promotional battlefield, where record companies are competing for limited amounts of airtime, it is often the new artists and releases that die before even being heard by the public [...] the production of musical material, and the momentum which is often built up in the early stages of a marketing campaign, can be brought to a halt if the artist cannot get airplay. (Negus 1992, pp. 101-113)

Therefore, convincing these directors that a particular song is worthy of airplay is a fraught exercise in negotiation where huge amounts of capital expenditure, and the jobs of record company personnel are at stake (Frith 2006, p. 46).

McIntyre theorises around the selection criteria these directors would adopt that include a range of processes such as ‘gut instinct’, ‘vibe’, referrals from other staff members and methods more associated with market research (2006, p. 456). What McIntyre fails to take into consideration entirely, however, is the effect that loudness has upon the audition processes when multiple songs are presented at the same time for scrutiny. This audition process may only last a very short period per song and loudness may be the initial criteria by which a first impression is made. As Bob Ludwig elucidates, this had a distinct influence on the production practices dating back to the days of the vinyl 45’ record:

When I first got into the business and was doing a lot of disc cutting, one producer after another wanted to have his 45 sound louder than the next guys so that when the program director at the top-40 radio station was going through his stack of 45s to decide which two or three he was going to add that week, that record would kind of jump out to the program director, aurally at least’. (Quoted in Seigel 2009)

During this period of the 1960s-70s that Ludwig describes, record companies would also send out compilations of all their new tracks to radio stations on a single compiled LP. When either the producers or the artists would listen to these compilations ‘if their song wasn’t the loudest one on the record, they would call the mastering engineer and have

them raise the level so they could be competitive’ even amongst artists from the same label (Donahue, 2010).

These program directors who wield a significant level of power in what a radio station may play, are inundated by both record company personnel, artist management and radio “pluggers”<sup>30</sup>, all vying to impress upon them their artists and their songs. Program directors may have 100 songs to audition per week for only a small number of potential slots. Competition for these slots is intense. Sean Magee presents first-hand experience of a radio plugger attending a mastering session that best illustrates this dilemma:

I’ve had radio pluggers attending a session and they say, “It’s got to be loud”. He said the reason why it has to be loud is because, “I go into a room about this size and there’s a guy in there who’s the program director, he’s got a shitty little stereo and a pile of CDs and he’ll put it on, and if it’s not loud, or as loud as the other ones, he’ll go, “No, it’s not happening”. But you think, “well, actually, you’re being fooled by psychoacoustics”. (i/v, 2015)

Jonathan Wyner alludes to how common this mindset of using loudness to influence the first impression of the program director by stating:

And so, I guess the analogy in radio is... the program director or music director, whoever’s responsible for making those decisions. So yeah, if it’s a matter of getting a quick, good, strong first impression. That’s where it’s got to happen. (i/v, 2015)

To add to this, Scott Horscroft, believes the first 30 seconds of the decision-making process is crucial and loudness is a dominant factor in this process:

You’ve got to capture them within the first 30 seconds of the track really, and especially for a radio plugger who’s taking in a few songs at that point and the artist that you’re working on, you definitely want the track to leap out. (i/v, 2016)

---

<sup>30</sup> A radio “plugger” is a common description for an agent that acts as an intermediary between the artist/record company and the radio station program director. These pluggers charge large fees to companies for access to the station program directors and a favourable introduction. Negus states that ‘although used initially to relieve some of the workload from record companies, independent promoters have become very powerful organisations which mediate between the record company and the radio station’ (1992, p.107).

Despite the nature of the connection between radio airplay and the success of music releases, it is interesting to consider whether radio “gatekeeping” actually qualifies as an example of what Csikszentmihalyi classifies as “field”. Csikszentmihalyi’s systems model of creativity details that the field is ‘made up of experts in a given domain whose job involves passing judgement on performance in the domain’ (1997, 42). The point here is that program directors from commercial radio stations who are essentially of the field of large-scale production, are heteronomous to the field of power (market forces), and do not necessarily make selections according to what is best for the domain of Western mainstream popular music. The commercial stations make decisions according to what satisfies the particular format that the station identifies as, whether it be top-40, rock or “easy listening”. These decisions are largely made with the aim of attaining high ratings which in turn attracts advertising revenue, which could hardly be considered in the best interest of that domain.

These decision strategies made by radio station may even exert undue pressure on agents and as such, the boundary between field and agent becomes blurred. Radio influencing the way music is constructed and produced, including the way recordings sound is nothing new, particularly in the commercial realm. Sawyer makes the point that radio and music have had a tightly knit symbiotic relationship since the origins of top-40 in the 1950s in which the economic aims of both parties are ultimately complementary (2006, p. 230).

Sawyer contends that:

...much of popular music is created to respond to the demands and tastes of radio listeners and major advertisers. If a radio station attracts more listeners because they like the songs that the radio station is playing, advertisers will pay more money to the station to advertise to those listeners. (ibid)

In the case of country music, Sawyer goes even further to suggest that radio could be considered an agent in the creative process due to the influence of advertisers in that ‘the companies that pay for advertising time on country radio are the people who really control what gets played on country radio. In a sense, they’re the creators of country’ (ibid).

Arguably the most influential person in Australian radio for new acts is music director and presenter, Richard Kingsmill<sup>31</sup>, who in 2017 stepped aside after 14 years as music director at Triple J to oversee and co-ordinate a team of music directors for all three related stations<sup>32</sup> (The Music 2017). The autonomy that Kingsmill and his team possess concerning selecting new acts to feature on Triple J is considerable but has, however, attracted negative attention and the team has been referred to by some as the ‘Triple J Mafia’ (Fitzsimons 2014). Because the station has a national presence and is viewed as the only platform of its kind outside the mainstream stations which strictly vet acts based on their format and demographic potential, Triple J is viewed as the only credible alternative in Australia. As one anonymous musician is quoted as saying:

It really is shit, it really is frustrating. I talk about this with nearly every musician friend that I've got that there's no other station that's up there with Triple J. (quoted in Clarke 2014)

In 2014 the Sydney Morning Herald ran a story by Nick Clarke with the by-line of ‘Triple J is a powerhouse supporter of emerging talent but there are rising fears it may also be behind the homogenisation of Australian music’ (2014). This is obviously suggesting that Australian music is being overtly influenced to the personal taste of Kingsmill et al.

---

<sup>31</sup> Kingsmill was awarded the Best International Music Director at the 2012 Worldwide Radio Summit in Los Angeles (All Access Music Group 2012).

<sup>32</sup> The Australian Broadcasting Corporation (ABC) have two other digital radio stations apart from the terrestrial FM station Triple J which are offshoots, being Double J (for an older demographic) and Triple J Unearthed (for unsigned artists).

Essentially, the story outlines that Triple J (and Kingsmill) had amassed too much influence on the Australian indie music scene, forcing acts to adopt what they considered to be the “Triple J sound”:

Triple J is perhaps the most discussed, divisive station in Australia's musical landscape. Paradoxically, it is also the most supportive of emerging Australian artists, with an average weekly reach of 1.8 million listeners across the country. Theories about every aspect of Triple J's policies and operations are debated endlessly in bars, offices and rehearsal studios. But the single accusation that leaves the worst taste in musicians' and music fans' mouths is the suggestion that musicians are ignoring pure self-expression in favour of manufacturing a sound to get played on the popular station. (Clarke 2014)

Station manager, Chris Scaddan immediately rebuked this notion by stating that the station was not looking for any particular sound, but what resonates with their audience:

We'd much prefer bands to go out and find their own style. There are so many exciting new artists out there at the moment, doing their own thing and making something quite unique, it's really exciting. We're never looking for one particular sound, we're looking for songs that stand out and resonate with our audience. Basically, we're looking for good music, as shown by the range of artists and styles currently played on Triple J. (quoted in Fitzsimons 2014)

Australian music producer, Lachlan Mitchell, believes that despite this assurance by Scaddan that songs are not selected according to a particular “Triple J sound”, it most likely is and a significant aspect of the auditioning of that sound is loudness:

In Australia, we don't have many outlets for new music by young people, so we have Triple J which is the national broadcaster, that I think, perhaps unknowingly picks a lot of music that is quite loud and has this “exciting sound”. I think that's a problem because what people in positions of authority think is cool and hip is a very narrow scope exhibiting these very shallow characteristics, and quite often not much more [...] The proof's in the pudding. The songs that are being selected are those loud ones, so we've set the standard and then that's what has to be met to make it to the next one. And I think that this was the big argument with Triple J in Australia, was people tailoring their music to fit with whatever they thought radio wanted, and then them saying, “we don't actually want any of that. We want you to do what you normally do”, but the songs they're picking aren't necessarily reflecting that ideal much the time. They're picking this music that sticks out or conforms to those styles that use loudness as a blunt instrument. Beyond the acoustic songs that get their occasional [play] on radio, which I think is great, that's about the only relief from that “in your face” barrage. (i/v, 2016)

Despite Scadden's claim that Triple J does not intentionally strive to influence the way artists present their music in the hope of airplay, there is ample historical evidence to the

contrary. Artists have been tailoring the presentation of their music via mastering to fit more correctly into what they *believe* that Triple J represents on air since the onset of the Loudness War.

Veteran Australian mastering engineer of Benchmark Mastering, Don Bartley, developed a style that particularly suited radio in the 1990s that he became well known for, especially for Triple J. Artists would master a version that was more suitable for the context of an album and then create another that was either more or less compressed, equalised differently and/or edited shorter if it was longer than 3:30 minutes, the typical length that was considered appropriate for airplay. Bartley sees radio as driving a lot of the loudness *myths* during the initial period of the Loudness War in Australia; a louder recording will sound louder on radio. This separate master became commonly known in Australia as the “radio edit”, and there could be a number of these separate masters that would be tailored individually to cater to different stations and their format. As Bartley explains:

A&R people were definitely listening to what the radio programmers were saying. Radio programmers would go – I remember at the time even Triple J was saying this to people – go and get it mastered properly, we’re not going to play that [...] The only point is if you want to impress somebody like the radio programmer, then we should give them a different version. Almost go, “if you’re going to play it, here’s the radio version”. (i/v, 2015)

What Bartley means here by “go and get it mastered properly” really means in many cases, go get it mastered “loud”. Although Bartley is widely but anecdotally credited with the “radio edit” in Australia, Negus states that this was a common promotional strategy, particularly in the United States where radio was fragmented into definitive formats that proved problematic in getting airplay; ‘A further tactic which record companies may adopt is to record and produce a number of mixes of the same song and promote them to different formatted stations’ (1992, p. 104). It also was common for record companies to

liaise with the program director of the time at Triple J in Australia as to what changes to the song could be made to make it more Triple J “friendly” (McIntyre 2006, p. 454).

However, there is an irony at play here. Since loudness may be a mechanism to influence the program/music director at the initial stage of gatekeeping within the radio paradigm, Bartley would be the first to admit that excessive hyper-compression does not make the song actually sound better – or louder – than others once it has been processed through the radio stations excessive processing on its output. Radio stations commonly use a range of compression processing to create the “station sound” which is generally excessive for a variety of reasons. Predominately, it is for the very same reason that artists compress records; to attract the audience’s attention. This use of excessive hyper-compression on radio station output so they are the loudest station “on the dial” is reported comprehensively by Milner (2009, pp. 267-278). According to many of the subjects interviewed for this research project, they believe that hyper-compressed recordings sound worse when transmitted through the stations hyper-compressed output; they are essentially double hyper-compressed.

Bartley found that getting the correct equalisation that enhanced the energy of the song as opposed to excessive compression was the key to his radio edits sounding so good on radio. For many years he worked closely with the engineers at Triple J, mastering content that was recorded by the station so it was ready for airplay. Bartley says that it was during this period that he came up with the “J-curve” – a specific equalisation for Triple J:

Well I used to do a lot of stuff for them and we invented the J-curve. Well it’s that energy thing again because most of their bands are guitar orientated and indie bands so we basically went for that mid-range energy sound, the clarity in mid-range and energy. Well the people I worked with, Phil McKellar, he and I worked a lot together on a lot of their stuff when he was at Triple J. He did a lot of their “Live at the Wireless” and all that stuff and we used to

master it for Triple J and that's where the J-curve came in because we made it sound energy efficient if you like and clear for their transmission. (i/v, 2015)

But it wasn't only about the equalisation that made recordings sound better through the heavy processing of radio station output. Bartley also learnt that excessively hyper-compressed recordings worked counter intuitively through this process and it was better to reduce the compression level rather than increase it. This ethos, in combination with the equalisation he had discovered, provided a result whereby recordings sounded more impressive and louder than the excessively hyper-compressed recordings on radio. Bartley provides a compelling account of one experiment he conducted with the famous Australian act, Cold Chisel, which illuminated this discovery. After remastering 'the whole [Cold Chisel] catalogue', a competition was to be held at commercial radio station Triple M (Bartley i/v, 2015). Listeners were asked to call in and those that were able to choose the remastered version of songs in a comparison to the original version would win the box set. However, in a test prior to the competition going to air, it was discovered that the newly mastered and very loud version 'sounded really bad' once it was processed through the station as compared to the original which had no hyper-compression (ibid). Hence, it was more likely that listeners would choose the original version, and no one would win the competition, to considerable embarrassment.

UK mix engineer/producer from Assault and Battery, Alan Moulder, agrees with Bartley that lower level recordings sound much better when processed through the radio processing although Moulder does not mention equalisation. He uses a particular mastering engineer that has an understanding of this problem and as such, reduces the

level of the singles that are destined for radio by as much as 3dB to overcome this problem of double hyper-compression – again a separate version for radio:

I use a mastering engineer called John Davis a lot from Metropolis. I like it that he gets volume. He understands how to make things loud and that it's a necessary evil, but when he's doing a single, rather than make it louder he makes it quieter. Because both of us find that when it's a really loud rock record particularly, it sounds quieter [on radio]. It hits the limiter so hard that the track ends up sounding a mush and ends up being quieter. So, he does them 3dB quieter. The first Foals single from the last album, I thought sounded great on the radio and just as loud as everything else. He said he had to drop it 2 or 3 dB because he said it works with the limiters better. (i/v, 2015)

Björn Engelman, senior mastering engineer and owner of the Cutting Room in Stockholm, Sweden, believes that record companies are under a misconception that loud masters will sound better and louder on radio. He states that the process is counter-productive, and not only does it make the recording sound softer, it is deleterious to audio quality in general:

[It's] a misunderstanding of almost every record company, that for radio purposes we should have a master that is very hard limited and compressed, which is actually the opposite of what it should be. If you look into the most commercial channels where they use brick wall limiters, and other kind of limiters and compressors to narrow the dynamics. If you put a compressed and hard limited master into that chain it doesn't add any quality at all. It only trashes it even more, and makes it sound lower than the stuff which is not so compressed. So, it's backward and contra-productive in those terms. (i/v, 2015)

As a consequence of this phenomenon, Michael Romanowski finds it important to therefore advise the client wherever possible to avoid potential problems down the line in transmission. His opinion echoes Engelman in that the louder you make the master, the smaller it sounds on radio:

“Well I want it to be loud so it sounds good on the radio”. Well ok, I'll tell you what, the louder you make it, the smaller it is in actual dynamic range, therefore on the radio with their multiple compressors going on to even things out and up their transmission rate, it actually makes it sound smaller. (i/v, 2015)

In addition to sounding small on radio, William Bowden similarly believes that hyper-compression alters the natural progression of dynamic variability and the result can be extremely undesirable on a musical level:

The verse was way louder than the chorus on radio because the compression just grabbed it and smashed it and I remember thinking to myself, “that’s actually a great example of never to go there”. (William Bowden i/v, 2015)

The irony that that loudness may be a mechanism to influence the program/music director but works counterintuitively once it goes through the radio processing is not lost on American mastering engineer of Digital Domain, Bob Katz:

But what’s funny is, it’s interesting to hear that radio programmers are a wall to get through with this problem. Because, we’ve discovered, some of us, in the last couple of years, that if your master is semi loud but not as loud as can be, it actually sounds better on the radio. Yeah, so it’s funny that the programmers don’t get that. (i/v, 2015)

It may well be that the mindset that louder recordings will translate to sounding louder on radio is a myth that in reality has the opposite effect. However, as argued, the “louder is better” paradigm is apparently active in swaying the program director during the audition process. Similarly, there has been speculation as to a connection between ‘loud’ masters and sales figures of music, reinforcing ‘the belief that increased loudness will translate into additional sales’ (Vickers 2011, p. 346). Viney analysed 30 recordings from the UK charts and concluded that ‘there is no evidence of any significant correlation between loudness (and implied compression) and commercial success’ (2008, p. 54) and this ‘encourages further research into the “actual” factors determining success’ (ibid). He does however make the point that sales success is ‘closely interlinked with radio and TV airplay’ (ibid p. 55). Viney states that the loudness of the music track may significantly influence the decisions made by these broadcast companies as to what tracks will be

featured but does not affect the audience's opinion directly (ibid). Vickers discovered a similar result for the US Billboard charts. He concludes that, 'in general, content trumps loudness' (2011, p. 350), but there is the 'possibility that the various music industry gatekeepers, who decide which songs get airplay and other types of promotion, may demand hyper-compression due to a firm belief that consumers prefer louder songs' (ibid, p. 349). This supports Viney's assumption that loudness could contribute to the success indirectly by attracting support from the industry gatekeepers of the field. It seems that there are multiple myths associated with loudness that perpetuate its perceived importance in production practices.

### 6.2.2 Artist and Repertoire (A&R) – The Transformation of a Business Model

Similar to the role of the radio programming director, the A&R (Artist and Repertoire) agent's position within a traditional record company model is 'the first strategic checkpoint in the preselection process' of an artist and their music (Wikstrom 2009, p. 55). They are also responsible for both guiding the artist's careers to possible success and also within the record company itself. As Frith explains, the record company can be split into two areas in dealing with artists, being A&R and marketing (2001, p. 46). Both areas work together on the release of records and within the record company, Frith maintains there is 'a culture of blame' if the product doesn't sell; 'when a record fails [...] it is routine for one department to blame the other' (ibid, p. 47). Frith goes further by suggesting that 'to begin with, although the industry presents itself in risk-taking terms, and it's true that every release is a kind of gamble, in day-to-day practice what this means is a strategy of risk avoidance' (ibid, p. 46). Therefore, the position of the A&R agent is

defensible only in accordance to the success of the releases they are responsible for. If they pick artists that fail and incur considerable financial losses, they are likely to lose their job. For this very reason, the A&R person is very cautious about which artist they put forward to the record company to “sign” a recording contract.

As a result of this risk avoidance strategy, the A&R agent (or team of agents) are notoriously difficult to persuade to take on such a risk with a new artist. During the initial auditioning process, the loudness of any recordings presented is usually considered highly important at this stage. As American producer/mix engineer Rob Chiarelli suggests:

The reality of the business—and everyone will hate this—is that the louder record wins. I’ve never heard a quieter record win in an A&R meeting. (Quoted in Harvey 2015)

Again, similar to the radio programming director, the A&R agent may have a range of artist’s songs presented at one time and as Jonathan Wyner suggests, the first 20 seconds is important in making that initial impression. As such, loudness is crucial to this process:

The A&R office is the place that’s pointed at most frequently where you’ve got about 20 seconds to impress the A&R executive before they move on to the next record and if they’re only listening for 20 seconds, you know, there’s only a couple of things that they’re going to notice, which is how attractive the person in front of them is and how loud the record is. (Jonathan Wyner i/v, 2015)

As a counterpoint to the scenario mentioned which could be described as “traditional” A&R processes, Scott Horscroft, General Manager of A&R of EMI Australia, provides a compelling insight into working with artists from within a social media-based paradigm. Horscroft maintains that the loudness of the recordings he initially receives from the artists has very little influence on his decision-making process at this stage. As part of Horscroft’s risk avoidance strategy, he readily admits that an artist who already ‘has

millions of Twitter fans, millions of YouTube fans’ is more attractive as a potential roster artist in which he states, ‘I mean it’s a given’ (i/v, 2016). As such, he believes that it is not until the music is ready to be released that the significance of loudness becomes apparent to which its importance is then amplified due to the new business model of promotion via social media and dissemination via internet platforms.

Horscroft’s career originated in music production as a successful producer and then moved later into an A&R position. Therefore, he has the relevant habitus to understand how to get an artist produced to a level where the product is suitable for the music market. Currently, Horscroft and his team are working on internationally successful acts such as Alison Wonderland, Empires of the Sun and Troye Sivan. Horscroft believes that the record company model is going through a stage of transformation that is largely influenced by the internet and surrounding technologies. He is surprisingly upbeat and sees it as an exciting time for artists who can think more globally than ever before with the immediacy and reach that the internet now provides:

The whole model is changing, and I think that if we continue this way, I think it’s really exciting. I think things changing and innovation changing the way that we do things is a really exciting thing. And I think one, it’s enabling artists to get their stuff out there with or without the same means of distribution that a major record company does, which that never would have happened in the fifties and sixties. You needed record company’s distribution and big money behind you to get that exposure. Whereas now with socials and streaming and so on, you can, with good promotion, do the same thing that major record companies are doing. (i/v, 2016)

Despite much evidence that loudness is important in the audition stage of selecting artists by A&R, which is most likely the case in many other scenarios of audition, Horscroft in this discussion concentrates on the process once the artists have been selected. Working with artists, Horscroft believes that loudness only becomes a consideration during the later stages of production. Prior to this, during what he calls the “demo phase”, he

maintains that the songs themselves are the primary concern and whether they can envision the music having a place within this new market:

I don't think we're kind of too worried about the demo phase. We know that we're going to jump in and work on it after that. I think there's certain things that you're looking for from a demo which is their ability to write great songs, being one. The production, have they - for instance, if you know this artist and the plan is for you to get them on commercial radio, then have they got the right production? Are they up-to-date? Are they referencing the right things that are working at that time? (ibid)

However, once the music has been recorded and produced, loudness then becomes a significant concern for the songs to be able to be competitively loud within this market:

But, in terms of the final track that comes in, I think yeah - I would be concerned if it was very quiet. In terms of final mixes and final production on our artist's work, we want the best for it. So yeah, we are looking for that, you know very present, vocals, the keys, you want that right up there and you know sounding as modern as possible, which is loud and over compressed. (ibid)

Loudness, in this social media paradigm that Horscroft mentions, still plays a vital role in getting past the gatekeepers of radio, streaming and also in other areas of the media. Horscroft maintains that the recording must be sonically pushed as far as it can to immediately impress the gatekeeper:

The brightness and the dynamics, it's kind of wall to wall these days. The bottom end, pushed as hard as it can. Top end pushed as hard as it possibly can without sounding ridiculous. So, you definitely want to have all of those attributes in the track that you're taking to radio to blow them away. (ibid)

Another important point raised is the speed at which internet culture “processes” information. Promotional campaigns are now concentrated on what Horscroft terms “socials” (social media) instead of more traditional media outlets such as print which are now seen as ancillary. As such, he believes that single tracks, or “singles” as they are referred to, act as advertisements for an artist which represents a shift away from the album concept – a group of songs:

One, I think it's the internet. I think, even with a lot of our artists, socials, Facebook, Instagram, Twitter... the events move so quickly through people's attention, and I think that it is just so fast these days that to put the emphasis on an album all the time, it's like it's over so quick. Campaigns are quicker than ever. So, to be having events, social events, or trending events or being in people's focus for that moment, a single is often the best way to do that. I think just financially and time wise as well. (ibid)

Concentrating on albums instead of singles tracks was a feature of the listening experience before the “playlist” era of personal media devices (PMDs) and this has had a significant impact on the use of hyper-compression (discussed in section 6.5.1). With the shift towards downloads and streaming, and the artist having to develop a presence on the internet, there was also a shift away from albums to a series of singles in which short but intense promotional campaigns could be based around. This, Horscroft believes, makes the process cost effective within the short time frame that the internet culture allows. In this paradigm, loudness therefore becomes of even more significant because these single songs are then formed into playlists (of the consumer's favourite songs) in which there is a constant comparison between songs. As Horscroft explains:

I think with streaming, people are having even more control over their playlists and what they love to listen to. They can create their *own* albums. (ibid)

As previously mentioned, Horscroft maintains that the artist's on-line presence is one of the most significant aspects of the decision-making process they use to choose which artists they work with as this presents immediate opportunities for promotional campaigns. A large social media following presents a ready-made audience that the record company can access at nominal expense. This also makes it understandable why Horscroft does not consider loudness as an issue when they are searching for artists, as there are other much more persuasive considerations. Referring back to what Frith describes as ‘a strategy of risk avoidance’ (2001, p. 47), choosing artists that have already proven to be

marketable on the very platform they intend to use makes sound financial sense. This on-line presence is then capitalised on through a multitude of on-line streaming platforms that also include videos, blogs etc. as well as the music. Traditional outlets such as terrestrial radio still form an integral part of this process alongside featured exposure on streaming platforms. Terrestrial radio plays an important role domestically, while exposure on streaming platforms also presents global opportunities as these outlets have a world-wide reach. Therefore, there are more gatekeepers that must be convinced in this scenario than simply the radio program director:

The promo teams are still working with traditional radio stations but they're also working with Spotify, and iTunes and how to get as much coverage on those outlets as possible. (ibid)

It is here that loudness plays a significant role. As Horscroft states, the recording must 'blow them away' in how loud and exciting the song presents itself (ibid). This situation means traversing the worlds of traditional terrestrial broadcast to web-based narrowcasting in gaining exposure to a mass audience. The same gatekeeping processes are evident in getting featured spots on streaming platforms similar in effect to gaining high rotation airplay on radio. Although Horscroft maintains that "'à la carte" [...] your own "pick and buy"' from download sites such as iTunes Music Store is still holding on in Australia. However, he contends that 'I think we're in a real big transition period at the moment with streaming becoming the main focus' (ibid). This situation has provided challenges that record companies are slowly working through, but he sees it as inevitable that streaming will overtake all other formats but admits that it's nowhere near that point at present:

I don't think the streaming model has reached its full potential. And I think with the other two on a steady decline all around the world [CD and downloads], it's kind of like a race game to get everyone set up and ready for this new kind of format. And are we there yet? No, I don't think so. (ibid)

In terms of loudness normalisation and how this may be the catalyst that will contribute to phasing out the use of hyper-compression, Horscroft is doubtful it will have any immediate impact on practices, or in changing record companies' attitudes to the final product they release. He states that it is 'a really positive thing' to go for 'a standard that is as high quality as can be' but considers there are other factors that are more important at present than considering reducing the compression on recordings (ibid). Maintaining positions within the market place during this transition period is more important according to their "strategy of risk avoidance".

### 6.3 The Consumer

The consumer, or audience makes up an enormous and very influential part of the field in western mainstream popular music. The example provided with Metallica's *Death Magnetic* (section 5.2.3) where over five million copies were purchased by the consumer far outweighed the resolute rejection of the album by a comparatively tiny number of "expert" members of the field. It was mentioned that part of this consecration process, Bourdieu asserts that there are 'competing principles of legitimacy' which represent a disjunction between its [experts] own principles of evaluation and those that the 'mass audience' (Bourdieu 1993, pp. 50-51). Each group is looking at the cultural object from a different perspective. Furthermore, Bourdieu believes that the mass audience interferes with and threatens the hierarchy of other sub-fields that may consider themselves more qualified and therefore more legitimate (ibid, p. 116). Therefore, the way that the average consumer listens to music is also vastly different to experts of the field. What is communicated to this listener and the associated meaning-making process in play comes from an entirely different habitus to that of the expert.

From previous research, we have learnt that the average consumer who makes up the larger share of the global audience appears unable to discriminate between even large magnitudes of hyper-compression when the music is loudness normalised (see for example see: (Hjortkjær & Walther-Hansen, 2014; Ronan et al. 2016; Taylor 2018). Also, due to the multi-dimensional nature of music, the decision-making strategies between the average un-trained listener and the expert listener is vastly different (Ronan et al. 2014b; 2016). We can view music as a form of communication that evokes abstract responses in

the process of meaning making and as such it could be argued that musical content means more than the way it sounds. That said, we also know that a 10dB increase in loudness can significantly influence preference (Taylor 2018).

It could also be argued that the consumer has little knowledge of how recorded music is made or the processes used. The consumer is simply responding to what they hear from a naïve perspective and connecting to the music on a level of basic communication, including pitch, melody, rhythm and lyrical meaning. On a more abstract level they may be able to connect emotionally with a combination of these elements. On a psychophysical level, they can distinguish between simple precepts such as loudness and frequency response (bass and treble). What they cannot generally discern is complex structures that a trained listener would be able to elucidate such as magnitude of compression, the origins of many particular sounds (they could be digital samples of acoustic instruments), subtle difference between genres etc. As such, Andrew Scheps highlights this issue by commenting that he believes that the consumer has no idea of what “loudness” is in a recording as a result of hyper-compression:

I do a lot of seminars, and I'll tell this to people who come to the seminars. The number of people who will hear a record you work on - especially if the record is successful who have any idea of what any of the tools you use are or what you do - maybe it's less than 1 per cent, half of 1 per cent, a 10th of 1 per cent. If you work on a popular record, everybody who listens to it doesn't know anything about making records. So, who cares what tools you're using or how loud you're making it because you want it to be louder. They're connecting with it because of what they listen to. And they have absolutely no idea what you've done to get it there. (i/v 2016)

Scheps indicates that when the listener is presented with a music recording they consider what they hear has been intentionally done and rarely question the way music is made unless there are specific elements the listener finds subjectively objectionable. This situation may be related to a preference for specific genres. For example, a listener may

not like the sound of violins and finds them boring. Michael Romanowski follows this line of thinking where the listener does not get caught up in the process but only the outcome:

Anyone buying a record thinks that that's intentional. They have no idea that's there's a budget, that there's writing, that there were rehearsals, there was relationships involved with the band members and then all of a sudden the bass player gets kicked out because he was dating the singer's wife... you know what ever it happens to be. Like you know, there are all these things... people they just put it on and they go "I like this, or I don't". So, the record is intentional. If we were intentional with putting it out completely slammed, they assume that's it's supposed to be. (i/v, 2015)

William Bowden is another agent who doesn't believe that the consumer can tell if music is hyper-compressed and when challenged in a mastering session with what he terms as 'crazy nit-picking' over loudness he then asks the question 'will it affect sales? And of course, the answer is always no. Of course not' (i/v, 2015). Romanowski goes one step further by arguing that since almost all mainstream music is hyper-compressed, the consumer also believes this is intentional and therefore the way music should sound. However, Romanowski also equates hyper-compression with the music shouting at the listener to be heard:

If we're shouted at and told enough times to have a white t-shirt, and that's what's cool to wear, we're going to start wearing a white t-shirt or whatever it happens to be, pick anything. We're competing for people's time and attention. There's so much media out there. And people think shouting is the way to do it. (i/v, 2015)

If music is shouting at the consumer, then there must be some reason for this to be happening, something that is more nuanced than a blunt marketing mechanism. We can look to the reproduction of music and how this changed the way we listen to music for answers. As previously mentioned, music has transformed away from being centric to albums, to a focus on single songs in which the consumer can then create their own

albums made up of many different songs of different artists. With the introduction of personal media players (PMDs) in particular, such as the iPod and its controlling software iTunes, the consumer has been able to construct their own playlists. Furthermore, the miniaturisation of PMDs and also the inclusion of music within smart phones had led to a burgeoning use of headphones which has also had an impact on the way people listen. All these factors have had a significant impact on how the field approaches the use of hyper-compression and were the focus of discussion for many of the interview respondents.

### 6.3.1 The Effect of the Playlist

We can date the concept of the playlist back to the jukebox era in which loudness first became a concern in the reproduction of 45rpm vinyl heard in public spaces. The playlist that is commonly referred to in present times is a prominent feature of Apple iTunes introduced in the 2000s, and more recently in music streaming platforms. Both of these examples enable the user to curate selections of individual songs most commonly sorted into categories corresponding to mood or interest. Due to the possibility of these songs originating from differing time periods, their level may change dramatically as some may be hyper-compressed and others not. There may also be smaller discrepancies between songs with different magnitudes of hyper-compression which appears to be more concerning to artists post-1990s.

This presents several problems. As previously mentioned, ‘nobody really wants to have a record that's not as loud as everybody else's in an iTunes playlist’ (Chris Athens quoted

in Smith 2008). When a song comes on that is louder than others it can present itself to the listener as being superior which is highly undesirable for the artist to which Plambeck is in agreeance:

With the rise of digital music, fans listen to fewer albums straight through. Instead, they move from one artist's song to another's. Pop artists and their labels, meanwhile, shudder at the prospect of having their song seem quieter than the previous song on a fan's playlist. (2010)

The second problem is that large shifts in level can cause considerable annoyance to the listener which interrupts the flow of the listening experience. Sean Magee asserts that level discrepancies between songs also interrupts the listening experience. When a song comes on that is quieter, there is a distinct reduction in sensation and excitement experienced by the listener:

But as soon as you start pulling individual tracks off and mixing them with other tracks, you then you have an issue where, "this track's louder and that one's quieter" and your whole vibe drops. (i/v, 2015)

This of course was a key issue with streaming platforms in which hyper-compressed and non-hyper-compressed music can be played concurrently. This issue represents the primary reason for the introduction of loudness normalisation to mitigate the problem by reproducing all songs at the same loudness level. It's important to note that loudness normalisation was applied for this very purpose and not as a solution to the use of hyper-compression. The latter is simply a by-product of its original purpose.

We can, however, identify that the former issue concerning playlists is one of the fundamental concerns that fuels the use of hyper-compression. Michael Romanowski maintains that he first recognised this problem arising during the era of CDs when "multi-stacker" players enabled the consumer to shuffle between songs of different CDs providing the first rudimentary form of digital playlists (i/v, 2015). This marks a period

where, as Romanowski highlights, more recent listeners became aware of the difference in loudness between recordings and attention was shifted away from the album.

As the playlist become an even more integral feature of contemporary listening practises due to this method of curation – representing an integral part of the music streaming paradigm – this situation further highlighted the importance of loudness normalisation. However, there are also other factors introduced that are a by-product of this form of listening that have had unintended consequences. We can look to how hyper-compression has changed the *way* we listen to music. There is an argument to be mounted where it is claimed that listening to music has become more passive inasmuch as music appears to have been pushed into the background of a listener’s attention. In conjunction with this alleged phenomenon, new modes of reproduction, such as earbud headphones, have also recontextualised music away from being a collective experience to one that is an individual “soundtrack” that drowns out external noise (Taylor & Miranda 2016). Whether this change is a natural progression due to shifts in reproduction technology or another casualty of the Loudness War is of some conjecture.

John Dent comments that ‘kids walk along with this phone blurting out some sound and that’s their only enjoyment of music’ and they might be unaware of any alternative (i/v, 2015). Dent points out that there is now a generation who have grown up with digital technology that has considered miniaturisation and subsequent convenience as more of a priority than quality. This scenario is certainly different to his own experience where he states that ‘there was, I think, a kind of thirst and hunger for sound in a way that just doesn’t exist now [...] they don’t want the kind of big amplifier systems with the volume knob, they just want something to stick in their ears or open on their laptop’ (i/v, 2015).

### 6.3.2 Headphones and Laptops

The shift in listener habits that are a direct result of the introduction of personal media players (PMDs) have meant that ‘Apple’s iPod and MP3 players in general have risen to cultural prominence in recent years’ (Beer 2008, p. 1). Beer claims that PMDs have ‘reconfigured and recontextualised’ music away from the physical artefact to the virtual and ‘moved it out across the spaces of everyday life, a process that transcends boundaries between public and private zones’ (ibid). Bull expands on this suggestion to assert that it ‘gives users unprecedented power of control over their experience of time and space. They do so by managing their mood and orientation to space through the micro-management of personalised music’ (Bull 2006, p. 1). This shift in audience listening habits also instigated a large market for headphones, and in particular ‘celebrity headphones’ creating a multi-billion-dollar market<sup>33</sup> (Feduka: 2011, online).

There are two issues that are important here. The first is that PMDs have moved the listening experience for most listeners away from the home to the noisy environment one experiences when in transit. This environmental noise acts as a masking agent that can interrupt the listening experience when sections of the music fall below the noise level (see for example: Bull: 2006; Hodgetts et al.: 2007; Beer: 2008; Epstein et al.: 2010; Levey et al.: 2011; Vickers: 2010, 2011; and Devine: 2013). It is thought that

---

<sup>33</sup> This was exemplified by the Beats headphone range of rap artist Dr Dre, reportedly sold to Apple Corporation for US\$3billion dollars in 2014 (Solomon: 2014, online). This propelled Dre to the top spot of Forbes magazine ‘annual list of musician millionaires’; confirming him as the highest paid musician for 2014 (Michaels: 2014, online).

hyper-compression is a way to combat this annoyance by relegating all sections of the music to exactly the same level. Therefore, this argument is presented as a benefit of the hyper-compression process, however, Taylor & Miranda could find no such correlation (2016). In their study which presented hyper-compressed and non-compressed music to subjects in the presence of significant environmental noise, the results indicated no significant preference for either (ibid, p. 7). They suggest that the dynamic variability of most contemporary music does not have sufficient range to present itself as a problem even before the hyper-compression process is added (ibid, p. 8).

The second issue is that many listen to music through the tiny speakers of a laptop, and in some cases, reference the mastering of mixes through this medium. The frequency response of these devices is limited and favour hyper-compressed recordings giving a false sense of auditory identity especially to the agent (artist) who may be comparing to other recordings. Lachlan Mitchell asserts that listening to music on these reproduction systems can mask the deleterious effects of hyper-compression and in some cases, can provide misleading interpretations of comparative loudness:

There's a disconnect, and I think that's a valid thing that there are people in studios, experts who can hear this stuff, and then when it goes out into the world there's a lot of scope for it to just be hidden. If people aren't really listening with great gear they're not really hearing these differences, I wouldn't imagine. And on headphones how *are* you going to hear it? (i/v, 2016)

When audio production personnel monitor music in a professional studio with professional equipment they are able to hear every imperfection within a recording and a significant part of their expertise is recognising such flaws and removing them. The aim is to create the best sounding result sonically. However, John Dent believes that the listener who reproduces this music on headphones and laptops are being denied access to

this full musical experience and this situation devalues the expertise of the audio production agent:

It's a different way of viewing sound you see. In some ways there's nothing wrong with it but if everybody does it, what it actually does it makes the jobs of all the dedicated recording technicians, all down the line, it almost makes nonsense of that. All this hard work going into making these great masters and very few people ultimately are experiencing that greatness. (i/v, 2015)

As such, Dent believes that the average listener has had their ability to discern quality audio considerably reduced due to these reproduction formats. Considering that the audience is largely represented as un-trained listeners, this situation would have serious repercussions in their role as part of the field:

I think people are... you know, they're slowly waking up to this kind of listening. We've been through a large number of years where everything has been dumbed down to some really silly level. (ibid)

Furthermore, Bob Horn asserts that as a result of the phenomenon, some mix engineers deliberately tailor the frequency response of the mix to suit reproduction through tiny speakers by accentuating the mid-range. This in combination with hyper-compression makes the recording sound better specifically for this type of reproduction:

Laptops, iPhones, iPads, Bluetooth speakers... and not actively listening, just putting on a song for background. That's what changes it all. I know mixers that intentionally EQ the overall mix so that the low mids and the lows come through on laptops better and when you listen through a HIFI system or a studio system. It's kind of like "ahh, the mix is not amazing". But then you put it on a laptop and it sounds good, because you can hear more of the full range that the laptop is trying to shave off. Which makes it sound better on a laptop. So, loudness has made it sound better on smaller speakers. More information is squeezed through if you will. (i/v, 2015)

Lachlan Mitchell agrees with this account by Horn and adds that laptops are routinely used to make judgement on loudness through playlist comparison:

And so they're comparing, they're just on a laptop and putting it into iTunes and then just saying, "Well, here's my favourite songs," and then going, "It's not loud enough". (i/v, 2016)

These accounts represent a compelling example of how the target reproduction system can affect the function of the field, production practices and also propagate the use of hyper-compression. If the target reproduction system of the consumer demographic is predominantly these systems with tiny speakers, then this situation would undoubtedly have an influence on the outcome of the product and its consecration. For example, Lachlan Mitchell describes a mastering session in which the attending artist chooses to rely on the familiarity of what the final outcome will sound like on laptop speakers as opposed to studio monitors that may have cost tens of thousands of dollars and are impeccably calibrated to the room, but not indicative of what the consumer will actually use:

I've done records with bands I've produced and had a beautiful mix, took it to mastering and one of the members of the band played it on his laptop against other songs. "Oh no, it's not loud enough." I tried to talk this band member out of this idea but failed, so it ended up just getting crushed into this little ball of sound to be loud on a one-inch speaker. So, these beautiful master mixes we had that just ended up just being shrivelled and the bottom end of it just got so tamed that it just sounded horrendous, and all for the fact that they wanted to sound good on a laptop speaker. I don't think this is unusual for some genres of music. (i/v, 2016)

Mitchell, like many other agents in music production, admits to using similar systems for reproduction himself but states that relying on them for anything apart from convenience means that the listener is missing out on many important aspects of the listening experience such as the emotive ones. He believes these laptop speakers should never be used as a definitive form of reference which was the case mentioned above:

I guess I do it, but I only use it as a work tool, as a convenience tool, but there are people who listen to music on their laptops almost exclusively, or ear buds which is just as bad probably. You're just missing out on a whole range of emotion in the music really, that's probably the most disturbing part of it. I don't have a problem with people listening to music like that, but using that as the go-to? (i/v, 2016)

It is evident, therefore, that the reproduction systems that have been an integral part of the miniaturisation of technology for the convenience of its user have come with unintended consequences. In the process, it has altered the listening experience of the consumer, as Susan Rogers contends, from active to passive background listening and significantly reduced audio quality by masking many sonic discrepancies such as hyper-compression (i/v, 2015). This in turn has also had a significant influence on the way music is produced in-line with these reproduction expectations. As Susan Rogers also asserts, ‘music functions differently today than it did a few generations ago’ and as such, production practices that were once suited to a different reproduction paradigm are being recontextualised. It can be debated that hyper-compressed music is part of that recontextualisation.

## 6.4 Conclusion

One of the major contributing factors to the propagation and reliance on hyper-compression as a commercial mechanism is the failure of the field to act in the best interests of the domain. The ability for the field to effectively negotiate novelty entering the domain is concomitant to the method of constituting the domain. Hence, there are several factors that were instrumental in a shift of power from the field of experts to the less audio-competent artists and consumers. We can identify technology as one of the fundamental catalysts of this shift in power. The internet and digital audio technology provided the means for agents to bypass traditional channels that had facilitated the filtering process of the field and as such, the domain was inundated with too much unassimilated novelty. The example was used that in the US, between 1999 and 2010, the number of music releases roughly tripled while revenue decreased by almost 65% (Lunney 2014, p. 292). Globally, revenues declined by approximately 40% (IFPI 2017, pp. 10-11). As mentioned, the increase in piracy during the early 2000s, followed by the adoption of on-line publishing platforms, coupled with the democratisation of digital audio technology for music production, meant that the consumer (and the artists themselves) could effectively bypass record companies, which made those companies increasingly irrelevant to the field. The record companies up to this time had acted as the field of experts who in large part, controlled what music entered the domain.

It was argued that this shift of power within the field was representative, not as the demise of the music industries as some may see it, but the demise of an outdated business model and the introduction of a new paradigm of music production and dissemination. With this

transformation came a deep-seated sense of insecurity for music makers as music was substantially devalued both economically and symbolically. What is also evident from this transformation is a dramatic shift in the structure of the field itself concerning power relations and the ability of the field to function. This large increase in music releases which was accompanied by a largescale reduction in monetary returns caused the global market for music to become increasingly competitive. This situation corresponded with a high level of insecurity around the potential success of the costly process of releasing music and the job tenure of those involved. It is argued that there is a strong correlation to this insecurity and the use of hyper-compression as a practice. The more insecure artists became regarding the release of their product in such a competitive market, the more they resorted to hyper-compression as a mechanism to enter the market.

Another way of looking at the field is as a set of gatekeepers. Sawyer describes gatekeepers as ‘intermediaries’ whose role is to ‘legitimize certain works as creative and deny that status to others’ and encompasses anyone who is involved in the decision-making process of whether something is worthy or not worthy of interest (2012, p. 215). Two types of gatekeepers whose role has been seemingly unaffected by concerns mentioned above are the radio program directors and record company A&R personnel. Both roles have existed throughout the history of mainstream popular music and are still currently considered extremely influential. Despite Viney asserting in his research that he could not find any direct correlation between ‘loudness and commercial success’, terrestrial broadcast performed a significant role with those that were successful. He believes that the loudness of the music track may significantly influence the decisions made by these broadcast companies as to what tracks will be featured (2008, p. 54). In agreeance with Viney, there is a commonly held belief that a louder recording has the

potential to positively influence the gatekeeper when they have many other recordings to audition. This is said to be relevant to both the radio program directors and record company A&R. More specific to radio, it was also commonly thought that a louder recording will sound louder during broadcast and therefore also influence the consumer. This positioning of loudness performing such a function has also been seen as a justification of the use of hyper-compression as practice, however, it was argued that the latter is most likely a myth that cannot be substantiated. Hyper-compressed recordings that are subsequently processed again through the radio station's output processing arguably sound worse than softer recording according to accounts of interview participants. Therefore, the use of hyper-compression cannot be substantiated as a method of gaining any advantage over competitors during broadcast. However, respondents agreed that loudness is still a key issue in influencing the gatekeeper in choosing the recordings to be broadcast and as such plays a distinct role in the propagation of hyper-compression.

Similarly, it was found that loudness plays a similar function in influencing the A&R director who, as Wikstrom argues, is 'the first strategic checkpoint in the preselection process' of an artist and their music (2009, p. 55). In the traditional sense of this role, A&R performs the same gatekeeping process as the radio program director and accounts by participants interviewed tend to correspond with the notion that loudness plays a role in influencing these agents. A profoundly important predication by Frith outlines that due to the inherently risky nature of releasing records, which he describes as 'a kind of gamble', record companies employ a 'strategy of risk avoidance' (2001, p. 46). This strategy of risk avoidance can be seen as part of the reliance upon hyper-compression as a pre-condition of preparing a recording for entry into the market. The insecurity

mentioned due to the transformation occurring within the field of Western mainstream popular music in general is seen as exacerbating the propagation of the practice of hyper-compression.

This strategy of risk avoidance was also strongly evident in accounts by Scott Horscroft. Despite commenting that loudness now plays a lesser role in the audition stage of finding artists as opposed to artists who already have an existing on-line presence, it still plays a significant role in the final product that is designed for the new paradigm of dissemination via web-based channels. Horscroft believes that due to the transformation of the industry itself to these web-based channels of marketing and music streaming, emphasis has shifted from the album to a series of single songs which short, intense promotional campaigns could be based around. This leads consumers to construct their own albums of various songs by different artists in a playlist. Within the playlist, there is a constant comparison between songs which is also seen as major factor in the use of hyper-compression, to which he believes that loudness normalisation will have little immediate impact due to this strategy of risk avoidance. He believes that the gatekeeping process has now extended to the new music streaming platforms where again, loudness is used as a mechanism of influence to have songs featured.

Lastly, the audience and the way the audience listens to music was examined with reference to the playlist and new dominant forms of reproduction. The consumer performs a significant role in the field which largely comes from the position of being unaware of how music is constructed, nor the processes involved. They nevertheless are in a position of power to consecrate a recording over and above the field of experts as witnessed with Metallica's *Death Magnetic*. New digital methods of reproduction have redefined the way

consumers listens to music, seen as causal to the proliferation of the playlist and hyper-compression. As mastering engineer Chris Athens suggests, ‘nobody really wants to have a record that's not as loud as everybody else's in an iTunes playlist’ for fear that the consumer may perceive their recording as inferior (quoted in Smith 2008). This coupled with the scenario whereby the reproduction systems defined herein as “headphones and laptops” has had undue influence on both reception of the music by the consumer and also the production process itself. Agents involved in the production of music have been seemingly influenced in their use of hyper-compression by what they believe will be the dominant target reproduction medium. As such, artists, management and audio engineers will audition music destined for release on a laptop or earbud headphones, and final decisions will be based upon these responses; a process that many agents consider counter intuitive to audio quality and dubious practice.

It is evident that hyper-compression and issues of loudness has had a distinct influence on many areas of the field and represent a major part of the agency of agents in preparing a recording for appraisal by the field. The next two chapters will examine this agency and possible choices of action with respect to objective conditions that may present either constraints or allowance in the production of music.

# 7 AGENT: SECTION 1 – HABITUS & CAPITAL

Addressing the agent is separated into two sections that are loosely delineated, firstly by a discussion of the habitus and capital of agents, and the second chapter, agents and their agency. By use of the word “loosely”, habitus, capital and agency are so closely interrelated that it is inconceivable to separate them entirely, however, it does provide a mechanism to divide discussions into concerns that are more related to each other. This first chapter on the agent regarding habitus and capital examines the primary roles agents play in the field of record production/audio engineering that are closely associated with the use of hyper-compression. These roles are of the professional mastering and mix engineer. These roles present a different perspective on the propagation of hyper-compression through practice. The relationships between these agents and the positions they hold in the field, as well as amongst themselves are highly relational to the amount and type of habitus and capital that they possess.

As previously discussed, doxa delimits an agent’s habitus and as Deer explains, ‘determine[s] "natural" practice and attitudes via the internalized "sense of limits" and habitus of the agents in those fields’ (p. 115). Hence, the orthodoxy or heterodoxy of an agent’s stance concerning hyper-compression is highly influential to the habitus that is acquired and developed, and relative to the positions available to them. This also serves as a fundamental set of objective conditions which influence potential action. Considering that the field of Western mainstream popular music is predominantly also the field of

large-scale production, agents in the production of music have little autonomy. However, the degree to which they are more or less autonomous relies greatly on the habitus and various forms of capital that these agents are in possession of.

The professional audio engineer whether they are a mastering or mix engineer have vastly less autonomy than those who exist within the field of restricted production. As a consequence, there is a trade-off for this autonomy in that those within the field of restricted production are unable to attain the sort of capital that is achievable in the field of large-scale production. The mastering and mix engineer, require a highly specialised habitus that is constantly evolving to changes in the domain as highlighted in the previous chapter. The mastering engineer's role as further discussed, was initially that of a "disc cutter" for vinyl records only. This role developed over a period of time to that where crucial decisions on the overall sonic quality of recordings were performed by the mastering engineer that required a highly specialised skill set. Likewise, the role of the mix engineer in more current times has developed where they are also performing the role of the mastering engineer within the mix process to achieve pre-determined aesthetic outcomes. This is largely due to the decentralisation of specialist technology. For example, Dave Pensado asserts that 'I think a great engineer is capable of tracking, mixing and mastering, and as I said, in today's world things have changed a little bit' (i/v, 2015). The relationship between the mastering and mix engineer is constantly evolving and as such there is a distinct tension that has developed due to this evolution, especially surrounding the propagation of loudness as practice.

With specific reference to the practice of hyper-compression and the loudness of recordings, the roles played by the mastering and mix engineer are examined via

responses from interviews conducted. From this, an understanding is achieved of the particular behaviour of each role which is directly relational to their acquired habitus and capital. Of particular interest is the symbiotic relationship between the mastering and mix engineer whose cultural output is seen as two final and vital stages of the completion of the music production process. What is evident is that both roles in some way contribute to the propagation of loudness but from differing viewpoints. Despite the mastering engineer being the agent who has traditionally performed the act of hyper-compression, this duty, it could be argued, has been demarcated to other areas of production. Despite blame being commonly apportioned to the mastering engineer, they are largely heteronomous and more often than not following the requests of their clients.

## 7.1 The Mastering Engineer

Michael Romanowski provides a concise explanation of the role the mastering engineer plays in the overall production chain of a music recording; ‘there’s a technical side to it and an artistic side to it. And the technical side as I see it is the preparation for the distribution. Creating the right type of master that goes out to whoever it’s going to be distributed to in the best possible way that it can be’ (i/v, 2015). The artistic side to which Romanowski refers to concerns manipulation of the recordings to achieve a specific outcome through a series of processing that may alter many of the sonic elements of the recording. More often than not it includes determining the loudness of the recording. This, however, has not always been the case as the mastering process has undergone a transformation over the many decades since the inception of Western mainstream popular music.

Influential veteran Australian mastering engineer Don Bartley provides an account of the transition of the role played by the mastering engineer from being simply that of the person that performed the cutting process in vinyl record manufacturing, to where they would actively intervene in the sound quality of the overall product. There are distinct parallels between Bartley’s account and that of UK mastering engineer John Dent. Despite the fact that Motown had been actively processing their masters in a more modern-day approach with the “loud and clear” methodology during the 1960s, mastering up to the mid to late 1970s was largely left to the producer via the mix engineer to facilitate. Bartley started his career at CBS (Sony) in the late 1960s and at that time, the mastering engineer’s role ‘was just transferring directly from a master to vinyl and not

doing anything except trying to find the maximum level you could fit onto the vinyl' (Bartley i/v, 2015). The masters came in from overseas for acts such as the Beatles and ABBA and company policy with these tapes was 'very strict, you weren't allowed to touch the sound of the tapes' (ibid).

John Dent provides a similar narrative where he started at Trident Studios in 1973 and rapidly progressed from 'tea boy to tape librarian', and then to disc cutter (i/v, 2015). After a short period of training, Dent maintains that he had his first 'accidental' number 1 with the Band of the Black Watch, *Amazing Grace* (ibid). During this time, Dent mentions that no processing was done during the mastering (cutting phase), however, because he was located in the city where many of the big hits were made, test pressings were made in which the mix engineer would analyse the outcome and go back and change the mix accordingly. One particular example that Dent recalls is that of the song *Video Killed the Radio Star* by The Buggles:

When I was at Island Records I was introduced to this guy who came in with a new mix, it was Trevor Horn, "Video Killed the Radio Star". Stuck the tape on, did a test cut and all his radio voices were so resonant and gnarly and kind of really sharp sort of sounding that they just cracked up on the vinyl, they just distorted, and I recommended that Trevor go back and remix it with less EQ on those radio voices. And he listened to me, went back and remixed it and I actually cut that flat and it was a number one record. (i/v, 2015)

It wasn't until many years later that the mastering engineer was given the job of changing the sonic structure in the mastering studio as opposed to having to go back and fixing the mix itself, and also addressing the issue of loudness. This should provide some evidence of how Motown were ahead of their time in their approach to mastering.

When Bartley moved to RCA (BMG) in 1976 he was confronted with a whole new circumstance where artists were actively concerned with how their music was reproduced on vinyl, with loudness being one of the key issues:

The loudness thing was happening and the only way we could do it was using compressors and limiters and that really only started to happen for me when I worked in RCA where they had a Neumann console that had Neumann compressors and limiters built into it. (ibid)

It was at this point where producers and their artists would attend mastering sessions such as Charles Fisher (most notable for his production of Savage Garden) who in the late 1970s brought Australian bands such as Radio Birdman into the mastering suite to oversee the process:

And that was a challenge too. I mean they really wanted a specific sound, they wanted loud and they wanted it hard. "Can you go harder Don? Can you go brighter on the guitars Don?" (ibid)

Dent points out that it was around this time when mastering engineers became actively involved in the way records were sonically presented that they were actually credited on the album sleeve in the production notes:

Island was keen on promoting me as an engineer. They were actually putting either mastered by John Dent or cut by John Dent actually on the label of the record. And I bumped into Trevor Horn last year and I had a chat and he remembered that my name was on that record! So, I kind of shared the fame of that particular record but I did suggest he remix it and that happened quite a lot. (i/v, 2015)

Dent stresses that loudness was a key issue throughout the 1970s and the following vinyl era that stretched into the 1980s. Like Bartley who had discovered that particular frequency bands would bring out the energy in a recording without having to change level, Dent describes this very thing as "subjective" loudness which worked well with vinyl. This philosophy was exactly what Motown had pioneered a decade earlier with

“loud and clear”. Dent provides an explanation of why he thinks loudness played a large role in how music was presented on vinyl at the time:

You just wanted to be heard above the noise. The noise being all the other music that’s out there. And there was this thing that if you got the sound of the record right and it may not be a physical volume, it may be a subjective volume. It may be the type of highs on there or just the content, people would bring in a choice of mixes and one would have a subjectively louder sound than the others. So maybe you would suggest that would make a good one for a 7” and a more subtle one for the album. (i/v, 2015)

In 1980, Bartley moved to EMI to head up mastering at the legendary Studios 301 in Sydney where the digital audio revolution slowly unfolded, particularly with the introduction of the Sony U-matic 1610 digital tape machines. Bartley’s first mastering for CD was Air Supply in 1984. By that stage, the role of the mastering engineer had evolved into a substantial stage of production that involved the processing of the sonic qualities of the music, the editing of the music in a compositional manner, and compiling the songs as a playlist within the structure of an album, EP or single.

With the gradual introduction of digital processing, both Bartley and Dent recognised that during the mid 1990s, artists and their entourage of record company and management would submit a reference CD to define the type of mastering that was required of a particular session. This consisted of another recording or album that the client is familiar with that acted as an indication of the desired loudness level, frequency response and so on. It was during such sessions that Bartley discovered a trend to push the level of the recording to the uppermost of the CD media; ‘this rock band producer said, “we want our CD as loud as that one” and then I kind of went “you want it distorted?” “Oh no, no. No, we just like that level you know, that power” (i/v, 2015).

When pressed on who was driving this new trend, whether it be the record companies, management, the producers or the artists, Bartley simply replies, ‘everybody!’ (ibid). He adds that ‘it was a comparison thing, they’d bring in a CD and say “right, I want this”’ (ibid). During the 1990s Bartley was known as the ‘loudest guy’ in Australia but after a while, like most mastering engineers, he found it tiresome and lamented the time when music had greater dynamic variability:

I just couldn’t see any end to it. People were wanting more and more or jumping on top of each other going I want more, I want more, I want more. And in my opinion, it’s not very musical compared to how music should sound. (i/v, 2015)

What Bartley has mentioned here is a typical response from many that were interviewed for this research project. They subjectively identify a potential loudness in a project, however, the client often wants to compete on the same level as others and demands excessive hyper-compression even when it may not be musically appropriate. John Dent states ‘the volume of a CD is probably one of the biggest debates that takes place’ (i/v, 2015).

As a result of this trend that Bartley and Dent describe, during the latter part of the 1990s, mastering houses (and mastering engineers) became known specifically for their expertise in excessive loudness and artists would consciously seek to have their recordings hyper-compressed by these specialists<sup>34</sup>; ‘guys at Bernie Grundman Mastering and some guys at Sterling, in my opinion. If you want it as loud as can be, if that’s your focus you go to one of them’ (Bob Horn i/v, 2015). Senior mastering engineer at Sterling Sound, Greg

---

<sup>34</sup> It is certainly worth noting that not one of the mastering engineers that can be classified as the “loud specialists” would agree to be interviewed for this research project despite repeated requests. This was most likely due to the controversy surrounding the practice and hence, were unwilling to draw any undue attention to themselves.

Calbi, ascribes some of his colleagues as falling into this category, but does not identify any problem in this, and suggests that having loud specialists at Sterling Sound is just one part of their business model in which they cater for all type of clients. Calbi himself, however, does not identify himself as that kind of “loud” specialist:

I mean... there's a part of this business that is much more dependent on level than what... I'm not in the trenches, I'm not really in the trenches with that genre, that part of the business. Tom Coyne certainly is, Ted Jensen certainly is... those guys here are more involved with that. I have a lot of people that still really like dynamics and they tell me that. (i/v, 2015)

In more recent times, mastering engineer Vlado Meller of Charleston, South Carolina, has somewhat of a reputation for both extreme loudness and extreme confidence. Meller was the mastering engineer responsible for the loudness of the Red Hot Chili Peppers album *Californication* among many other extremely loud records. William Bowden met Meller at the 2013 Grammy Awards where he won Record of the Year for GOTYE's *Somebody That I Used to Know* (2011). Bowden provides a humorous account of this meeting:

The Americans are very big on compression. They compress the crap out of everything and the idea, as Vlado Meller said, was that “the average couch potato shouldn't have to get off their chair to change anything”. He said, “dynamics died with Beethoven”. And he's done some very loud albums. He's a character. God, he's very confident. When I met him, he said “yes, you know, they have the shoot outs”<sup>35</sup>. “It's always between me, Jensen and Ludwig. And I usually win”. He was pretty confident. And I was like, “oh, I'm this guy from Australia”. What was funny though was that he had a horse in that race of the [Grammy] Record of the Year, but I beat him. Rank outsider. So that was funny. (i/v, 2015)

Jonathan Wyner, when pressed on mastering engineers who blatantly use clipping to achieve extreme loudness immediately points the finger at Meller; ‘there are some famous

---

<sup>35</sup> A “shoot out” is a scenario whereby a client may have a recording or album mastered by several well-known mastering engineers to find the most desired result (usually the loudest), much to the ire of those involved.

clippers. Well there's "Vlado the *Impaler*" (i/v, 2015). Lachlan Mitchell makes the necessary observation that although it's easy to point blame at the mastering engineer for being the agent that commits the act of hyper-compression, in many cases the degree of loudness it is at the behest of the client. However, in the case of engineers such as Mellor, Mitchell believes that the reverse may be likely:

It's easy to target mastering engineers and say it's their fault, and sometimes that's true; you hear mastering engineers talking about just trying to get as much volume as possible, as a badge of honour. (i/v, 2016)

In an interview with Greg Milner, Vlado Meller provides his own particular insight into the issue of loudness in mastering which addresses several key issues. Firstly, Meller states that loudness is an "expectation" within music production so the listener does not have to alter the volume control, predominately because the loudness is at a constantly high level:

"Today's generation likes to listen to CDs which are loud," he said. "Most people listen to music in their cars, and they don't have to turn it up. They expect you to make it loud. If it's not loud enough, they'll take it out and put in something else. This is the game we play now". (Quoted in Milner 2009, p. 290)

It could be argued that this account by Meller is a glaring over-simplification of the issue, but expanding upon this sense of *expectation*, Milner states clearly that 'for Meller, making hot records is about giving the audience what it wants' (ibid). Meller also tends to attack critics of his approach in the interview with Milner which includes Bob Katz among others (ibid, p. 291). On a more general level, Meller claims that:

"the people who criticize loud records are probably the ones who never listen to them. If you like Shostakovich, you don't buy Chili Peppers CDs. If you like Metallica, you don't listen to Miles Davis. There are very few people who like classical music and heavy metal at the same time. Go to any college, gather two hundred kids, and ask them if they like loud records. I guarantee all two hundred will. Are they "fatigued?" *Nonsense*" (italics in quote). (quoted in Milner 2009, p. 291)

Mellor may have a point here insomuch as many of the detractors of Metallica's *Death Magnetic* and those particularly from the MLA, it could be argued, do not seem the type of people that would actually *listen* to that genre of music. Whether this point can be generalised, however, is of some conjecture. When questioned by Milner about a Red Hot Chili Pepper fan who launched a petition requesting for their albums to not be mastered so loud, Meller responds in a vitriolic manner:

“Another techno-freak,” he said. “I say get a life, get a job, and do some real mastering. Then I’ll talk to you. Sitting at home analysing my sine wave on an oscilloscope—I don’t call that mastering. I tell you right now—all these people who criticize and send me e-mails, if you want to do mastering, go ahead, see how many clients you get” (quoted in Milner 2009, p. 291).

Importantly, Meller does see the issue of hyper-compression as an “expectation” but he situates this expectation with the audience as ‘giving the audience what it wants’ (ibid, p. 290). However, it could be argued that the audience by and large has no idea what it wants and is most likely unaware that the process even exists. Leon Zervos in contrast to Mellor, believes the expectation lies with the client, the artists etc. and it is loudness within the aesthetic structure of the cultural production of music that is where this expectation lies:

All clients want their finished product to sound impressive, and these days loud is normal, so not many people actually ask for it to be loud. If you give it back to the client soft, then you are going to be in trouble. The loudness factor is not requested, it’s considered normal that a finished master will be at an acceptable level. Loud today is normal. It was only a talked about point when loudness crept in over 20 years ago. (i/v, 2013)

As part of these expectations, one of the biggest issues for mastering engineers is recordings submitted for mastering that are already hyper-compressed by the mix engineer, leaving very little room to make any changes. The client and their mix engineer

may submit a recording for mastering in a compressed state that is exactly what they already envision the outcome to be. This can be a contentious issue. The mastering engineer, however, generally believes they can match or reproduce the hyper-compression of the mix engineer in a more superior way or may have a different vision for the overall end product. This can lead to conflict between mix and mastering engineers, particularly when both have dominant positions within the field. In other cases, though, it just makes light work for the mastering engineer as Greg Calbi recounts with the latest album from Australian band Tame Impala:

I get records like Tame Impala that was slammed. I'd say I've had fifty projects, and the letter that we send to ask about what they like or what they're listening to [as a reference], they say we loved your work on Tame Impala and I didn't do any levelling on Tame Impala whatsoever. I kept it in the digital realm, and all I did was lower a couple of songs, because some of them were louder than others. I couldn't make it any louder. And it was so loud. *It was so loud!* (i/v, 2015)

It's also common for masters to be submitted in a totally un-processed state, allowing the mastering engineer to facilitate loudness as they see fit. This is what the mastering engineer would consider the best-case scenario. It then presents the question of determining exactly how loud the client wishes the recording to be as they may not attend the session. A reference will be requested from the client in the form of another CD or recording that will give some indication of what loudness is preferred:

When I leave you now, I'm gonna go in and have four different projects to work today. I think I have three one song projects and one album. So, my assistant will always ask for references or "what you have been listening to?", whatever. We try to get some evidence as to whether they want it loud. We sometimes ask them to say if they are looking for a hyper level whatever. And then I kind of approach it from there. (ibid)

Client expectations may, however, be difficult to match the reference due to a significant difference in the quality of the submitted recording. Björn Engelmann points out that

matching a recording that have been created using a laptop by an amateur or prosumer that has considerable peak limiting already performed, to a professionally recorded song is challenging and represents a significant problem for him:

The much bigger problem is when they are in the same genre and you have a recording made in a super studio somewhere in the UK, or the U.S., or even in Sweden. Mixed properly and made with extremely good mastering on it. And you come with your own files, with your own project, made on a laptop in a project somewhere with plug-ins, and everything is cranking. (i/v, 2015)

Ian Shepherd believes that he can always get a better result if the loudness is left for him as the mastering engineer to achieve. A combination of experience and high-quality equipment means that the hyper-compression process he can accomplish will be of superior quality and he can mitigate many of the unpleasant artefacts that are commonly associated. However, to do this he requires a version of the recording that has no pre-existing processing, otherwise, as Shepherd maintains, this cannot be reversed:

If somebody sends you that, as a mastering engineer your hands are tied, you know you're stuck with whatever they've done [...] when I ask people to send me a less crushed version, I always get a better result. (i/v, 2016)

The worst-case scenario is the mix that is submitted for mastering that has been clipped, distorted and the client expect the mastering engineer to make this (only) version even louder. Bob Ludwig points out that 'Oh yeah! All the time that happens' and they don't even turn the master down slightly to it can be re-processed, 'they just send it to me all clipped' (i/v, 2015). Ludwig maintains that 'they expect to make it louder!' which he says, defies the laws of physics. Ludwig states that:

...my goal is to make it loud and impressive and yet have the dynamics. I try to do what the artist, what the artists wants to do but defies the laws of physics. So, I try to find a way around the laws of physics. (i/v, 2015)

One important thing to consider, however, is that the role of the mastering engineer is to satisfy their client's needs. It is also a business decision for the mastering engineer to perform a role that achieves this satisfaction and in turn may have to ignore their own beliefs on the best way to present the music. Eric Broyhill asserts that it is wrong to "preach" too much to the client:

I'm still dealing with clients; they just want it louder that day, and I feel it's sending things backwards, but it's a business choice of mine to not over-preach. Arrogance and over preaching is creating a divide by coming across as "you idiots, what the hell are you doing here? You're destroying your music". (i/v, 2015)

That said, some mastering engineers find that if there is too much of a mismatch between the aesthetic of the mastering engineer and client, it is an equally valid business decision to suggest someone else who is more aligned. As such, Broyhill maintains that this may involve turning a client away for what could be a genuine desire to not disappoint a client:

Now, I'm a little more experienced I'm more likely to see these red flags and then address them before I start. The worst thing I could do is take somebody's money and deliver apples when they are hoping for oranges. And so, a big part of what I'm doing is managing people and their expectations, which can include turning business away. (ibid)

Ian Shepherd, who is globally prominent for his active stance against the use of hyper-compression and his provenance of Dynamic Range Day, believes this acts in his favour as potential clients would be seeking his particular services that are aligned with this doxical positioning:

I think the first thing is that I'm lucky. Pretty much all my publicity these days is because of my online presence and the, you know, the podcast and dynamic range day, so I get a lot of people who contact me specifically because they know that I'm an advocate of dynamics and that's what they want, so that's great. (i/v, 2016)

Even still, Shepherd states that there are always situations whereby the client will ask for greater loudness despite this stance that he states, ‘just drives me mad!’ (ibid). This doxical stance does provide Shepherd a point of difference to other mastering engineers and this can be beneficial to his career—his position within the space of positions. He freely admits that his online presence that revolves around his activism against hyper-compression and the software he has developed, has provided him with sufficient alternative income to not succumb too much to market pressures when it comes to mastering. In this way, he can afford to be more autonomous in his decision-making strategies and states that, ‘I’m guessing my income stream is about 50/50 between the online stuff and the mastering work now. If I was solely reliant on mastering then I might well be, you know, compromising on my, on my beliefs, in order to get work (ibid). There are some mastering engineers such as Sean Magee who simply refuse to make masters that are as loud as those in the mainstream pop genre, and as such, do not promote themselves in this area (i/v, 2015).

Whether or not a mastering engineer is willing to succumb to clients wishes concerning loudness, it is common for the mastering engineer to be the focus of the blame surrounding the loudness of recordings because they are the ones that actually perform the act of hyper-compression. Björn Englemann makes specific mention of this and importantly, states that it then becomes the job of the mastering engineer to act as educator to the various clients involved in the process. To alleviate this blame, one of the core functions of the mastering engineer is then to act as advisor and explain the process and potential pitfalls. Englemann states that:

Another problem is mastering studios tend to get the fault put on them, people are saying that it’s your fault that it’s going this way. But it’s not. We are struggling every day in telling

people, and trying to teach people, educating record companies and labels, artists and engineers... To actually bring down the levels a little bit, it would make a big benefit just to bring it down 1 or 2 dB. It would make a big difference in the sound. (i/v, 2015)

American producer and Associate Professor in sound recording at McGill University, George Massenburg, makes the important point, however, that the role of audio production personnel in general is to serve the client. He is adamant that these personnel have no right to *dictate* to the artist what they should or shouldn't do, but they do also have a responsibility to advise the artist or client through the lens of their experience:

"I'm there to serve the artist" as are we all; when we're in the studio with an artist, it's their record – their picture is on the cover, their name is on the front. It's not our record. We have no right to do any... to think that we can control the record. What we can do is advise the artist and that's what we do. We say "Well, I want you to just think about this and I'll give you some examples of that and you can decide and of course I'll do whatever you want". (i/v, 2016)

Therefore, a common theme with the mastering engineers interviewed was the importance of their role in educating their clients on potential outcomes which the client obviously may not be aware of. The mastering engineer has specific expertise regarding the preparation of master for distribution and problems that may arise. As Michael Romanowski contends, the way that a master is 'presented' is directly relational to the way it is received, and loudness may be an issue that requires discussion:

The other is that a large part of the job is education. We're educating our clients what the manufacturers need. Or educating them on how to do distribution where... now I'm educating them of archival and holding onto the material for long term. But we're also educating them on presentation. How do you want people to listen to this? What's going to happen to it? 'Well I want to be really loud. I love the question, why? Why do you want it to be loud?' (i/v, 2015)

One web-based service that has caused considerable consternation amongst mastering engineers that is a contradiction to the expertise mentioned, is the website LANDR which

promises ‘Professional Audio Mastering – sound like a pro. Instant results at a fraction of the cost of studio mastering’<sup>36</sup>. It is unclear exactly how this process works or the algorithms behind it, however, it involves a “drag and drop” of audio files onto the web page in which the track is seemingly analysed against a ‘massive library of music genres and styles to create a unique fingerprint’ and processing is then added. Greg Calbi is one mastering engineer in particular that recounts a situation whereby the LANDR outcome was preferred over his own efforts by a client. How successful this process is in creating a useful master recording is unknown and requires analysis. If the algorithm does indeed reference against this “massive library”, it most likely creates very loud masters. The website makes the following claim; ‘Your music is delivered with polish and balance, ready to play alongside the best and biggest sounds. Share with confidence’. From this statement, it seems the creators of LANDR are well aware of the “louder is better” paradigm and commercial imperatives. They also seem to be capitalising on this phenomenon by bypassing any concern that may be brought up by its human counterpart as mastering engineer.

Apart from the obvious concern that an automated website is offering an extremely cheap alternative to the more traditional mastering services which most likely cater to the prosumer, changes in attitudes to the top-level mix engineers are also creating conflict. As hyper-compression has become an inculcated part of agent’s habitus, a situation has arisen where mix engineers are more likely to submit mixes that are “pre-mastered”, effectively diminishing the role of the mastering engineer as a potential mediator of loudness.

---

<sup>36</sup> <https://www.landr.com/en>

## 7.2 The Mix Engineer

The role of the mix engineer is to take the recorded material and to manipulate and balance these sounds into a comprehensive end product. It is the second last phase of the production process where the mix engineer's "master mixes" will be delivered to the mastering engineer for what Michael Romanowski likes to refer to as the final process of presentation (i/v, 2015). The mix stage is where the artist or producer's vision is finally realised and where hyper-compression may be introduced to the recording as either a permanent feature or as a reference for the intended loudness later in the mastering process. From the responses from all mix engineers interviewed for this research project, loudness is a consideration that is high in priority and an integral part of their mix strategy. As Bob Horn maintains of Dave Pensado's mixing style; 'he's pretty loud. He spends time on it. Like he'll go down the song and anything fighting to keep it from getting louder, he'll work on that' (i/v 2015).

Horn himself has developed extensive strategies for achieving loudness in which he uses 'three stereo busses on the final mix [...] One of them is natural, no processing. One of them is heavily, heavily compressed, about 10 db, 15 dB of compression on the mix [...] and then my final one has a tape simulator that has been brightened' (ibid). Alan Moulder similarly admits to using clipping as the final loudness inducing process because as he maintains, this process although destructive in a sense, states 'I find that that doesn't change the mix as much and makes it louder and in the ballpark' (i/v, 2015). Loudness is therefore a process which mix engineers feel they must incorporate into the mix process and have developed their own individual strategies for achieving this.

Dave Pensado looks at the mix process as taking the recording to another level, to which the mastering engineer's charter is to do the same when the final mixes are bestowed upon them:

I think when I get a song from a tracking engineer it's my job to take it to another level. And when I give it to a mastering engineer it's his job to take it to another level. But we all try to complete the original vision for the song which the artist and the producer had in mind. (i/v, 2016)

In describing this process Pensado returns again to the idea that the act of mixing is not as he states, 'tethered to reality', but in fact goes beyond it to create an experience that elicits a particular response from the listener (i/v, 2016). Mixing attempts to create a form of acoustic fiction that may not be a direct representation of the acoustic events that it is supposed to symbolise:

So, in my world as a mix engineer, I'm not tethered to reality, I want to give the listener an enhanced version of reality. In other words, if I'm trying to give the listener something to hear and appreciate, an acoustic guitar, I'm not going to sit there and try to create what I heard in the room, I want to create something that transcends that to an emotional level and gets the listener to be involved on an emotional level... when you're working in that spectrum, it's not about reality. This could come as a shock but if you want seek truth don't go to a pop music room, it's not the bastion of truth. (ibid)

As hyper-compression became more increasingly a part of music production, instead of being relegated to the mastering process at the end, loudness became a systematic inclusion to all stages of production whether it be preliminary presentations to production personnel or management/A&R (reference mixes), or in fact from the point of compositional inception. Therefore, many mix engineers incorporate loudness into their mix for a variety of reasons. One reason is that the mix engineer would not risk having the artist or related parties compare their un-mastered mix with another that is mastered and considerably louder. Such a comparison could give the impression that their mix is

inferior to other mixes despite there being another process that would provide a match in loudness. As previously mentioned, this could have the dramatic effect of losing the client's trust and their position on the production team.

Another reason that is especially relevant to the high-level mix engineer with a dominant position in the field, is that they wish to deliver a mix that they would consider the finished item with little mastering necessary. This in effect limits the possibility of any further interaction with other agents that may unduly alter their vision of the recording in a negative way. Bob Horn provides the example of Dave Pensado who after having 'some bad mastering experiences', Horn states that Pensado suggested that:

"I'm never going to allow that to happen again". "I'm going to make the record as loud as possible and turn them in that way". So, he turns his stuff in all the way up, as loud as it can be, and the mastering engineer just has to work with it that way. (i/v, 2015)

The degree to which a mix engineer can leave the recording open for further processing is a matter of how dominant the mix engineer is within the field, how much symbolic capital they possess. As Andrew Scheps maintains, when he started out as a mix engineer he had little input available to him to select the mastering engineer or what they ended up doing with his mixes (i/v, 2016). As his dominance in the field grew, so did his ability to control the outcome of the production process he was involved in.

The mix engineer may not wish to leave the final outcome open to the mastering engineer to alter in any significant way. In some cases, the mix engineer may have a relationship with a mastering engineer that is based on mutual trust and a similar aesthetic understanding. As Horn asserts, 'I think mastering guys match mixers' and sometimes the types of mixing from a particular engineer may simply not suit the style of some

mastering engineers (i/v, 2015). A common theme from those interviewed that identified as a mixing engineer is that mastering engineers and their feedback in their formative years working in the field have been essential in helping them hone their ability to mix. However, as they became more proficient and their access to the same equipment and processes as that of mastering were available to them, these engineers would complete the mixes to a far greater level than previous possible, leaving very little for the mastering engineer to do. As Andrew Scheps points out, 'it's just gotten to the point where the mastering and the mixing sonically are just one and the same' and that '90 per cent of my mastering is flat transfers' (i/v, 2016). Here we can find a conflict in the doxical stance and habitus of those mastering engineers who are opposed to hyper-compression such as Bob Ludwig and mix engineers such as Scheps who see loudness as a natural part of his aesthetic intent and habitus. Scheps admits that in the past the mastering engineer was expected to perform a much greater role in the outcome of a recording but recent developments in technology and practice are reducing this role:

...the mastering engineer used to do a lot sonically. And that just isn't the way mixing happens now, you know, people are finishing their mixes more. But I mean, that said, you could argue that Bob Ludwig would be one of these older guys who hates loudness. But he's awesome. I love Bob. But he's just not the right guy to master my stuff usually. But he has mastered a few things I've mixed and it's been fine. He's got great ears and he hears music in a way that I understand. And I think that's the biggest thing, there's no right answer with any of this stuff. So, it's all about, "Does the master engineer have the same taste that you have?" and that's it. That's the only thing that's important. And if they do have the same taste but you do very quiet mixes and then they do a lot to them, that's one way of doing it. Or in my case, they do almost nothing, and that works out really well too. But it's just about having a common aesthetic, I think. (ibid)

This 'common aesthetic' that Schep mentions could also be construed with regards to loudness as a doxa which the two agents do not share. Scheps and Ludwig come from opposing belief systems. An example of this is explained by Scheps with previous experiences with mastering engineers that were negative and admits that 'I've had complete nightmares with some mastering engineers who basically just don't like my mixes. (ibid)

One reason that could be attributable to this shift in mixing practices to deliver mixes that are practically already mastered is that many mix engineers such as Scheps now mix “in the box”<sup>37</sup> which has changed many facets of their work flow. One advantage is the ability to control the mix with far greater precision and also the ability to recall the mix within an instant if changes are necessary. Many of the plug-ins that are used are of similar quality to those used by mastering engineers or emulations of the same hardware. Adam Ayan of Gateway Mastering Studios affirmed that he too had moved to *mastering* in the box at an 141st AES convention seminar in Los Angeles (AES 2016). Hence the processes of both disciplines have indeed merged on many levels.

Alan Moulder maintains that he has noticed that many of the production processes even from the tracking stage are now incorporated into this method of mixing and recorded songs are arriving at the mixing engineer with many production elements already completed and sub-mixed (i/v, 2015). This is equally applicable to loudness within the mix. Lachlan Mitchell points out that the gap between the role of a mix engineer and a mastering engineer is closing and in many ways the work of the mastering engineer on high-level productions could be argued are diminishing. Mitchell states that:

I think it’s getting narrower and narrower, the difference between what a mastering engineer can do, particularly with loudness, and engineers currently mixing. I mean if people are writing music that’s already got that loudness element to it then there’s stages left to go. There’s the recording, there’s the mixing and then the mastering, and if it already has a sample of that at the very beginning, then there’s less and less to do down the other end of the chain, so it’s a difficult one. And I think that it’s not unheard of for things to just be released straight out of mixing. (i/v, 2016)

---

<sup>37</sup> Mixing “in the box” means that the mixing process is completed entirely within the computer environment without the use of a large format console which was previously normal practice.

Michael Romanowski, on the other hand, makes the interesting point that he believes that mixing and mastering should be separated purely because it offers another layer of objectivity to the process. Romanowski suggests that a relationship that may be fostered between the mix and mastering engineer in which this objectivity is offered and discussed is extremely helpful. He states that:

I also feel like the mix engineer and the mastering engineer should not be the same people for that whole reason of objectivity. And non-connectedness to it. They may be totally skilled at doing that as a mix engineer and I'm not slagging on them for that. But I do feel that there's an objectivity to be able to stand back. But there's also a relationship to be built through the dialogue and through the understanding what they're doing. (i/v, 2015)

On another level, Mitchell believes that apart from the effect of mixing in the box, client expectations that are in-line with this technology paradigm reflect that the final mix should be more complete before the mastering process (i/v, 2016). The older paradigm of expecting large changes between the mixing and mastering stage are no longer expected nor risked. Dave Pensado understands this new paradigm more than most and believes it is in the mix engineer's best interest to have the mix as completed as possible to avoid large unwanted changes that may occur in the mastering process. Pensado states that:

I think a prudent engineer would try to get it as close to a finished product as possible and then hand that off to a mastering engineer that you coordinate with quite frequently and let him finish and tighten up the last part of the process. I've gotten burned a few times where I've had a mix that I was really in love with, handed it off to a mastering engineer and it comes back sounding completely different. The snare's over compressed, I guess you could say that the mastering engineers are the kings of hyper-compression because that's what they do for a living. And the ones that do it really great in a musical way, God they're just an asset to have, and I will still use them. (i/v, 2016)

Bob Horn agrees with Pensado and asserts that 'I don't want my mix coming back sounding like someone else mixed it. Even if they have to do a bit to get it loud' (i/v, 2015).

### 7.3 The Relationship Between the Mix and Mastering Engineer.

This idea of avoiding large changes between the mixing and mastering stage seems to be a contentious issue with some mastering engineers who find it extremely restrictive to their sense of craft to be limited in this way. This also includes the scenario where the mix engineer may submit what Bob Ludwig terms as a “pre-master” which is a version the mix engineer supplies to give an indication of how loud the mix should be after mastering. This pre-master mix sets boundaries for the mastering engineer concerning an intended loudness. Sometimes the mix engineer supplies a version of the mix that has all the processing turned off for the mastering engineer to work on from scratch. Ludwig finds that these pre-masters are generally louder than he would prefer to take his work on the final master. If Ludwig then delivers a master that is softer to that of the pre-master, he states that the client who is familiar with the louder one will inevitably gravitate towards it as opposed to his softer mix which he believes to be of superior quality. This presents itself as the cause of some frustration for Ludwig and he gives an account of this scenario:

I mean not every mixer makes these pre-master things. Some of them have enough confidence in themselves and a reputation, so people don't need to do that. But for those that do, we can insist that they send us any listening copies that are being referenced by other people because that is the height of madness, to hire a mastering engineering and not give him the music that everyone's been listening to. I mean that's insane! So we insist that if there are listening copies, that they send those to us. There are still times that they spring it on us in the middle of a mastering project. They tell me, the listening copy sounds more impressive you know, and we find out that something that existed that they didn't give us. (i/v, 2015)

Alan Moulder agrees that it generally is the louder listening copy that the client gravitates towards when he submits masters in this fashion:

I'll send the non-limited one to the mastering engineer and the limited one they've heard as a reference. And we'd try and beat it. But of late, I've had from a lot of the artists I've done that with, the poor mastering engineer... they all want to use the loud one. He masters the lower level one like the +6 one. And they don't like it as much as my +6 mix flat [the clipped reference mix]. (i/v, 2015)

Ludwig asserts that once someone has gotten used to a recording that is loud it is very difficult for them to respond positively to something softer later on. He uses an example of former Beatle, Paul McCartney who had a very similar dilemma when working with Ludwig:

The human body is designed so that once you hear something at a certain loudness and you get used to it, you just don't want to hear something less loud, it sounds less impactful. I was doing a Paul McCartney record where he... there was a mastering studio literally next to his mix room and he had gotten used to it very loud. When I went to master it... he was like... 'I think I'm just used to the loud one', you know that kind of thing. It's very tough for the human body to have the education and the ability to do it. (i/v, 2015)

Many of the other mastering engineers interviewed, however, stated that they preferred to have a pre-master situation than a single loud final mix which severely limits the scope they can work within. It seems to be considered the lesser of two evils.

However, what we also see here seems to represent a disconnect between the mix and mastering engineer concerning aesthetic intent. The high-level mix engineer such as Pensado or Scheps wishes to submit a mix that they consider as virtually finished and at the loudness level in accordance with their aesthetic intent and only requires minimal changes. The mastering engineer that is possibly against what they themselves consider to be the excessive loudness that the mix engineer had presented within the final mix, may find working at this level of loudness against their own sense of aesthetic. Here we can see a doxical conflict concerning loudness which seems to be a common issue. Bob Ludwig gives an example of this kind of conflict in the following when asked how he responds when confronted with a master that is hyper-compressed to a high magnitude:

It's physically upsetting to me. It's very depressing to hear something that... you know especially when you get a famous name mixer. They take their own creation and squish it and take the life out of it. It's like, why would you do that? (i/v. 2015)

We are witnessing the opposing doxa of Ludwig and the mix engineer who considers high-level loudness as an intrinsic part of his/her aesthetic intent and habitus. Therefore, the relationship between the mix and mastering engineer is extremely important which requires a matching doxical stance on loudness and hyper-compression. This is a common response from all mix engineers who, although they recognise the importance of the mastering process overall, say it is crucial to develop a working relationship with a mastering engineer that suits their aesthetic intent and their needs. These needs revolve around the forces of large-scale production that regardless of the level of autonomy the mix engineer enjoys due to their dominance within the field, they are still bound by. It also requires a similar aesthetic so this can be achieved in the outcome. Dave Pensado provides an explanation of this kind of relationship in which the latitude that he leaves the mastering engineer to work within is dependent upon the nature of the relationship between the two:

Probably 60-70% of the time I get to choose the mastering engineer and I try to choose a mastering engineer that I've had experience with and I have predictable results. And then we have a relationship so that particular type of music and the amount of room I've left the engineer to be creative come into play. (i/v, 2016)

Pensado gives another example of a particular relationship between himself and mastering engineer Brian Gardiner in which the doxical stance between engineers are well suited. Here, Pensado points out that it is Gardiner who is educating *him*, not that he should reduce the level of his mixes, but how to increase the level through clipping in what he describes as a 'musical way':

Brian Gardner, we called him Big Bass Gardner, he kind of started the mastering loudness thing or popularised it at least. From Brian I learned how to go past zero in the digital world and to make clipping a musical thing, gain a little bit extra volume. (i/v, 2016)

Pensado further describes at length his previous relationships with mastering engineers that helped shape his ability to mix and overall habitus, and highlights one in particular with mastering engineer Eddie Schreyer:

One that actually taught me a lot about mixing, a gentleman named Eddy Schreyer, he was at Future disc here in Los Angeles. When I moved here in the late 80s early 90s, the first time Eddy mastered something of mine I wanted to see the process. I went down and we formed a relationship and for the next five or six years, seven years, maybe even ten years, Eddy would come and go “Dave, I just heard this, just got this record by Dave Way, you’ve gotta come down and listen to it, it’s amazing, I think you can learn from it”. And then when he would master some of my records he’d go “Dave see, the room you’re in here, you’re not hearing enough 800 so you’re putting too much 800 in your mixes. So, next time you’re there don’t do that”, and kind of on and on and on he taught me about compression as it relates to his needs as a mastering engineer. And we had a partnership and sometimes Eddy would say, “if you go back to the studio and re-print this, I can do this”. So early on I was exposed to one of the greats and not only did I learn a lot and become a better mix engineer, but I’ve learned the importance of a relationship with a mastering engineer. (Dave Pensado i/v, 2016)

The relationship that Pensado describes is common according to many accounts by both mix and mastering engineers reported. Of particular note are suggestions made by the mastering engineer that if there are consistent abnormalities in the spectral range of the mixes that are submitted, this could represent something abnormal about the room the mixing engineer is working in or the equipment they are using. The mastering engineer, who is usually working within a highly specialised environment that they are keenly attuned to, is duly capable of uncovering such anomalies. In this way, the mastering engineer acts as an advisor or “quality control” to the output of the mix engineer which may be affected by constantly moving to different mix rooms (studios), acquiring new equipment that they may be unfamiliar with, or using different speakers and so on. Greg Calbi asserts that this relationship has been evident for many decades and offers an early

example of this type of relationship that dates back to a period where he was a mastering engineer at the Record Plant (New York) in the 1970s:

When I worked at the Record Plant in early 70s, the mixers would come up and we'd put the tape on the machine in the mastering room. And I only had two years' experience, but a lot of the times they would ask me if I thought the bass was too loud, or the vocal was too loud... they just wanted an opinion you know. For me that was the best learning because I learnt about the insecurity of the mixer, the insecurity that's in our business because of the abstract nature of what we do and what we perceive. (i/v, 2015)

Another similar example was offered by John Dent mentioned earlier with *Video Killed the Radio Star* by The Buggles. Here, the conflict between the effected voices and the vinyl process were realised during the cutting process and suggestions were afforded by Dent to alleviate the problem.

Other than the high-level mix engineer that has significant dominance in the field and also a higher degree of autonomy, there are the next tier, or “up and coming” mix engineers such as Bob Horn who have significantly less symbolic capital and therefore less autonomy. Engineers such as Horn have less opportunity to suggest a mastering engineer that they may like working with or authority in the mastering process. This depends upon the extent to which Horn is contributing to a particular project. When asked if he has a choice in which mastering engineer is to be used for a project he has contributed as a mix engineer, Horn replies:

No. If I do a project where I mix the entire album, I usually get to suggest a mastering engineer. Some projects I'm only mixing the single or two or three songs. And they've already had a deal with a mastering house. I can suggest someone, but they just nod their head and whatever they were intending to do is what they do. (i/v, 2015)

Horn has more to lose if the mastering – which he has little control over – changes his mix significantly enough to lose sight of his aesthetic intent because he has far less symbolic capital to trade within the field and is far more affected by the forces of large-

scale production than the more dominant mix engineers mentioned. Horn believes that loudness is one of the most crucial elements involved in impressing the client and getting that right could be the difference between continuing working on a project or not. Hence, he maintains that he has developed processes that deal with loudness that reduces the risk of his mix being negatively affected by the mastering process. As Horn points out:

I really prefer my take now on how I'm handling loudness and I would suggest that for anyone. That, don't ignore loudness. Be the guy that tries to make it loud, so the mastering guy doesn't have to do it all on his own. If you leave it all to him, it could get ruined. So, if you work hard on it yourself, even if you turn it off later, drop the mix, make sure things have the potential to be loud. When it's finally made loud it will be a much better product. (i/v, 2015)

In a professional sense, the mix and mastering engineer are *generally* on the same page as far as an understanding of the forces of the field of large-scale production. They can, to a large extent, understand the demands placed upon them by their clients and although they may differ in a doxical sense concerning loudness, there is a sense of professional comradery.

## 7.4 Conclusion

The habitus and capital an agent possesses is directly commensurate with the position that they hold within the field. The habitus an agent acquires, that is inculcated through immersion in the domain, enables them to perform their role. As requirements of the field change, so must the habitus of the agent. This was signified in the field of popular music, for example, by the role of the mastering engineer which was transformed, from disc cutter of vinyl records to that which oversees the entire presentation of the finished recording, over a period of many years. Technology as a set of objective conditions also contributed to altering the domain and as such, the requirements of the field changed accordingly which the agent was required to take into consideration. Hyper-compression then became a more significant concern to mastering engineers than it previously had been due to a change in the domain which, again, presented them with the necessity to alter their habitus so they could exist within the field. This change also impacted on mix engineers whose role is seen as symbiotically related to the mastering engineer due to them both being involved in stages of completion in music production.

According to participants interviewed, one of the key points raised is that mix engineers have felt as though they have had to significantly alter their habitus to accommodate for loudness since this aspect of the mastering process has been incorporated into the role of the mix engineer for a variety of reasons. This change in habitus is not only a result of changes to the domain, but it also represents a requirement to maintain positions in the field. Mix engineers must incorporate loudness into their workflow to both satisfy client expectations and manage the trajectory of loudness through the production chain. Due to

technological shifts such as “mixing in the box”, Andrew Scheps maintains, ‘it’s just gotten to the point where the mastering and the mixing sonically are just one and the same’ (i/v, 2016).

Hence the role of loudness in mastering, it could be argued, has diminished to some degree due to this change in the role that the mix engineer plays in the production process. This is something that Lachlan Mitchell believes is in-line with client expectations which have also changed accordingly with digital technology. He suggests that this technological paradigm is reflected in the final mix which the client thinks should be more complete before the mastering process (i/v, 2016). Therefore, the mix engineer has taken responsibility and assumed authority over the loudness of masters, an area that was once strictly the realm of the mastering engineer. This is also reflected in what Bob Ludwig labels as the “pre-master” which in effect restricts possibilities of action for the mastering engineer. This diminishing importance of the mastering engineer in this stage of the production process, is the cause of considerable tension between many mix and mastering engineers. Therefore, there has been a shift in blame from the mastering engineer who has been traditionally implicated in the act of hyper-compression to the mix engineer.

An important consequence of this shift in authority over loudness is that the mastering engineer has traditionally played the role of “quality control” which Michael Romanowski maintains, adds a layer of objectivity (i/v, 2015). It could be argued that with the mix engineer assuming authority over this factor of production, this situation negates a layer of *field* in terms of the systems model of creativity, which may have provided a necessary process of filtering excessive use of hyper-compression. The mastering engineer, many of whom consider themselves as well equipped and skilled in

the presentation of music recordings, believe they are better suited to pass judgement over this area of production. They consider the mix engineer's level of loudness against their own doxa and feel pressured to work within the boundaries that are set by the pre-master. It is obvious that many find these pre-masters, or reference mixes, as a key source of the continuation of the loudness paradigm which could be argued is a key factor in the continuing use of hyper-compression. Ludwig may be correct in stating that it sets the limits of what the client will accept as they will inevitably gravitate towards the louder version that they are used to. It is, however, possibly unfair to lay blame with the engineers who use loudness at previous stages of production to mastering as they are simply supplying what the client expects. There is a deep sense of insecurity that if they do not impress the client at these formative stages, they may lose their positions. It is important to remember that all audio practitioners who exist within the field of large-scale production, despite having varying degrees of autonomy attributable to the position they hold, are subject to influence from some form of objective conditions placed upon them. Their action is largely at the behest of the client who themselves are influenced by forces of a completely different set of objective conditions.

It is also necessary to factor in the doxical stance of the agent in this equation. Not all mastering engineers consider loudness as a negative issue and actively embrace it as we have witnessed with Vlado Meller, who states that 'dynamics died with Beethoven' (quoted in Bowden i/v, 2015). There are also those agents that see loudness as what Rogers would term as the "norm". As Leon Zervos contends, 'these days loud is normal [...] if you give it back to the client soft, then you are going to be in trouble' (i/v, 2013). Hence, there are always going to be differing opinions between agents on hyper-compression as practice, which stresses the importance of a match in doxa between

engineers. The relationship between mix and mastering engineers has historically been extremely important and most likely will continue to be so. Problems tend to arise when there is a conflict in the doxical stance and habitus of those mastering engineers who are opposed to hyper-compression and mix engineers who view loudness as a part of an aesthetic intent and required habitus to operate in the field, and vice versa. There are many arguments for and against the use of hyper-compression that form an important part of the narrative which will be discussed in the following chapter.

## 8 AGENT: SECTION 2 – AGENCY

This second chapter on the agent, that is choice-making individuals within the system, concentrates on the objective conditions and subjective responses that determine possibilities for action for those individuals. Hyper-compression is representative of a structural determinant in the field of Western mainstream popular music and as such its use places constraints on the agent, although some agents make claim that hyper-compression is enabling on many levels. There are many arguments for and against the use of hyper-compression as a practice which are examined in this chapter. Besides the physical condition that renders hyper-compression as a useful marketing mechanism in the form of the “louder is better” paradigm, there are also a plethora of other factors that adhere the practice to music production which will be discussed. One such factor in particular is the acute insecurity caused by the downturn and subsequent transformation of the field and domain that has been previously examined. Due to declining revenues and increased competition, agents fear that a recording that is not as competitively loud as others in the market place will adversely diminish its chances of success from the onset. There are of course legitimate concerns linked to this assumption regarding impressing gatekeepers as outlined in Chapter 6.

Another level to this gatekeeping process concerns impressing decision-making agents who may be involved in the production process itself. One of the most serious considerations examined in the following chapter is that the music is presented as

loudness maximised throughout the entire production chain from the demo phase, right through to mastering. This causes considerable consternation to choice-making agents who are presented with the conundrum of constantly needing to maintain a loudness level that may have been appropriate for recordings at premature stages of production, but nevertheless, restrict possibilities for action later in the chain where it really counts. This is particularly pertinent to the mix and mastering engineer who are in conflict with the influence of the “dreaded reference mix” in which the decision makers have contracted what is colloquially termed, “demoitis”. This means that agents who hold power over the production process have got used to a certain loudness level and any retreat in level at these later stages causes insecurity to take hold. As Dave Pensado mentions earlier, mix engineers have lost lucrative deals because they had presented something softer than the reference mix and, despite being of better audio quality, loudness has the greater influence on the decision-making process. This is despite the fact that the mastering process was yet to be completed.

On a more general level, arguments for and against hyper-compression as a practice are extremely varied and are outlined in the interview responses. The concerns raised by agents have tangible implications for their agency. Again, we will experience both extremes along the doxic scale from Australian mastering engineer Tony “Jack the Bear” Mantz, who is scathing of the whole issue surrounding the Loudness War and asserts that it is ‘a dead horse and it’s been flogged ad nauseum’ (i/v, 2016) to Bob Katz who is unashamedly militant against its use and considers hyper-compression as an affront to his audiophile sensibilities. Agents who are positioned firmly within the field of large-scale production and heteronomous to outside forces mostly fill position along the heterodoxical side of this scale, however, there is an underlying theme that many agents

do not easily tolerate being dictated to as to what they can or can't do as part of their production practice, nor what action may help maintain their position within the field. Hence if hyper-compression fulfils some kind of aesthetic outcome that best suits the intention of the client, then most agents involved with production will capitulate to the client's wishes. In many cases outlined in interview responses, this could be viewed more as a business strategy that maintains both their economic as well as symbolic capital. In other words, it keeps the doors open to their businesses and their careers moving forward.

As will be evident in the following section, some agents who are positioned more firmly on the orthodox region of the doxic spectrum actively dissuade clients from loud masters and see their role as *educating* the client when possible. This could be construed as attempting to indoctrinate the client into their doxic positioning, however, most clients choose a mastering engineer, for example, on what is known of them, their symbolic and cultural capital. It could be argued that a client seeks an agent in production because they share elements of the same doxic positioning concerning hyper-compression. Ian Shepherd for instance, admits that his public profile as a campaigner against the use of hyper-compression is useful in attracting the type of clients that he prefers to work with. Problems arise when there is a mismatch of expectations and the audio practitioner is requested to perform a function such as making a recording louder than what they consider to be appropriate. This mismatch of doxic positioning is a main point of discord between agents that will be evident in interview responses.

## 8.1 The Insecurity of Competition

One of the most common grievances, especially of mastering engineers, is that the client is always asking for the recording to be just that little bit louder, or at least as loud as another loud recording that they are referencing to. Generally, mastering engineers respond to these requests by stating that the recording has reached its “loudness potential” and to go any further would be destructive to audio quality. Driving this thirst for that extra dB of loudness is an intense insecurity of the artist, management or record company who see the market as over-crowded, extremely competitive and represents a great financial risk to enter. They ardently believe that if they are not as loud as other artists’ recordings, that it will render them disadvantaged from the outset. As Cem Oral points out, ‘people fear they will not be heard, not selling enough when they are not loud enough’ (i/v, 2015). Similarly, Jonathan Wyner believes that ‘everyone wants to be competitive. No one wants to be seen as being inferior by being a little lower’ (i/v, 2015). This issue is so ingrained in the psyche of artists in particular and represents by far the biggest issue with those agents who are directly involved with them in the production of their recordings. Greg Calbi reinforces this scenario by stating ‘You know... It’s... how could I describe it? We’re in a period of tremendous insecurity’ (i/v, 2015). Importantly, he also describes how this insecurity then has a domino effect within the industry where the insecurity of the artist fuels the insecurity of the audio engineer who then feels as though they may not get the job if they are considered not loud enough:

Unfortunately, there is a niche, that is the business, because the high price mixer guys are competing with each other. There’s a thing that goes on [...] in competing. Yeah, but musicians, see the musician... it really comes from the musicians and their insecurity. (ibid)

George Massenburg, encapsulates this issue of insecurity and states that he believes that it is the primary cause of the Loudness War:

Very insecure. I was going to go further and say “neurotic”. I’m guarding my words here. And it’s hard to convince them that what they hear isn’t their truth and they hear the Pink record as being louder. Tell me that’s not louder, say “It’s not louder. Here look at the meter”, say “Well the meter’s lying”. So that’s a separate problem is how we deal with artists who keep cranking it up. That’s where the Loudness War started, make no mistake. It’s artists and producers coming back to engineers and saying “I’m going to go somewhere else if you don’t turn it up”. (i/v, 2016)

Michael Romanowski maintains there is endemic insecurity right through the chain from the artist to the record company, forcing unnecessary loudness at every level of the production process. He states that ‘insecurity on a lot of levels guides a lot of this’ as far as loudness permeating choices made by agents at every stage (i/v, 2015). One of the main issues, particularly with mastering engineers, is excessive hyper-compression being added at the mix stage which leaves them with little option during the mastering process, such as the case with Ted Jensen and *Death Magnetic*. Romanowski plants blame at the mix engineer who feels unable to present a mix before the mastering stage that is not excessively loud for fear that they will lose the job:

And then that’s back to the insecurity of the people at the label. It’s also the insecurity of the engineer. I will tell you this, I feel a lot of this is the insecurity of the mix engineer. They know right away, they’re going to make a mix and their artist is going to go take it and compare it to something else they already know. Now wait a minute, there’s two problems there. One, the insecurity of the artist, the insecurity of the engineer to be able to not say “this is what [the mix] is now and why, and this is what’s going to happen to it later [in mastering]. The process isn’t done, there’s one more step to be done and we have to leave some room for it”. (ibid)

This insecurity, amazingly, even reaches back to earlier stages of the production process whereby if the mix engineer does not provide rough mixes that are loud enough, they could possibly lose the client altogether. Dave Pensado provides another example of this

in an interview on Pensado's Place<sup>38</sup> where he comments during a discussion with Jonathan Wyner that 'a friend of mine lost a \$200,000 gig because his "rough" wasn't as loud as a world-famous engineer's rough... he lost the whole gig' (Pensado's Place, 2017). As previously discussed, it appears that hyper-compression is not only within the controlled realm of mastering, where it traditionally should only exist, but has seemingly permeated every level of the production process.

Having to provide this excessive loudness has baffled many engineers who view this as sometimes being unnecessarily destructive to audio quality and contributing nothing apart from satisfying the insecurity of agents that are personally invested in the outcome such as the artist and their associated entourage of management and record company. Lachlan Mitchell provides a humorous but honest account that illustrates this point:

I've worked with bands that told me, "Oh yeah, we did the album and it was all great, but then we mixed the single and it was just so in your face," and you had the record company pushing it louder, and you had the manager pushing, and then the mix engineer going, "Oh, really?" And it just turned into this screechy horribleness that became the single, and you think, "Well, what's the point?" And it became successful but you think, "well, it probably would have been successful if they didn't really push it that hard". It's just this desperation to... "if I just do this extra little bit it'll get over the line". In this case it would've worked with or without the overly loud mix. (i/v, 2016)

Bob Katz, who is renowned for his audiophile approach and militant stance against hyper-compression admits that even he regularly faces the insecurity of his clients despite his pleas to remain true to the sonic integrity of the recording:

Unfortunately, clients are very insecure and if their recording is lower... I go over this again and again with many clients. This is as loud as I believe it can be made without hurting the sound and they say "can you please make it louder?" so I'll do that. It's all part of the political

---

<sup>38</sup> Pensado's Place is described on their website as 'Grammy winning mix engineer Dave Pensado and veteran manager/executive producer Herb Trawick are the host and co-host of Pensado's Place. A weekly talk show covering the audio and music spectrum, its craftsman and the business of. Pensado's Place has been called the "Charlie Rose of audio", a description that sits fine with both Herb and Dave'. <http://www.pensadosplace.tv/>

thing [...] it's all the insecurity, you name it. They want the best but what they really want is the loudest. (i/v, 2015)

Therefore, Katz believes that educating his clients that every recording has a certain “loudness potential” is a necessary role he has had to adopt. He tries to provide an alternative to hyper-compressed mastering as much as possible without alienating the client. Beyond this loudness potential, he states there is a reduction in payoff until any further loudness becomes a negative result in terms of quality. However, he maintains that not every client can understand this logic:

Yeah. Infinite patience is what we have to have. They'll come back and I would say today, when they've been more educated, they'll come back and say seven times out of ten, “Bob you're right, let's go back to the lower one”. “Well thanks for the extra \$500 in my bank account when I already told you five days ago it was as loud as it could get without it getting hurt”. But the other three times out of ten, one won't hear the difference and appreciate it that I made it louder, and the other two times they'll say “thank you, thank you, thank you, now I can compete with Britney Spears or whoever”. (i/v, 2015)

Katz's clients are, however, most likely seeking his specific approach and when a client requests a “recall”<sup>39</sup> with most mastering engineers, making it lower in loudness level is not generally the case. More often than not, when the client takes the master home and compares it to other recordings that they like, they realise that theirs is not as loud. Then the client will contact the mastering engineer and request to make it louder. This can be annoying to mastering engineers, particularly when they know they have made the recording as loud as possible without destroying it, but nevertheless they must capitulate to their needs. Björn Engelmann's response to this issue relates directly to Katz's aim to educate clients but he maintains the client *always* wants it louder:

We are struggling every day in telling people, and trying to teach people, educating record companies and labels, artists and engineers... To actually bring down the levels a little bit, it would make big benefit just to bring it down 1 or 2 dB. It would make a big difference in the

---

<sup>39</sup> A “recall” is when a client requests further changes after a mastering session has been completed. Therefore, the mastering session needs to be set back up and the music recalled.

sound. But it's impossible because, out of hundreds of recalls if you count them, you would have 97 coming in, well "we think it sounds great, but we listen to some other stuff and we think ours is a little lower than others", and then the circus is going on. That is a big problem, and I assume it's a big problem worldwide in all mastering studios. (i/v, 2015)

William Bowden maintains that even on the rare occasion when clients articulate they want a softer mastering to maintain quality, end up asking anyway if it's possible to be a little louder whilst retaining the quality which he finds somewhat amusing:

I occasionally get people who say can we have it quieter, we don't want it slammed. But then what will happen is that you do that and they go we absolutely love it but is there a way that we can keep that great tone that you've got, but just make it a bit louder? (William Bowden i/v, 2015)

We can locate the source of this insecurity at the transformation of the music business due to the impact of the internet, and digital technology in general which was discussed in previous chapters. The hyper-compression of recordings can be viewed as a first-level pre-requisition to conform with tacit expectations of the music market place. Susan Rogers views hyper-compression as 'utilitarian' in this respect:

It's useful. It's utilitarian, and the obvious reason why hyper-compression is engaged [is] because we want to be competitive, and we want our product that we've just finished making to come on and be able to compete with other products as a stimulus. So, it needs to share some of the properties of other successful stimuli. If you're making food, if you're making clothes, if you're making something that's too much of an outlier, it's unaccepted in the market place. So, we want to be competitive. (i/v, 2015)

It should be reinforced once again that this structural expectation is arguably only viewed from the perspective of the producer and not the consumer. There has been no reported correlation between loudness and actual sales success, but it has been suggested that loudness is vital in securing influential gatekeepers for entry into the market as discussed extensively in 6.3. As a further example, Cem Oral points out that with EDM community

in Berlin, the opinions of DJs are routinely sought to determine whether the loudness of a track is sufficient to fit within the specificities of a DJ playlist:

Almost everybody who is ordering mastering, they know a DJ and that's the guy who judges the quality and he says like "ah it's not loud enough", "I can't mix this one". (i/v, 2015)

Although loudness may be influential in the initial impression of a song, particularly from the perspective of gatekeepers who are auditioning many songs, loudness may not be so influential in the long-term. From a more consumer perspective, many believe that the consumer responds to other aspects more centric on the music itself and that loudness plays a lesser role. Paul McKercher confirms this assumption by stating:

It's hard to see how loudness would equate with a track's commercial potential; the song quality and the voice that carries it would be the determining factors I would have thought. (Paul McKercher i/v, 2013)

Greg Calbi agrees with this stance and suggests that the consumer is unlikely to dislike a song purely from the reasoning that a song is not loud enough:

I don't necessarily think that if something wasn't loud enough but it was really catchy, that somebody's going to turn it off. I think the word catchy... it has to intrigue you somehow like, "well I haven't heard this before so I'll continue listening to this". (i/v, 2015)

That said, like the short-term influence loudness plays on the decision-making process of radio program directors, it would logically make sense that this influence would also extend to the consumer. Therefore, loudness would play a key role in grabbing the initial attention of the consumer in which more long-term connections could be established. It is most likely this very factor – which has been used as a marketing mechanism since the jukebox era – is what represents the utilitarian usefulness of hyper-compression that Susan Rogers mentions. In an era of intense competition, with more product than ever to

compete against and less revenue potential, gaining the consumer's initial attention is considered paramount. Thus, the insecurity if an artist compares their product to others and discovers it is softer. Like Bowden earlier, Sean Magee argues that even if the artist has the best of intentions during a mastering session regarding loudness, as soon as they go home and make comparisons to other recordings, the insecurity will inevitably take over:

Everyone wants their record to sit amongst a pile of CDs and be in the same sort of ballpark, if you like. They don't want theirs to be quieter. Although I must say that there is more, nowadays, people saying, "I don't really want it loud; I don't want to compete in the Loudness War" and then they go and check their CDs against something else and then you end up having to put it up anyway. (i/v, 2015)

## 8.2 Arguments for and Against Hyper-compression by Agents

As previously discussed, one of the main arguments proposed is that a particular stance on hyper-compression is the manifestation of an agent's doxa, which creates suitability to exist within a particular field or sub-field. An agent's doxical stance could be either considered orthodox (against hyper-compression) or heterodox (in favour of hyper-compression) and a particular stance represents a 'form of symbolic power which is mediated by various forms of accumulated capital' that can be used to gain positions within institutions (Deer 2014, p. 116). It could be therefore considered that arguments for and against the use of hyper-compression are the manifestation of an agent's doxa and are highly interrelated to the positions they hold within the field.

### 8.2.1 Arguments for Hyper-compression

Some agents believe that the Loudness War is either over or was never an issue to start with. We can start with these two perspectives. Andrew Scheps thinks the conception of a "war" is a 'ridiculous' supposition and that loudness has always been a part of the presentation of music:

But my real feeling is, there's no such thing as a Loudness War, as I've said before. I try to be funny about it because I just think it's ridiculous. I don't understand framing it that way. That's all. (i/v, 2016)

Leon Zervos, on the other hand, believes that there was possibly a "Loudness War" at the onset of loudness inducing digital technology but interestingly, he emphasises the point

that the imperative has transformed from simply making a recording loud, but to make a recording sound loud and good:

It was relevant about 20 years ago but, now it's pretty much make it sound great as opposed to loud. It was a war when no one knew how to make it louder, so each engineer and studio developed ways to achieve this. But now, it's not a war... All artists want their music to sound great, and if it has the correct sonic enhancement and good level to disc then everyone is happy. (i/v, 2013)

Dave Pensado, who is arguably the most successful mix engineer in the world, is decidedly dismissive of the whole idea of treating loudness as some modern-day affliction and also believes that it has been a part of music production since the onset; 'let's be clear... the term Loudness War, there's never ever, ever been a time in audio where we weren't trying to enter into the Loudness War' (i/v, 2016). Like many of his peers, Pensado recollects that loudness was also a key issue during the vinyl era and as such he is indifferent to loudness as being of any real concern:

So, when vinyl records started coming along, all the mastering engineers were trying to create louder and louder records because at that time... So, there's a lot of companies like Grundman, Futuredisc, Sterling. They made their reputation by making the loudest masters possible. (i/v, 2016)

Pensado draws the argument directly back to the "louder is better" paradigm which he very much understands is one of the foundational motivations behind the loudness of recordings:

Volume is a seductive psychological process that will never go away. I think those of us that have mastered using volume in a musical way will continue to do well because you can play the same song for anybody on Earth, one can be a dB louder than the other and everybody will choose the loud one because a little brighter, and a little more bass. (ibid)

The term "Loudness War", or "Loudness Race" as it is also referred to can be described as a colloquial term and its purpose is to act as a metonymy. The use of the word "war" would suggest that there was some kind of battle to achieve the loudest recording, but this

is highly exaggerated. As Zervos asserts, it is more likely an expression that is outdated and fails to describe the current mindset of agents. This sentiment is echoed by many who work specifically in the field of large-scale production of music. Therefore, the use of the term acts more like a “trope” to figuratively describe a circumstance in a hyperbolic manner. For example, one mastering engineer of considerable note refused to be interviewed because they considered the whole subject of loudness irrelevant to discuss, and in particular, the use of the term “Loudness War” as being a “bandwagon” that some agents had jumped on to gain attention that they would otherwise be unable to achieve. Outspoken mastering engineer from Melbourne Australia, Tony “Jack the Bear” Mantz, is particularly scathing of the whole issue surrounding the Loudness War and asserts that it is ‘a dead horse and it’s been flogged ad nauseum’ (i/v, 2016). He continues by stating:

And, you know, you’ve got these purists who will talk about how, “Oh shit, you know, we want to preserve all the dynamics” and they’ll show you their A and B and whatnot, and everyone fucking knows it. The reality is this: loud masters are a commercial imperative these days. Unless you’re working in those realms of the uber audio fools of the world, then yeah, *so what* I think [...] I just do what the client wants. (ibid)

This of course presents one end of the spectrum of opinion, however, it is representative of many who operate specifically in the field of large-scale production and who require loudness as a form of symbolic and cultural capital to maintain their positions within the field. Mantz touches on an important point, that many agents see loudness as an integral part of the process of making music and are dismissive of any that try to dictate to them how they should conduct their business. Dave Pensado presents a point of view that he is an agent operating within the field of record production/audio engineering and therefore to maintain his position, he does whatever is necessary to create a commodity that people would want to purchase. He positions himself confidently within the forces of the field of large-scale production and in the following statement makes his doxic stance very clear:

I live in a world where I'm economically rewarded by making records that people want to buy and so there's no law that says you can't take that concept and make it musical. I would argue that my mixes are musical and do incorporate hyper-compression if that's what you want to call it. I'm not sure if I'm comfortable with that terminology but... I like my records to grab people's attention. (i/v, 2016)

Pensado's doxa and overarching habitus is obviously aligned so that his position within the field of record production/audio engineering is secure and this habitus has been developing over years of inculcation in the field and domain. It must adapt along with any changes to the domain that occur over time. Pensado goes on to explain the changing nature of music that he says, changes with the culture that surrounds it. The internet has instigated a dramatic increase in the speed and volume of information disseminated and this has had a distinct influence on the consumer, a topic that was discussed extensively in Chapter 6. Furthermore, Pensado believes that the adoption of hyper-compression can be considered as similar to other historical inclusions to culture that proved controversial at the time. Hence, he states that hyper-compression and loud recordings are just part of a natural evolution that is 'tethered' to the culture of the times:

I think that the music you grow up on and what your personality starts solidifying around, tends to influence everything that comes after it. So, this question reminds me of the questions parents used to ask me when I first started listening to rock n' roll. "How can you listen to that stuff, it just sounds so loud and just sounds like noise and that can't be music and all that?" So, I think a more appropriate way to ask the question is, is that a valid form of music when people do that? And I would say yes, it's just as valid as everything that came before it. If you look at music, it's always tethered to culture and the culture nowadays is pretty fast paced. This isn't a news flash, but the internet has made information incredibly available, everything is right on the line, everything is on demand, everything instant, instant, instant. And you can't take a record from the 40s and hold someone's attention with it anymore that's only sixteen or seventeen years old. (ibid)

Pensado's doxa or belief system is not tethered specifically to hyper-compression, but to the culture he is immersed in which has adopted hyper-compression. Interestingly, Pensado touches on the subject of popular music as a form of acoustic fiction that he deems is not meant to be a mirror of reality. In contrast to audio purists who consider authenticity to an acoustic reality as the most desirable outcome, Pensado wants to

augment this reality by whatever method that is available. This includes loudness that is made possible by the various digital technologies and he uses the analogy of photographic film:

Any creative medium... the goal should be to use the tools you have and the techniques to have to enhance whatever the medium is. For example, Kodak was cruising along back oh, a while back with film and with slide film and everybody was totally happy with it. And then Fuji comes along and has this jacked up hyper film that gave you more saturation, the colours were more vivid. So, Kodak was trying to capture reality and Fuji comes along, captures the market by trying to enhance reality. (ibid)

This idea of acoustic fiction of course leads to what is considered the “art” in the production of music and a topic about which many agents have strong opinions. Agents who are generally proponents against the use of hyper-compression can still find some usage of hyper-compression that they admit will enhance a particular aesthetic in the production of music. Aesthetics will be discussed in a following section, but as a precursor to this, hyper-compression is considered not only as a structural mechanism, but also a part of the artistic process. From this perspective, we can achieve an alternative insight into its use. Scott Horscroft, like Pensado, believes that there are cultural shifts in what is considered art and agents should not be limited in their expression if something is indeed a part of the creative process despite there being consequences that may not satisfy concerns from a scientific or purist perspective:

I couldn't find myself sitting here and saying that this is a bad thing because it would take me back to going “oh my God, Picasso he's deformed the body”, you know. You know that doesn't even look like a person. I studied art and loved avant-garde and I've always loved avant-garde music and forward-thinking forms of art. I've always classified producing music as an art form as well. So, look, are we reducing our ability to have a variety of styles of sounds and so on? I don't know. I think a lot has also been created, in what we've done with making things incredibly loud. So no, I'm not against it. But I think people need to realise there shouldn't be any limitations on what people do or present in art. (i/v, 2016)

The case against using hyper-compression largely relies upon scientific knowledge and

audiophile purism and it could be argued that this reasoning may have little bearing upon what constitutes an artistic act or more largely, aesthetics. Distortion as an effect has been omnipresent in music production and one has to look no further than its use with guitar sounds dating back to the early sixties<sup>40</sup>. Digital hard-core group Atari Teenage Riot from Berlin used *excessive* distortion on their entire recordings which illustrates the strategic use of this effect as an artistic tool (see for example: *Sixty Second Wipe Out* 1999). Therefore, to consider that artists and their production personnel are naively using hyper-compression without considering it as *both* a strategic artistic tool as well as market-based mechanism is arguable false. As Eric Broyhill points out:

Often the righteous loudness “preachers” are assuming that the people distorting, and driving music to 11 are an uneducated, unsophisticated group, but I can tell you this is not the case. Sure, it’s sometimes just being insecure and wanting your mix louder than the next guy, but often times it’s an artistic choice by an educated, sophisticated artist that is in control of every step. (i/v, 2015)

Furthermore, Andrew Scheps takes this idea one step further by suggesting that the use of hyper-compression to create a certain artistic outcome has been also accepted by the consumer as an artistic outcome that they have embraced. He makes a strong argument that if loudness in general was rejected by the audience that it most likely would have disappeared from music production as an unsuccessful artistic statement, however, he believes that this is far from the case. Scheps states that you cannot force an audience to like something and if hyper-compression is part of something the consumer embraces then there is little point in complaining from a viewpoint that he considers irrelevant to the overall artistic intent. He states that:

---

<sup>40</sup> Guitarist Grady Martin is anecdotally credited with accidentally creating the “fuzz” guitar via a faulty guitar amplifier during a session for country artist Marty Robbins. See for example: <http://thecountryclassics.com/jukebox/2009/01/02/how-grady-martin-discovered-the-first-fuzz-effect/>

If loudness didn't translate in some way into people liking the music, then it wouldn't happen. So, to say that every single music consumer for the last 20 years is wrong - that's crazy, that doesn't make any sense. It's an argument you cannot make. If the loudness didn't translate into people liking things and spending money on them then it wouldn't have continued. And we would have gone away from it. Whatever people like is what they like. You can't force people to like things. It's impossible. (i/v, 2016)

Dave Pensado focuses Scheps' point by arguing that genre and audience expectations have a lot to do with the artistic intent of what is delivered to a particular audience. Creating a connection with the audience requires strategic thinking that takes into account the audience on a cultural level that they understand, and also one that suits the world that they live in. This, Pensado believes, requires adaptation to *their* requirements as far delivery systems, methods of reproduction and developing trends. What he is saying is that scientific reasoning alone or outdated modes of thought concerning the culture of music have little place in the supply of music to audiences that have expectations beyond these more traditional ways of thinking. Pensado elaborates on this argument by stating that:

...in the popular music world [of] all the different genres, country, rap, pop... we want the audience to like what we do so we're kind of the like the fast food chain of the music world whereas classical and jazz is more like the table cloth, the fine china, you know, the real nice restaurants. And I think right more than any time in the world the connection between the audience and the product we put out is pretty strong because we've adapted to the implication and the idiosyncrasies of the on-line world. And still figuring it out by the way but I think we've made great strides to make an audience feel like we're creating music for them. (i/v, 2016)

Jonathan Wyner presents a valid argument that is related to what Pensado mentions in that there are certain by-products of hyper-compression that have had a direct impact on certain genres. A case in point is the amount of low-end frequencies that are synonymous with hip-hop music only achievable with digital limiting. Wyner asserts that:

There's some really interesting things that have come out of the Loudness War in terms of the amount of low end that we can get into a record because of the way look ahead limiters work. You know, the amount of low end in records now is something we could never have

done before 1992 just because of the low-end limiter and so I think that there's a synergy between the limiter and like low-end in a hip-hop record. And so, it's really interesting to think about. (i/v, 2015)

It may be argued that hyper-compression can be considered useful as a tool to create specific artistic outcomes, but many also mention numerous examples of misuse where the heavy processing simply didn't suit the style of music. This point was a common theme presented by agents. Therefore, the strategic use of hyper-compression must be used appropriately to conflate both artistic and commercial imperatives. American mastering engineer Stephen Marcussen articulated this issue in an interview at a period when hyper-compression was arguably at its peak in 2003:

I don't want to be averse or buck my peers, but I don't see it as a problem. I see the abuses of loudness as a problem, when the artifacts of loudness are unpleasant distortions that take away from the listening experience. But a really rocking, loud, well-mastered CD is great. It's fun, it's competitive, the music translates. (quoted in Jenkins 2003)

Björn Engelmann sums up many of the interview participant's opinions by pointing out that hyper-compression is not always a 'bad thing' and can add much needed 'attitude' to a recording (i/v, 2015). However, he readily admits that when used incorrectly, or for that matter, unnecessarily, it can be very damaging. He also maintains that it is these examples that are commonly referred to in arguments against its use, but this represents a biased point of view. Engelmann contends that:

It's not that every time it's a bad thing. There's some productions on some styles, some ideas, when extreme loudness on the masters [and] I still think, "shit, that's some kind of attitude". You can use that kind of distortion to create a sound, so when HIFI nerds only look into the amount of distortion and telling whether it's a good or a bad master, I think that is also making it a little too easy. It is not always a bad thing, it can be a good thing, but it's not always a good thing. That's the point. When you make a ballad with acoustic instruments and stuff like, it's totally uninteresting if it's had 2 or 3dB too much level on it. It's a bad thing. (ibid)

Like many mastering engineers who dislike the abuse of hyper-compression, Engelmann returns to the point made by Pensado earlier that there is an element of acoustic fiction that is necessary to create something the audience wants. Therefore, to say that hyper-compression is detrimental in every respect, Engelmann believes this is incorrect. He specifically points to the purists who believe that the audio should be as ‘natural as possible’ that in his opinion, this is not how music for large-scale production is created:

[There’s] a lot of people talking about we should leave the transients as they are. It should be as natural as possible. Telling it’s totally the wrong way to go because this is cutting off the waveforms and stuff like that. I’m not into that at all. I don’t think that’s the truth either. (i/v, 2015)

The message that Engelmann makes here is echoed by many of the agents who work within the field of large-scale production. They see potential benefits and dangers and it is a balancing act to satisfy the requirements of artistry and commercial imperatives.

## 8.2.2 Arguments Against Hyper-compression

Vickers, arguably provides one of the most comprehensive list of deleterious effects that are presumed to be associated with the hyper-compression process that are commonly stated by those against its use:

Hyper-compression has been accused of removing dynamics and making music sound “squashed”, creating musical clutter and reducing depth and texture, robbing music of its excitement and emotional power, producing an uncohesive sound due to the multiband compressor’s continually changing frequency response, amplifying mono information and reducing stereo width, and reducing the punch of transients. (2010a, p. 5)

Of which, five of these deleterious effects mentioned cite Bob Katz who is arguably the most vocal and high-profile agent against the use of hyper-compression. Katz presents

himself, first and foremost, as an audiophile and this very factor has delineated him as a mastering engineer apart from many others. He has become somewhat well known for an obsessive stance and is unapologetically against the use of hyper-compression in recordings. To understand Katz' stance on the subject, it is also necessary to understand his background.

Katz's audiophile background began in the 1970s as a recording engineer for 'mostly acoustic music [...] a very natural style with two microphones, quite often with two to four microphones in a minimalist way' (i/v, 2015). This career eventually led him to New York in the late 1980s where he became chief engineer at Chesky Records which specialised in 'recordings with as little if no processing at all in a minimalist way using preferably a stereo pair and positioned the musicians so that they could perform with their own natural dynamic' (ibid). From there he started his own mastering studio in 1991 (Digital Domain) and immediately noticed what he describes as 'a disturbing phenomenon which is that other people's recordings are louder than mine. And don't sound as good. Well that goes to my ears at least' (ibid). Katz's audiophile sensibility was certainly at odds with what was happening in the Western mainstream popular music at the time:

I was extremely purist and it bothered the hell out of me that my recordings where I needed to have the headroom could not compete with the recordings of anybody, literally anyone else in the field. (ibid)

It could be viewed that this audiophile sensibility is therefore at the heart of his distinct dislike for hyper-compression and what it may do to audio quality. It is difficult to pinpoint exactly what Katz doesn't like about loud masters, however, in his book *Mastering Audio – The Art and the Science* (2015), he makes specific mention of 'dynamic range loss, distortion, ear fatigue and possible loss of sales as customers get

tired of fatiguing sounding music’ (p. 242). He also commonly refers to hyper-compressed music as ‘wimpy loud sound’ (i/v, 2015).

Katz confirms that there are many like him, especially within the members of the MLA that share his passion for trying to educate the audio community to the damage hyper-compression has done on the musical legacy of the 21<sup>st</sup> Century, and asserts, ‘I was the first!’ (ibid). It could be considered that bringing the issue surrounding the Loudness War to widespread attention was singlehandedly attributable to Katz when he presented a talk at the 107<sup>th</sup> AES convention in 1999. During this talk, Katz compared earlier dynamic recordings to the hyper-compressed *Livin’ La Vida Loca* by Ricky Martin (1999), highlighting the lack of dynamic variability due to the hyper-compression process. Katz also mentions that he was acutely aware of the trend toward hyper-compression for many years prior to the AES talk and that ‘for me was four or five years too late into the cycle’ (ibid) and points out that there was a raft of agents who were aware of the trend and likewise began to develop suitable terminology to analyse and discuss it. For example, Katz credits engineer Lynn Fuston for coining the term “hyper-compression” as a descriptor of excessive compression via digital look ahead limiters:

We need to give credit for the coining of that term [hyper-compression] I think to Lynn Fuston. Who is a very fine recording engineer originally from Nashville and we had a lot of talk on one of the recording engineer/producer forums when it was very active at that time. And he took credit for that word. (ibid)

Katz believes that professionally, he offers an alternative to other mastering engineers ‘who default to stun’, and that he ‘will make the best recording, best recording possible unless the artist, the producer or the A&R says, “do it this way, or that way”’ (ibid). Katz states that he, like all other mastering engineers who ‘are the servants of our clients’ must capitulate to loudness occasionally to satisfy the wishes of the client (ibid).

It is understandable that this may seem hypocritical considering Katz's stance. Although, comparing his list of clients to those of mastering engineers of Sterling Sound or Bernie Grundman who cater predominately for mainstream "loud" pop artists, Katz seems to have a niche of clients whose idea of loudness is probably considerably tamer. Beneath the surface, however, Katz does not hide his displeasure at having to deal with the issue of loudness in his work:

'It's funny, you think how can a guy who's been boiling about this since 1991, still be sane in 2015? Ok, because I still get to make some good recordings now and again, that's why. And I live for that pleasure. The things I screw up, or have to screw up, I just tolerate. (i/v, 2015)

By capturing this niche market, Katz has become a very successful mastering engineer and commentator in his own right. It could be argued that Katz has used his orthodoxical stance against hyper-compression to create a position within the field of record production/audio engineering that is more aligned with the field of restricted production. He, and others of a similar orthodoxical stance treat the recording more as a symbolic object and dismiss the production of value that is in the "loud" commodity. Therefore, it could also be argued that Katz has used his well-publicised fight against the use of hyper-compression, that has often crossed over from the confines of AES conferences into the mainstream print and on-line media, in the generation of various forms of capital (see for example: Robjohns 2014). He has used these forms of capital to establish his position in the field of restricted production.

There are two examples of the generation of symbolic capital by Katz that is not related to actually making music recordings. The first is when in 2013, Katz announced on his

website/forum<sup>41</sup> via a press release that ‘THE LAST BATTLE OF THE LOUDNESS WAR HAS BEEN WON’ (capitals in original) referring to the potential of loudness normalisation incorporated into streaming platforms to affect change in the use of hyper-compression. According to Katz’ own account, the press release was uploaded to the website Reddit causing, ‘the entire node of my service provider in Chicago that services thousands and thousands of web sites’ to be ‘taken down by the volume of people that were coming to my web site, so they had to take my website offline’ (ibid). Here Katz claims authority to make such an influential statement and at the same time legitimatises his position to do so. He states that ‘I put out this press release because I didn’t want somebody else to take the credit for it’ even though he admits ‘it was premature’ to do so (ibid). Unlike other agents who operate within the field of large-scale production that are heteronomous to the associated forces of this field – generating symbolic capital to maintain their positions through hyper-compressed recordings – Katz’ produces ‘authority based on consecration or prestige [that] is purely symbolic and may or may not imply possession of increased economic capital’ (Johnson in Bourdieu 1993, p. 7). This authority, and the doxa/habitus that substantiate it, maintains his dominant position within the field of restricted production represented by the AES/MLA.

The second example is that Katz also takes credit for instigating the AES to establish a committee to produce the technical document, TD1004.1.12-10 - “Recommendations for

---

<sup>41</sup> Digital Domain is Bob Katz’s mastering house in Orlando, Florida (www.digido.com). The press release that Katz posted on his website on 14 October 2013, titled “THE LAST BATTLE OF THE LOUDNESS WAR HAS BEEN WON” has since been removed due to excessive traffic that Katz maintains caused the site to be pulled down temporarily. The press release however has been published on other sites and is available at <https://recording.org/threads/the-loudness-war-has-been-won-press-release.55058/>. Viewed: 3 October 2017.

Loudness of Audio Streaming and Network File Playback”); ‘I’m gonna take credit for this and most people are giving me credit for it’ (ibid). This technical document has been highly significant in terms of an attempt to set guidelines for loudness normalisation across streaming platforms. Furthermore, it has generated significant symbolic capital for Katz within the AES acting as the field of restricted production, in particular being awarded an AES Fellowship award in 2016<sup>42</sup> in which arguably the technical document mentioned above played some role. Refuting hyper-compression, and also as a result, refuting the field of large-scale production has limited Katz’s ability to exist within this field and also to generate economic capital that others may find more attainable. It also limits the types of symbolic capital that may provide the ability to work with the kind of artists that may generate symbolic and economic capital. However, within the field of restricted production, Katz is considered a leading figure and an agent of considerable authority, particularly within the AES.

Katz remains confident, however, that loudness normalisation will eventually have the desired effect over time; ‘difficult concepts take time [and] I see this positively because of the number [of people], everywhere, no matter what the topic is, loudness gets mentioned now’ (ibid). Significantly, he mentions that ‘the only solution will be universal loudness normalisation’ on all streaming platforms, providing a blanket disincentive for audio practitioners to use hyper-compression as there will be no advantage to do so. Without wanting to name specific companies, he points the finger at ‘the evil entity that is Silicon Valley’ and companies that act as a ‘fiefdom’ of ignorance in not paying attention to AES TD1004.1.12-10 – which he argues is a sound procedural plan to

---

<sup>42</sup> According to the AES website, ‘In 2016, Bob Katz was presented with the AES Fellowship Award in recognition of his outstanding contributions to the advancement of professional audio worldwide, over a sustained number of years’. <http://www.aes.org/awards/?ID=2181> Viewed: 25 February 2017.

standardise loudness normalisation; ‘they don’t want to have anything to do with a standards organisation’ such as the AES (ibid). Despite appeals by the MLA, who represent some of the greatest minds in audio, the major players from Silicon Valley are reportedly unwilling to communicate with them on the issue. Katz maintains that his plan all along was to have the technical document in place before embarking on a petition with Change.org (Bring Peace to the Loudness War) that would garner public support:

I had a kind of a Machiavellian plan which is that, you can’t have a petition to Apple and the other streaming providers if you can’t point to a document that says this is the recommendation of a professional organisation as to where you should be. So, I already knew that I had to have one building block in place before we could do the other and we’re now at the moment where the writers of this petition, myself and two others are still working on it, drafting it, we’re probably a couple of weeks away before we say ‘this is it’. (i/v, 2015)

Katz seems at odds with the mainstream music industry in general that deal with music as a product designed for a mass consumer audience due to his hard-line stance. He also seems at odds with those agents who view hyper-compression as an aesthetic statement. His self-confessed purist notions of the loudness of recordings sometimes come across to peers as “lecturing” and as such he has earned the moniker by some as the leader of the “grumpy old men”, i.e. the MLA. Eric Broyhill is one such peer although Broyhill importantly points out that some music has been pushed too far only for the sake of loudness and not for justifiable reasons. In this, he believes the MLA has a valid argument:

We’ll call them “grumpy old men” complaining about the Loudness War. What’s fair to them is this simple fact, that a lot of music that should be left alone dynamically is often pushed too far, so the experience of standing in the room has been compromised for the sake of loudness, and that’s a shame. (i/v, 2015)

Katz also has some other detractors who do not agree with him on many levels. Leon Zervos passes his audiophile approach off as the “easy” path that doesn’t take into

consideration the skill involved in getting recordings to sound loud and attractive for the commercial market:

If I were an artist or label, I would not want Bob Katz mastering my music. It's a lot easier to not use compression and limiting and pass off a soft master as being perfect. The top mastering engineers have spent years and years developing ways to get their sound and levels - and satisfying the client. (i/v, 2013)

On a similar level, there were the disparaging remarks made of Katz by Vlado Meller in Milner's *Perfecting Sound Forever* (2009) where Mellor boasts that Katz – a critic of Meller – was 'out of his league' when it came to the position which Meller holds within the field (p. 291).

Regardless of these detractors, Katz has many champions, particularly amongst the AES, MLA and the broader audio community who hold similar doxical belief. Another high-profile member of the MLA, Thomas Lund believes that 'hyper-compression is one of the most serious problems we are facing in listening, in music pleasure' and remains a staunch ally of Katz (i/v, 2015). Lund along with co-researcher Soren Nielsen have conducted what can arguably be viewed as the most comprehensive and important research on what happens to high level signals from a scientific perspective. This research highlights problems associated when these kinds of high-level signals are processed either through D/A converters or encoded into lossy formats (codecs) such as MP3 and AAC. This research is available via a plethora of highly respected published research papers (see section 2.4.2.6.1). George Massenburg is in agreement with this research and points out that the main cause of these issues is square waves that are a result of the process of clipping:

Clipping is a disaster. It's a disaster. It's a disaster not only in PCM, it's a bigger disaster in any kind of Codec because the Codecs are just... just are wild for what they put out into analog, an D to A analog [converter] and you put a clipped signal into that and it just puts dog shit out. It's terrible. (i/v, 2016)

Lund describes hyper-compression as the main factor in signal degradation (distortion)

above all other problems faced with digital audio technology:

So, typically, we have talked about factors that worsen the listener experience, for instance lossy data reduction or limited frequency bandwidth etc. Or exotic HIFI issues like dither, types of dither, higher sample rates and what have you. But I think they all, in comparison to hyper-compression, they are all completely dwarfed so it's the hyper-compression that is the main enemy. (ibid)

Despite being widely cited in much of the overall research concerning the use of hyper-compression and bringing attention to the pitfalls of high-level signals created by the hyper-compression process, the field of large-scale production has largely ignored this valuable research. The disregard of this research goes to the very heart of the research question posed for this research project; “why does the myth persist despite the scientific evidence to the contrary?” To which, Lund remarks ‘it’s a pity’ and ponders that ‘maybe they really don’t even care about the distortion [...] or maybe they think of the net effect of being louder is much more important than distortion going up’ (ibid). In many ways, Lund has answered the research question with this one simple statement. Being a leading global expert on the perception of sound in which he makes valuable contributions to committees in Europe (such as Cenelec<sup>43</sup>) and the World Health Organisation (WHO), Lund is the first to admit the ‘contagious’ effects of hyper-compression due to the “louder is better” paradigm:

Moreover, hyper-compression is contagious [...] Aesthetic reasons for using hyper-compression, as a way of expressing yourself, that’s completely fine. Crush everything as much as you like if you think it sounds better that way, but the key is to not make the crushing contagious. (ibid)

---

<sup>43</sup> Cenelec is the European Committee for Electrotechnical Standardisation. For more information: <https://www.cenelec.eu>

As such, Lund is a strident supporter in loudness normalisation being the key to ending this “contagion” of loudness via the removal of loudness bias. Acting as a change agent and opinion leader among other members of the MLA, Lund has conducted many seminar presentations at conferences globally on loudness normalisation technology and its benefits. In one particular “Project Studio Expo Session” at the 2016 AES conference in Los Angeles titled “The Tipping Point”<sup>44</sup>, Lund made the very humorous but compelling comparison of a range of selected hyper-compressed music recordings by various artists and a recording of a “Nilfisk” vacuum cleaner<sup>45</sup>. Surprisingly, he illustrated that the PLR of the musical tracks was less than the vacuum cleaner indicating the noise from the machine had greater dynamic variability than the music. One of Lund’s main regrets about the extensive use of hyper-compression is what he calls ‘the destruction of an entire musical heritage’ that cannot be reversed (i/v, 2015). Lund regularly uses the example of *Demons* by Imagine Dragons (2012)<sup>46</sup>. He comments that it was ‘deliberately chosen’ to show an example of how music can be ruined by excessive hyper-compression:

But actually. I like the *Demons* track by Imagine Dragons. From a music point of view, it’s got a good melody and it’s a good track but from a music heritage point of view it’s ruined. (ibid)

---

<sup>44</sup> <http://www.aes.org/events/141/projectstudioexpo/?ID=5236>

<sup>45</sup> Nilfisk is a Danish company that according to their website, ‘is a leading global provider of professional cleaning products and services’.

<sup>46</sup> *Demons* by Imagine Dragons is excessively distorted which is arguably audible even to the average listener. It is an example where the amount of hyper-compression and resulting distortion is questionable in an aesthetic sense. However, this has not had any effect on the apparent popularity of the song which has over 600 million views on YouTube. [https://www.youtube.com/watch?v=mWRsgZuwf\\_8](https://www.youtube.com/watch?v=mWRsgZuwf_8)

It is not only the members of the MLA that are vocal about the more deleterious aspects of hyper-compression. There are many practicing agents from within the field of large-scale production that have reservations about what hyper-compression does to the emotional value of the music. Michael Romanowski is particularly caustic when it comes to music as a ‘human expression’ that has any subtleties removed as a result of the process:

To me just the whole loudness thing is kind of ridiculous. It’s ridiculous on the presentation side of things. I mean this is music and art. Art is human expression. When we take away the subtleties that help with the creation of the human expression, we are taking away those things that make us unique. (i/v, 2015)

Romanowski makes a very important point here that would certainly apply to many genres of music, however, he does not hide his dislike for compression in general. He comments that ‘compression is something that takes away [...] from one side of things it’s the artistic expression of the given push and pull and the emotion of it’ (ibid).

Unlike Dave Pensado who strongly believes in the art of music production being an acoustic fiction, Romanowski equates many of the digital techniques for altering the properties of music as detracting from the human quality in music performance. This is what George Massenburg also refers to as the ‘transparency of the performance. I want to hear the performance. I want to hear the details of the performance’ (i/v, 2016). Of which, loudness is one of the main offenders in this argument, an argument that is very much in line with that of Bob Katz:

To me the loudness thing, taking the dynamic range away and making something that is just a sausage, and making it square, is not unlike auto-correct, pitch tuning and beat detective. All those things that take the human factor out of it. You know, wave forms... listening to actual transients and high points, and low points, I think is the emotional connection. (Romanowski i/v, 2015)

Romanowski is not the only agent who believes that hyper-compression has a negative effect on the emotional aspect of music. Bob Horn suggests that when something is constantly loud, an emotive response is removed along with the dynamic variability of the music which he believes can be a key driver in making a connection with the listener. He also indicates that music with a ‘push and pull’ as far as level is concerned, can have greater impact on the listener. Hyper-compression used incorrectly can perhaps remove this emotional connection and therefore, Horn asserts that dynamically variable music:

...will be more impactful because the music has more push and pull to it. It has quieter moments which you need to make the loud moments sound that much more impactful. You know, if the entire three-minute song is nothing but loud, it’s the same feeling all the way through. If something gets quiet for a few seconds and then gets loud it will impact for you, it will move you, it will create an emotion. (i/v, 2015)

“Depth” is another descriptor that is commonly used in this discussion where hyper-compression brings all the background sounds to the foreground. This creates a situation where all sounds therefore exist on the same plane and this removes a sense of depth in what is termed as the “sound stage”. Vickers commented on this very issue suggesting hyper-compression ‘may damage audio quality by removing dynamics, creating musical clutter and reducing the excitement and emotional power of the music’ (2010a p. 2). This depth is what Alan Moulder also claims to miss in modern hyper-compressed recordings where everything is pushed to the foreground and the loss of transients in the initial attack of instruments:

What I miss most from the loudness is depth. That everything, by definition of limiting everything, you’re pulling all the stuff from the back of the mix to the front. I’ve done a lot of listening at home to older stuff against newer stuff. The fact that you hear transients, you hear things right out the front of the mix. The clicks of kick drums or the clicks or attacks on things out front. It all goes back. You listen to some modern pop records and it’s all shaved off. Everything’s compressed. (i/v, 2015)

Scott Horscroft extends this idea of Moulder’s, especially when comparing the music of eras before hyper-compression it becomes evident that something has been lost in what

he describes as the ‘depth and silkiness’ of recordings (iv, 2016). Horscroft makes specific mention to acoustic music which he believes hyper-compression has had a particularly negative impact on:

It’s tough. Especially if you’re working with an acoustic musician and you’ve got a lot of nostalgia about music that was made in the fifties and sixties and you know they’re not screamingly loud and there’s a sense of depth and subtlety to the music. I think that’s what’s suffered. That’s what’s disappeared, that beautiful depth and silkiness to the music of that era. Now people are wanting it so loud that we’ve destroyed that. (i/v, 2016)

Listener fatigue is another dominant theme from those agents interviewed. Despite being scientifically unsubstantiated, it represents an issue that many tacitly believe exists as a result of the music’s constant level. Alan Moulder presents an example of this belief despite not being able to prove its existence:

I think... there is listener fatigue. I, again... I have no scientific evidence, but I have a feeling that something’s going on. It brings frequencies into it, into your spectrum that you don’t hear but you experience. And it kind of always squashes, bring all the frequencies into the perceptual area. (i/v, 2015)

Don Bartley goes to the heart of the issue by simply stating that dynamic variance is more pleasurable to listen to, especially during the mastering process and believes that it is fatiguing for him to work on ‘a certain product that was continuously flat out all the way through’ (i/v, 2015). In contrast, he states that ‘that’s why it was a pleasure to do albums where people wanted it to breathe because you could enjoy the dynamics’ (ibid).

Interestingly, Michael Romanowski blames the continuous level and associated fatigue on the short attention span of this new age of listeners, that is typified by the preference now for singles over albums:

I think the loudness is potentially one of those things that has created the singles mentality and created a short attention span. We're fatigued, and subconsciously we think that the relief is to move on to something else. (i/v, 2015)

Leon Zervos, however, states that listener fatigue is not necessarily the cause of hyper-compression per se, but the cause of deficient skills in audio engineering that create inferior sounding recordings. He states that:

It's not the hyper compression that fatigues the ear, it's the way non-professionals EQ and add distorted sounds to the mix. Bad distorted grainy sounding mixes are the result of lack of experience, bad monitoring and so on. These are the main culprits of a mix causing fatigue. (i/v 2013)

This assumption by Zervos leads to the argument that many agents espouse when discussing the negative aspects of hyper-compression; that there is a right way and a wrong way to approach the process. As Moulder points out 'it has become a sound now which I am not totally against and like everything, some people are great at it and some aren't' (i/v, 2015). As Eric Broyhill suggests, there are some recordings by artists that simply do not suit the excessive hyper-compression that is utilised. George Massenburg makes the point that artists such as Paul Simon and Paul McCartney both resorted to hyper-compressing current albums that he believes was inappropriate to the style of music; 'they're all pushing it and they're wrecked! [...] this record could have been great but it's fucking crushed. It's right up against the wall and it just happens again and again and again and it pisses me off' (i/v, 2015). In particular, Massenburg takes great offence at albums he had produced prior to the hyper-compression age that have been re-mastered for re-release. He singles out recordings by Earth, Wind and Fire which represents music of a specific era that has been inappropriately hyper-compressed to make it sound more modern and competitive in the current market; 'and the real shame is my old remastered stuff, the Earth, Wind and Fire, they've fucking crushed that! You know, that's punchy as hell and you know, the new stuff is just ruined!' (ibid).

The re-mastering of classic albums from eras previous to the use of hyper-compression is common and generally a very contentious issue that has been well documented in both the media and research studies (see for example: Levine 2007). Vickers provides a comprehensive overview of this issue which discusses remastered version of artists such as Abba, The Rolling Stones, Bob Dylan and Led Zeppelin. Vickers states that record companies have a financial incentive to re-release classic albums with the perceived added value of “digital re-mastering” which inevitably alters the original intent of the artist, much to the ire of fans:

They need to appeal to the notion that each time they are getting closer and closer to the original, bringing out further unheard details.... The irony is that the remastering of Abba’s catalogue has, with respect to dynamic range, probably gotten further from the master tapes with each new release. (2010a, p. 6-7)

The appropriate use of hyper-compression that is not detrimental to the musicality of the recording is a subject that is repeatedly revisited by interview participants. Paul McKercher believes that using loudness as a tool is walking a fine line between it being destructive and effective. McKercher contends that although dynamics in a song can be a great way to ‘evoke emotion and create contrast’ he also believes that ‘the ear can drift away from things that are too soft or sound weak, so there's a line to be trodden between these two opposing requirements’ (i/v, 2013). This is a common theme that was evident in many of the agent’s responses. McKercher also emphasises that the refutation of hyper-compression on principle is over simplifying the issue. He believes that there are good and bad examples of hyper-compression and to successfully utilise the process requires skill and sensibility and ‘that line moves between genres’ making it all the more challenging (ibid). In closing McKercher states:

It's a bit like cooking with salt in that way, there's good loud and bad loud just as a larger dynamic range that features soft sections can be alluring or just plain feeble. It's oversimplistic to say loudness is good/bad. (i/v, 2013)

To get this balance right between a track sounding “feeble”, as McKercher contends, and sounding impactful does require skill but it also requires a sense of aesthetics that corresponds with music. For many producers of music, this is the required habitus they must develop over many years, to be able to correctly apply processing of any kind to suit the music under question and avoid many of the pitfalls that have been mentioned.

### 8.3 Aesthetic Considerations

A significant part of any agent's habitus in the field of record production/audio engineering is an aesthetic awareness, particularly concerning the specificities of genres. Some agents tend to specialise in specific genres while others are able to work across many genres depending upon the role they play in the production process. There are basic skills that the agent must acquire to maintain a position within the field of record production/audio engineering that entail an understanding of the scientific principles of sound and audio, and also processes to achieve certain outcomes. Since, as Michael Romanowski, Greg Calbi and many others were at pains to point out, music is a form of art and consequently there is also a highly subjective side to the production of music that also entails an understanding of the aesthetics that are associated with genres. These skills, whether they be deliberated or innate are the habitus that is required to operate within the field and to hold a position within the space of positions.

What is particularly important when Bourdieu describes habitus, is that he implies that it represents a 'set of dispositions' that are not always consciously drawn upon but nevertheless provide the necessary means for agency or action (Johnson in Bourdieu 1993, p. 5). For the agent operating in the field of record production/audio engineering, an aesthetic awareness of musicality is a prerequisite for many positions within the field of record production/audio engineering. An aesthetic awareness could encapsulate a very broad range of descriptors such as the selection, arrangement and sonic characteristics of instrumentation, compositional elements such as lyrics and melody and so forth. What may constitute one of these "dispositions" is the ability to tell whether something is

“good” or “bad”. What of course is of interest here, is the use of loudness as a descriptor of dynamic variability which is representative of just one within a complex array of aesthetic considerations.

Andrew Scheps is explicit in pointing out that loudness is not a conscious decision that he makes when mixing music. There is an overall aesthetic response to the music that is born of a series of complex decision-making strategies that Scheps believes has nothing specifically to do with loudness. Scheps confirms this stance by stating:

There's never a conscious decision that I need to be louder. I don't care. I really don't. It turns out my mixes are incredibly loud, but that's just because when they sound right to me. No. Never conscious. Never. (i/v, 2016)

Here he makes the admission that his mixes are extremely loud and that aesthetic is what to him “sounds right”. He also stresses that if he were to reduce the level of compression it would no longer have this effect. This is Scheps’ habitus, what he believes “sounds right”. As Bourdieu maintains, this is a set of unconscious dispositions that have been inculcated over many years of immersion in the field and domain and represents a habitus that enables Scheps a continuing position of dominance within the field. Concerning loudness, he claims loudness is just one element that is part of a complex structure of musical knowledge that he draws upon:

I never set out to try and make things loud; it's just a matter of what it sounds like and how it feels when I'm working on it. And it turns out that at the moment what I hear as being good is generally really, really, really loud. And it's not as simple - I know a lot of the arguments are, 'Well, you can just leave it less compressed and I can turn my volume up,' but it doesn't sound the same. And I don't look at meters ever. I have no idea what the meters are doing; but it turns out that my mixes are really consistent level-wise because of how it feels. (ibid)

Another important point that Scheps maintains is that loudness for him has developed into being a part of his habitus, unconsciously over a period of time. This is most likely the case with other agents as well, especially Dave Pensado who maintains that his mixing style has developed along with modes of reproduction and the culture that surrounds these modes. Pensado's habitus has developed in parallel to transformations within the wider field, over time. Therefore, we can see that loudness has permeated the habitus of some agents who do not see it as a concern, nor something that they consciously or actively consider when they are in the creative process of mixing. Scheps also feels it is just part of his process that has developed over time according to cultural trends:

You know, that's part of the sound of the mix, it isn't just level. And it's not like we get a mix going that we like and then figure out how to make it loud, because that would change it, and then we wouldn't like it any more. So, it's all just part of mixing. It's just the evolution of the way we listen to things. And it doesn't change - I mean, it's not like I go back and listen to Led Zeppelin records and wish they were louder. Things are what they are. And what we're doing now in general for pop and rock stuff, it's just loud, and that's just the way it sounds. It's not just level. And I think that is something that gets, sort of, missed in a lot of the discussions. (ibid)

Other agents within the greater field of Western mainstream popular music such as the artists, management and record companies, who are within the tight grip of insecurity previously discussed, are heteronomous to the forces external to the field, including the field of power. The degree of autonomy is directly commensurate with the forms of capital agents have acquired. The degree of autonomy has a direct impact on agency. Artists who are just starting out will be less autonomous and more likely to succumb to loudness as a mechanism to enter the market, overriding their aesthetic judgement. Similarly, mix engineers who have fewer high-profile clients attached to their career are in a similar situation. Mix engineers such as Andrew Scheps, Dave Pensado and Alan Moulder have considerable capital at their disposal to trade, and equally considerable

positions of dominance within the field. As such, they are afforded more autonomy than others, however, these agents are not entirely free from the forces of the field. These agents have developed a habitus in-line with market expectations and it could be argued, have transcended loudness as a simple mechanistic tool, to that which is an unconscious disposition that forms part of their overall habitus. Their aesthetic judgement overrides loudness as a mechanism. As such, loudness just becomes part of their overall aesthetic which Scheps points out is not unlike a desensitisation to violence, you notice it less and less as you become more accustomed to it:

'Back in Black' when it first came out, that was crazy. That was the heaviest record ever made. And of course, now it sounds so unbelievably tame. So, it's just like with violence in movies, it's a combination of changing tastes and desensitisation - and just things that move on. You know, culturally we just move on. (ibid)

As an example of this aesthetic taking a more active role in the process, Scheps makes mention of working with Swedish act The Hives in which the band felt that loudness was starting to override their aesthetic intent and therefore requested Scheps to reduce the magnitude of the process:

I've had records - like, The Hives, of all people, who very low fi and blown up and everything - I mixed a record for them, we're halfway through, they just said, "You know what, this is a little smashed up. Let's go back and open it up a little bit". And we did, and it was fine. You know, they decided for their art that we'd gone too far with it, so we backed off. (ibid)

Alan Moulder maintains that an integral part of an agent's habitus is also knowing how to effectively use various processes in an aesthetic sense, and that no process is particularly detrimental, it's just how you apply it:

And, some things it suits. It's like everything I find in technology and what we do. Nothing's bad, it's what you do with it. You know, no piece of gear in particular is bad, and every piece of gear can have its day in your mix. It's learning to leave it alone or not. (i/v, 2015)

Like Scheps, Moulder describes a similar situation with Nine Inch Nails in which the album *Fragile* (1999) was effectively clipped through Apogee converters. Trent Reznor<sup>47</sup> preferred versions of the mixes which used the clipping process as opposed to those that were without. Moulder states that loudness per se was ‘no big deal to him [Reznor] really’ and ‘had never been an issue with us’, however, he claims that ‘I did a couple of mixes, that I took the “soft limit” off as an experiment for some passes and none of those made it onto the record’ (i/v, 2015). Moulder believed that aesthetically, the clipping process suited the style of the music and this of course leads to the subject of genre and how this can have a significant influence on the amount of hyper-compression that is considered appropriate.

Even John Dent who is a self-confessed “grumpy old man” when it comes to excessive loudness states ‘I think there are certain styles of music that benefited from the extra volume. You’re talking about some classic hip hop records, and you’re talking some well-produced classic rock albums (i/v, 2015). Paul McKercher goes one step further by suggesting that genre certainly has an influence on the amount of hyper-compression that is appropriate but also the age group of the intended audience:

The age group of the listeners and the most likely medium of replay are other factors I consider. Are they an album listening age group or more playlist focused, for instance? (i/v, 2013)

---

<sup>47</sup> Trent Reznor is an singer, record producer, songwriter, film score composer from the United States. He is best known as the founder of the band *Nine Inch Nails*.

As far as pop music is concerned, which is arguably the most consistently loud genre of music, Michael Romanowski is disparaging of the use of excessive hyper-compression. He equates pop music with having little substance, akin to selling more of a “lifestyle” and associated merchandise than delivering any meaningful experience and therefore hyper-compression is used as a form of shouting over the competitors:

I think some genres are not gonna get it. In a way pop is a good example. They're fighting for attention. They're selling clothes or something else. It's not about the music, it's about the entertainment and the lifestyle [...] not about having some message. (i/v, 2015)

Romanowski also believes that producing music in this way is for short-term benefit only which corresponds with what Scott Horscroft mentioned as the significantly reduced attention span of the audience in the age of the internet. Romanowski suggests that:

...what they're doing is trying to be famous for their fifteen minutes, get as much as they can out of it and then, as I said, hope to sell tennis shoes or whatever it happens to be. But an artist is thinking about the long term. To me an artist is someone who is compelled to express themselves in some way or another, and that's what they will do. That short-term wow factor of loudness does not help your long-term career. That helps your now. (ibid)

Consequently, aesthetic considerations of these genres of music became more mechanistic in their approach and this does not only extend to loudness. The compositional structure of the arrangement is also deliberate in which the main hook of the song is more often than not relegated to the very beginning of the song to get the listeners attention within the first 15-20 seconds. When discussing this issue, Greg Calbi states that now more than ever, it is important to get the intro to “hook” the listener into the song and this takes more than just loudness:

I think the intros have always been important, and that probably now the identity, the sonic imprint of the intro. A combination of the melodic and rhythmic elements is even more important. I think that if I were a producer now I would make sure the intro was really grabbing. (i/v, 2015)

Apart from pop music, more underground and independent genres of music that rely on authenticity and aggressiveness use loudness in different ways to form impressions in the audience that are in-line with their expectations of taste and lifestyle. Cem Oral expresses a sense of expectation within Berlin audiences, especially in clubs where he states that the music must invoke a sense of “stress” that is aligned with their mental state which may be drug affected:

Sometimes the totally compressed and pressed sound is wanted. People like stress, especially on the dance floor, they want some stress. It relates to the drugs and it relates also to the lifestyle and that sound is compressed, intense sound, fast forward, directly in your face that fits into the attitude that is wanted. (i/v, 2015)

A term that has been used before in discussions within this research project is hyper-compression presenting an “attitude” that is aligned with the musical genre. Oral believes that hyper-compression is a tool that is relational to each genre under what he calls “alternative” and its use can be extreme depending upon the aesthetic that is intended. He states this is a very different scenario to pop music where methods of production are very generic:

It’s an attitude. Alternative. The basic meaning of alternative means people live in an alternative lifestyle, they go to alternative clubs, non-commercial clubs and they produce alternative music in the history of alternative music like, you know, punk rock, techno, hippy music, whatever. You know all this kind of alternative side compared to the pop side, which is shiny and not too offending in the lyrics and all that what belongs to what we perceive as pop music. Or radio compatible music. (ibid)

Oral is not on the side of the audiophile when it comes to considerations of what hyper-compression does to the signal. To him, it is of little concern if the signal is degraded as coming from the underground Berlin scene, this kind of processing is commonplace to achieve aesthetic goals that are not aligned with an audiophile sensibility. More so, music of this kind is meant to elicit a response that may be intended to be unpleasant or

reactionary. Oral comments that ‘the Loudness War like Bob Katz defines it, is for me a kind of little too conservative, you know. Let the people do it, let’s see where they go’ (ibid). He goes further to say that the idea of a Loudness War is of little consequence to him or his clients, as they simple do what they wish to do:

I do not suffer from the Loudness War. Everybody gets what they want. And I don’t mind, and sometimes I even agree. I, coming from alternative myself and punk is not strange to me. Rough music and experimental music, even today I make really noisy music and I appreciate some deconstruction sometimes. (ibid)

This aesthetic, or habitus that Oral has acquired over time has been through an exposure to music that is not defined by commercial imperatives. This is very much the field of restricted production that as Bourdieu defines, is where the “loser wins” and commercial success is often seen as a sign of failure. Many of the Berlin underground artists see very little chance of commercial success, particularly in the current market downturn that has been extensively discussed. Therefore, these Berlin artists produce for other like-minded producers that are within the same sub-field and as such, frown upon those that do enjoy commercial success as “selling out”.

To acquire the habitus that is necessary to exist within this arena, Oral first started in a recording studio in which he decided that breaking common rules regarding distortion was a way to develop suitable processes that also developed an associated aesthetic sensibility. He provides an account of the acquisition of this habitus:

The first time I went to a big studio, it was totally impossible to have a red light on your meter. And that’s what I wanted! And many people of my age wanted that. They heard Iggy pop and it was distorted and it was aggressive and not Trevor Horn. It was aggressive. So, at the night I was allowed to work there and doing what today would be maybe some kind of Loudness War because you offend the previous aesthetics. So, we have to also invite that this is happening today as well, that people don’t give a shit. (ibid)

We can see that despite Oral and the other Berlin underground artists residing in the field of restricted production like Bob Katz and the MLA in which they are autonomous, their doxical stance, however, is radically different:

You can say they are people that fear they will not be heard, not selling enough when they are not loud enough. But then many people see this is an aesthetic. I mean, you know, ‘harder, faster, louder’! (ibid)

Eric Broyhill agrees with Oral and asserts that in many cases it is only about the aesthetics and to some artists, commercial concerns are superfluous. He also makes mention that many commentators of the use of hyper-compression don’t understand this and look from a perspective that is unrelated to the music itself that is being presented:

But that’s all we have, is an aesthetic. All we have is taste here. There’s nothing else. We could talk about what compressors do. So, there’s been some weird stuff decided somewhere on a forum, from a lot of people who aren’t really in the game, and the people who are in the game, aren’t talking because they’re busy! (i/v, 2015)

All things considered, Broyhill believes it just comes down to individual taste and making the right decisions that satisfy the intent of the artist. He uses the analogy of food to try and describe this sense of individual taste that involve an alchemy of ingredients and believes there is no real right or wrong way of approaching music: ‘so this is a tough question because it’s like saying “what spices do you add to food?”’ (ibid). Broyhill views hyper-compression as just another tool that can either add or detract from an artistic outcome and the skill involved in determining such an outcome is considerable. However, he believes it comes down to personal taste and the lines between genres are blurring which also creates new spaces for experimentation and potential outcomes.

Broyhill is also well aware of how this processing can damage the signal and is aware of the scientific evidence to this end. But he also understands that the desired end result is

an elicited human response and this is of far greater priority. This stance is in-line with Cem Oral's underground aesthetic sensibility of "stress". He states 'I mean I can't disagree with a [scientific] fact; but I'm dealing with songs and human beings. I'm delivering a signal, but I'm weighing that with the larger picture that I'm really dealing with songs' (ibid). This approach goes a long way to explaining why many agents have ignored the significant scientific research of Lund and Nielsen. It might just mean that there are priorities, and aesthetic and commercial imperatives are of greater priority to them.

## 8.4 Loudness in the Production Chain

What is abundantly clear is that loudness can be an important consideration in every stage of the production chain from composition to mastering. As Alan Moulder suggests, loudness is ‘like audio crack [...] you know, once you’ve had it you can’t do without it’ (i/v, 2015). Loudness maximisation<sup>48</sup> appears to be used at every stage when music in its various phases of production is monitored and the laptop seems to feature in this type of reproduction; ‘sometimes I think they just listen on their laptops and they’ll always go for loud’ (ibid). John Dent goes as far as to suggest that ‘you get A&R people that won’t listen to stuff unless it’s been maximised or they think it’s a demo. They think people are not serious’ (i/v, 2015). Therefore, a pertinent question is, who is it in particular that is pushing the most for loudness? The responses are extremely varied but the short answer is, everyone.

William Bowden states that ‘universally the loudness has been driven by the artists [...] I think the easiest thing for young bands to do is to just go we want to put it on and blast everything away’ (i/v, 2015). John Dent agrees and suggests ‘I don’t think [it] was necessarily driven by mastering engineers, it was driven by bands, artists listening to other stuff and wanting to follow that bandwagon’ (i/v, 2015). Bob Horn defers to two different scenarios depending on whether a major label record company is involved or the band is independent:

On the major label level? The executives. On an indie level? The band or the artist. Yeah, executives, the first thing they do, if they don’t have an ear themselves? They just put on something else that they know sounds good as a comparison. (i/v, 2015)

---

<sup>48</sup> Loudness “maximisation” is a term that originated from the use of peak limiter plugins which provided a quick and easy method for achieving the maximum loudness of a recording.

Sean Magee asserts that he's experienced it from everybody involved:

It could be the record label. Could be the radio plugger saying, "oh no, he's got to be loud for this". The A&R person. It could be the producer. It could just be the band. [I've] had it from all sides. (Magee i/v, 2015)

There is also the matter of popular trends which can influence what people do in terms of both loudness and style as Bowden explains:

What I did find occasionally with managers, especially A&R managers [...] they wanted you to try and make it a bit like Foo Fighters. But then of course by the time it got released, you know, something different was popular and they'd turn around and go, "can you make it sound a bit more like Goldfrapp or something?" (i/v, 2015)

In Sweden, Eric Broyhill maintains that pop music is considered a distinct art form and states that 'per capita, they're making more big hits here than anywhere' (i/v, 2015). He also delineates Sweden from the U.S. as being louder 'as a generalisation' in an effort to compete with the U.S. and then do it better', particularly as a result of the Swedish pop phenomena (ibid). Another factor that Broyhill believes contributes to this dominance of pop music is what he labels as 'real musicians' who are at the helm of producing this type of music that may even come from a jazz background. Broyhill uses the example of Max Martin who has written and produced hits for acts such as Taylor Swift, Britney Spears, NSync, Katy Perry and Kelly Clarkson. He explains that:

...[in Sweden] I'll see pop music producers that are actual accomplished musicians; they know what they're doing and they really do love pop music as well and so it's no surprise to me that for that the Britney Spears, Madonna style, they're going to have more than their fair share of success out of this city than any other city in the world. (i/v, 2015)

As a result of this pop phenomena, loudness is a key issue in the Stockholm pop music scene where artists feel under intense pressure to be competitively loud, and therefore

Broyhill believes it is the artists that drive the use of hyper-compression; ‘Yeah, I think more pressure is on the artist, on every level, and so therefore, it’s the artist, in my experience, who is pushing levels beyond my personal preference’ (ibid).

It is quite common for an artist to want to reference their recording to a favourite artist or album, especially during the mix stage. This creates a problem, in that what they are referencing has already been mastered and thus louder. Hence, a direct comparison is difficult to make as their recording is still under production and will always be much softer and by default, will sound less exciting prior to mastering. Therefore, the rough mix, or final mix will be loudness maximised for a proper comparison. Scott Horscroft explains the process:

The idea that, your clients are in the studio with you and you know they want a reference, let’s say for instance Daft Punk. So, they put on Daft Punk and then they’re switching back to their mix. You give them the mix, they drive home in their car and they’re switching between Daft Punk and your mix. They want to hear it mastered when it’s coming out of the studio. You find yourself mixing back through Pro Tools listening to it through a heap of plug ins, just to get that sense of what is it going to sound like when it’s finished. I don’t think that that’s, you know, a bad thing necessarily because you know as a mix engineer you do want to take what you’re working on to the most maximised level—you want to see that vision there while you’re making it. And why wouldn’t you as a mix engineer want to hear your work as close to finalised as it is? (i/v, 2016)

This process of maximising a recording for audition purposes is exactly what Bob Ludwig terms as “pre-mastering” and his grievance is that the artist and associated personnel get used to this high-level of loudness which makes his position more difficult when he wants to master at a lower level. There are, however, practical reasons why this process of maximisation is performed on most “reference mixes”, even those that are rough mixes

during and at completion of the tracking<sup>49</sup> of the song. Namely, so that during the act of comparison with other songs which are most likely mastered, even if the recording is not in a finished state, it can still be relatively near the loudness level of what it is being compared to. Expanding further though on the rationale for this procedure, Pensado once again offers an example of how submitting a slightly lower version of a mix can cost an agent their position:

Well, let me give you an example. I have a dear friend [...] He did a mix for a top three female artist in the world and he tried to do the thing where he left a little bit for the mastering engineer to do and didn't put a lot of compression on the stereo bus. Beautiful mix. But the artist heard the mix and then heard another mix by another engineer on the record and the artist told her management "I like this guy's mix, the loud guy, I don't want to use this mix". So, my friend lost probably...he could have lost a hundred thousand dollars because he didn't comply to the needs of the people. So, artists are very cognisant about levels, A&R people not so much, but the artist oddly enough, and then of course the producers are incredibly sensitive to that. (i/v, 2016)

Bob Horn, who shares studio space with Pensado at Echo Bar Recording Studio in North Hollywood addresses this issue brought forward by Pensado which also ties into what was mentioned previously about the mix engineer delivering a finished product that cannot be altered by the mastering engineer:

My involvement is when I turn in a mix to a client. The worry is that they are going to put it into iTunes, next to everything else that is mastered, and think something is wrong with my mix. They're going to think something's wrong [...] So to make sure that doesn't happen I have to basically pseudo-master my own mixes. (i/v, 2015)

Greg Calbi points out that in years prior to the digital technology revolution, the producer would be the final arbitrator in all decision-making processes and would also be in possession of the appropriate knowledge of how all of the stages of production would

---

<sup>49</sup> The term "tracking" refers to the stage of production where the recording takes place. It is derived from the process of recording separate instruments onto individual tracks which can be further processed and mixed at a later stage.

progress. In contrast, Calbi now believes that there is a large group of agents that are responsible in making a “product” prepared for release which makes this process much more complex. This may include the artist and all associated parties from management and record company. As such, loudness maximisation is used to assist those that are less knowledgeable of the various stages of production in this evaluation process by making it much easier and more obvious what a recording will sound like in comparison to others in the market place. Calbi also makes the important distinction between music recordings as art and as a commodity which is also an influential factor in this scenario:

But everybody’s been empowered, everybody’s opinion makes a difference. As opposed to the old days when you had a producer who was the God, and the producer was a trained individual who really knew what he wanted. I have to use the word; he was an artist. So, you have art or you have a product. When you have art, then there’s plenty of leeway for the art. But when you have a product, there’s not so much leeway. And this is unfortunately what’s happened. (i/v, 2015)

What is apparent is that loudness maximisation performs a role at almost every stage of the music production as an adjunct to the audition process and evident in the demo stage before the proper production process begins. Some agents believe this sets the loudness level of the future final product well before it reaches the mastering engineer who traditionally is the agent that is responsible for setting this level in concert with many other considerations. What is also clear is that agents become accustomed to a particular loudness level and it becomes increasingly difficult to lower the level at subsequent stages because of an affliction that is commonly referred to as “demoitis”<sup>50</sup>.

---

<sup>50</sup> The definition of “demoitis” as provided by the Urban Dictionary: ‘What happens when you listen to one version of something so much that when it’s properly recorded it’s difficult to accept’. Source: [https://www.urbandictionary.com/define.php?term=demoitis&utm\\_source=search-action](https://www.urbandictionary.com/define.php?term=demoitis&utm_source=search-action) Viewed: 13 October 2017.

## 8.5 The Reference Mix or ‘Rough’, and ‘Demoitis’

With the ease at which a recording can be loudness maximised using readily accessible plug-ins that is designed for the novice or amateur to operate with little prior experience, many agents feel that this process is a quick and easy step to invoke a sense of quality. It also gives the agent a sense that their recording is in the “ball park” of others in the commercial arena; such is the capacity of the “louder is better” paradigm to influence the listener. If the initial demo that is submitted as the catalyst for a recording project with the aim for commercial release is maximised, Lachlan Mitchell believes this sets the loudness “tone” for the rest of the project. All other versions of the recordings will be compared to the loudness of the initial, creating what Mitchell describes as the problem of “demoitis”:

People are bringing to the table demos that are really loud to start with. So that sets everything off and there’s a whole chain of mechanisms that kicks in before you’ve even begun to record in the studio. I find you’re always chasing your tail a little bit to get that same volume that someone’s got from a particular thing they’ve begun with in that instance. I call it “demoitis.” (i/v, 2016)

Mitchell is not the only one to articulate this problem. Alan Moulder sees this issue as one of the most significant problems he encounters:

Your demo is blisteringly loud cause someone done it on a laptop and they’ve got some plugins that they’ve playing round with and they get exciting results. Already! First thing you come across, the bar’s been set at a level, and you go urghhh. “Uh, I don’t like it as much as the demo, I don’t like the rough you’ve made”. So it starts at the beginning [...] You can’t just ignore it anymore. You can’t get shot down at the first stage. (i/v, 2015)

So endemic is this problem that its reach spans from the demo stage right through to mastering. Therefore, this issue revolves around the artist or those around them that will

be responsible for the dissemination of the recording, who are the main decision makers being at risk of catching “demoitis”. This is even more prevalent if they have spent a long time listening to the first versions of a recording which they will get used to and it imprints itself into their memory. Subsequent versions, particularly if they are not as loud, will seem to be lacking something they can’t fully explain. John Dent points out that if a recording is not at least as loud or louder than the original demo, ‘it sounds like the band hasn’t finished the work or whatever. I’m very aware of this phenomenon, it’s almost on every job’ (i/v, 2015). It can take a significant amount of explanation and convincing an agent otherwise.

Many agents who actually work in the production of a music recording are aware of this conundrum and are complicit, maximising any version of the recording before it is listened to by those that are the main decision makers. As previously mentioned, Dave Pensado offers several examples where agents have lost lucrative positions from “roughs” or what is termed as “reference” mixes that the artist has considered not as exciting as louder mixes. There are too many examples of this issue expressed by the interviewees to include them all, hence, a selection of examples are highlighted that typify this issue. Lachlan Mitchel presents such a response in what he will do to a mix that he presents as the artist:

What I will do, maybe I’m complicit in it as well, but I’ll put an L2, a limiter on the mix that I send to the band, but only just to lift it up to a level nearer to everything else they’re hearing.  
(i/v, 2016)

Alan Moulder found that as a mix engineer, the rough mixes that came from the producer and tracking engineer were so loud that it was incredibly difficult for him to match unless

he started to hyper-compress to such an extent that it dramatically changed the mix he intended which he found counter-productive. To Moulder, this situation presented a major issue as he preferred to send mixes off for mastering that were considerably lower in level and leave the issue of loudness to the mastering engineer which is the traditional method. The problem is getting the client to sign off on the mix which he states, ended up involving several versions of the mix to satisfy several stages of referencing. They would be listening to his mix and comparing it to the rough mixes at various stages of production and gauging whether Moulder had taken the recording to another level. Most of the time loudness was the main criteria that the client would assess this by:

The engineer who's done the rough mix, or the artist that's done the rough mix may have put loads of processing across the mix, especially if it's been done in the box. They'll put an L2 or another form of limiter over the end. I used to trust people... "My mix is lower than yours, adjust the balance, so you're comparing it on the mix and not the volume". It worked for a while. And now you can't trust people to do that, because a lot of people, like bands... they are maybe on tour and listen on laptops. (i/v, 2015)

Moulder further adds that 'it's become a massive issue [...] it's gotten worse and worse' and that these rough (or reference) mixes '99% of the time [are] through the roof in terms in terms of level' (ibid).

Similarly, Bob Horn provides an example where he explains how the reference mix is fundamentally different to the final mix in which all the parts are put into place as opposed to the reference which is very flat in its balance of instruments. Despite sounding superior on many levels, if the final mix isn't as loud as the reference mix the client can think there is something wrong. Horn explains that it can be difficult to achieve the level of loudness without damaging the mix which echoes Moulder's claim of the same nature:

There are times when I felt like I've compromised my mix in a certain way to achieve that. Rough mixes are a big thing and a big problem because when a mix is a rough mix, is undefined, not cleaned up, it's rather flat, everything's at the same level, things aren't louder and softer or sculptured. So what happens you can get your rough mix easily loud, and everyone's in the moment, they've got the speakers cranked in the studio. They've just

finished a vocal take. Crank on some plug-in, make it really loud, sounds great, it's blaring. And that's what goes out to everybody and they have it for weeks and they get used to it. So, in my mix, I push up the bass drum, it hits hard and it feels good. I push up the vocals, it's more dynamic, and it's punchy and it's clear but now I've taken up more room and I can't get it as loud as theirs. So now it looks like there's something wrong with my mix. (i/v, 2015)

To Horn, it's a matter of explaining to the relevant people involved with the project or likewise, relying on someone like the producer who can see through the initial influence of loudness:

Once it's been mixed the way I mix, everything's more dynamic and punchy and more exciting sounding. I lose a couple of dB compared to the unmixed version. So sometimes I'll send that out, and usually in the major label world, most guys have gotten it by now, 2015, but every once in a while, it's like 'the rough mix is so much better'. And that's a person that doesn't realize it's just louder. So, at that point hopefully someone else will step in, like the producer, someone that knows and says, "no it's just louder". Sometimes I got to take another shot at getting it louder, and even though it's for nothing. Or, I'll just write an email saying that the mastering engineer will get it as loud as you want it. (ibid)

Unlike some mix engineers who prefer (and have the autonomy) to submit mixes that are virtually mastered, Horn (as with Moulder) claims that he makes two masters; one for the client that is extremely loud and one that is considerably lower for the mastering engineer.

So, I work hard nowadays, and it's part of my mix, is getting it loud. I have a bunch of different techniques in doing so. I don't send it out like that though, I send out a mix that is loud to the client, and when they say it's good for mastering, I turn it down and allow a good 8-10dB of headroom. (ibid)

The important thing to note here is that Horn works hard to get the mix loud during the mix stage so that when the processing is applied in mastering, the same or greater magnitude of loudness is achievable by the mastering engineer without compromising his mix too much. In this way, Horn makes his mixes structurally impervious to loudness by mixing with hyper-compression processing, and then when the processing is removed, the mastering engineer can build the loudness back up without doing too much damage to the integrity of the mix. Horn believes that the mastering engineer who is well versed

in loudness should be able recreate and surpass the loudness that he achieved in the mix without any significant change. He explains the process:

So, I ask them “do you want to hear what my loud reference was, so you know how loud I was, so that you don’t give it back quieter to the client than I gave it to them?” And usually they can without any struggle to get it even louder as they have better tools for that than I do. But I think they can appreciate when they get it back up to my level, they’re not wincing in pain. Because, I’ve already struggled to make it that loud and sound good. I think that’s the trick now. (ibid)

Alan Moulder tells of a very similar situation whereby he creates a reference mix that is clipped through his choice of A/D converter (Lavry Gold) for the clients and then sends a much lower version to the mastering engineer to work with. Moulder then makes mention that quite often the client prefers his loud reference that they have become accustomed too over the mastered version:

And then again give to the mastering engineer the +6 one and I’ll send him the normal level one. But of late, I’ve had from a lot of the artists I’ve done that with, the poor mastering engineer... they all want to use the loud one. He masters the lower level one like the +6 one. And they don’t like it as much as my +6 mix flat [the clipped reference mix]. (i/v, 2015)

This of course creates a problem for the mastering engineer who is the last stage in the production chain. As discussed in section 7.4.1, the role of the mastering engineer can be a difficult one of managing client expectations and reference mixes that have shaped these expectations can make their job difficult to navigate, as William Bowden explains:

What’s very common is that people will send you the mixes, just the way they are, the way they mixed it. Then they will send you the hastily mastered demo masters that they have given to the band that have just been sort of slammed to the crap. And sometimes you go “wow, okay, I don’t actually really want to make it quite as loud as the band has been listening to”, but that’s very dangerous territory because then they’ll go, “well why are we paying this idiot, his masters aren’t as loud as yours. They don’t jump out”. You know, so it’s tricky. (i/v, 2015)

Björn Engelmann also provides a very typical response to loud reference mixes that speaks for many mastering engineers interviewed. Here, Engelmann articulates the

problem of matching the reference mix without ruining the recording but at the same time managing the expectations of the client:

The problem that occurs in many, many, many times is that the limited master is so hard limited so it's a problem to reach that level without trashing the sound. If the record company, the label or the A&R, or even the artists has listened to this limited master for quite a time, they're getting used to the sound, and when I deliver the master that I like, which is in my opinion is musically right or even much, much better than the limited version. They only hear the level. Yes, we like that one but can we get it louder? (i/v, 2015)

Of course, not all mastering engineers find loudness a problem to this extent and are seen as specialists in this area. We can count Vlado Meller in this category as well as some mastering engineers from Sterling Sound in New York and Bernie Grundman Mastering in Los Angeles that have been previously mentioned, and all refused to be interviewed for this research project despite repeated requests.

## 8.6 Conclusion

This chapter has concentrated largely on why agents, people who make informed choices who are involved in music production, use hyper-compression as part of their agency and what underlying rationale is presented for its use. What was uncovered was a very complex set of objective and symbolic conditions that determine possibilities for action for these audio practitioners concerning loudness, which is systemic in nature. The agency of these agents is defined by many factors that at one level can be described as driven by an insecurity that is germane to the transitional nature of the field that they operate within, and at another level, hyper-compression forms a distinct part of their aesthetic intent and habitus to exist within the field. It is therefore not possible to pinpoint one specific reason, or overriding feature of influence that affects agency, but a network of interrelated factors. We can certainly identify the main decision makers in the production process. The artist, record company representative and management have considerable influence on loudness being used as a mechanism of influence. This situation is evident in the maximisation of recordings from the outset of the production process through to its completion, to which agents involved in production are complicit, driven by their own sense of insecurity to maintain position within the field. It could be argued that this circumstance in itself presents one of the key drivers in the propagation of hyper-compression, typified as a “vicious circle” of loudness in the production chain. In many ways, the loudness of a recording is defined prematurely at the beginning of the production process which causes a familiarity that is often difficult to circumvent. This setting of a loudness level in the consciousness of decision making agents early in production demonstrates itself as a restriction of possibilities for agency at later stages of production.

There is, however, an underlying tension between satisfying market forces and achieving calculated aesthetic outcomes. Some agents also feel as though hyper-compression performs an important function in creating a form of acoustic fiction that is far removed from the kind of realism that others may find more authentic or appealing. These agents rebuke any form of restriction of their agency by the opinions of others that may be from an opposing doxical spectrum. They also disregard any attempt to curtail their agency which maintains their position within the field. These agents see hyper-compression delivering both what they envisage the client and the consumer wants and as such, these agents refute the very concept of a Loudness War. As evident in participant responses, there are those who dismiss entirely the issue of loudness as being a problem at all. These agents justify their agency, their choices, as representative of a cultural shift in music production that has adopted hyper-compression as a legitimate form of expression. As Dave Pensado claims, his doxa and habitus are not tethered specifically to hyper-compression, but to the culture he is immersed in which he believes has adopted hyper-compression (i/v, 2016). Pensado even takes to task the use of the term hyper-compression and what it represents, which he believes, does not adequately portray how he approaches loudness in his own practice (ibid).

On the other side of this tension are market forces and their influence on production practice typified when the agent is forced into making decisions that are not based on sound aesthetic judgement. This has been well documented in previous chapters and indicative of the misuse of hyper-compression. As outlined, there is an intense insecurity that has had a significant impact on agency which effects both agents that are external to the production of music. It was also discussed that the artist and their surrounding entourage of decision makers are highly insecure regarding the financial impact of

releasing music into the current market environment. This insecurity then follows on to those involved in the production of music who feel their roles are under threat if they do not capitulate to the desire for excessive loudness which may be against their expert judgement. This situation of course extends to both the mix and mastering engineer, although there is a tendency for the mastering engineer to point blame at the mix engineer considering mastering is the last stage of the process. This can be explained in the employment of what has been termed the pre-master, which in effect delimits the agency of the mastering engineer concerning the loudness of a recording. As mentioned, however, as part of the systemic nature of this issue, the loudness maximisation of the recordings throughout the production chain creates a situation to which the mix engineer can feel they are under similar constraint. This issue, however, feeds back to the artist etc. who act throughout each stage of the production process, in terms of Csikszentmihalyi's field, as gatekeepers.

In an attempt to ratify the use of hyper-compression, agents supply numerous accounts of both positive and negative outcomes of the hyper-compression process that hinge largely on its correct and appropriate use. These positive outcomes highlight, as Björn Engelmann suggests, the idea that hyper-compression is not always a 'bad thing' and can add much needed 'attitude' to a recording (i/v, 2015). This addition is largely dependent, however, on the process being used in such a way as to complement the recording both in its presentation and musicality. This complementarity is not always the case and much of the negativity surrounding hyper-compression focuses on misuse which is pointed towards the prosumer and artists who simply wish to be as loud as the next artist with less concern about the consequences for audio quality and supposed musicality. In summary, those that use hyper-compression and are not opposed to its presence in practice, view it

as an essential part of their habitus which provides either an intended aesthetic outcome or a mechanism to relate to their clients or audience. Concerning the case against hyper-compression which is founded upon scientific knowledge and suggested acoustic realism, it could be argued that this reasoning has little bearing upon what constitutes their creativity. In response to this line of reasoning, it has been suggested that cultural shifts have occurred in what is considered the art of music production and, therefore, agents should not be limited in their expression if something is indeed a part of the creative process despite there being consequences that may not satisfy concerns from this scientific or purist perspective.

This stance is in direct contradiction to those who are against the use of hyper-compression as a rule, such as Thomas Lund who believes that it is ‘one of the most serious problems’ in music production in the 21<sup>st</sup> century (i/v, 2015). Lund, and those like him from the MLA view hyper-compression as destructive to both signal quality, impact and musicality. It’s important to note that the focus of this chapter has been to uncover *why* agents use hyper-compression as opposed to concentrating on potential and actual deleterious effects on the signal, perceptual coding and subjective musicality. It could be argued that these aspects of the process have already been well represented in previous research and highlighted extensively in the literature review (for example, see section 2.4.2.7). The effect of hyper-compression on signal quality in particular is well defined and difficult to dispute. Comments made by interview participants support claims made in previous research that the hyper-compression process can indeed have serious ramifications to the signal and musicality. These comments suggest that hyper-compression can have adverse effects on the emotive value of music as a human expression and depth within the sound stage. Lund contends the extensive use of hyper-

compression has been causal of the destruction of an entire musical heritage and that this process cannot be reversed if needed at a later stage. This could be argued as correct considering that the hyper-compression process is non-linear and not regressive. Despite these negative side-effects of the process which is particularly evident in the distortion that is added at various stages of storage and reproduction of signals, agents continue to use hyper-compression and rely on it for the many reason outlined earlier. Importantly, when questioned on this circumstance, Lund makes the comment that ‘maybe they think of the net effect of being louder is much more important than distortion’ (i/v, 2015). It has been argued throughout this research project that the cause of hyper-compression as a dominant structure acting on audio practice cannot be attributed to one singular factor but is representative of a very complex set of conditions that are based within the interactions of sociocultural and socioeconomic considerations with choice making agents. These causes are therefore systemic in nature and highly interrelated and as such scientific rationalism does little to explain this phenomenon. Lund’s comment seemingly supports this argument.

## 9 CONCLUSION

It has been argued throughout this research project that the cause of hyper-compression representing a dominant structural factor in audio practice is not the product of one singular cause but is representative of a multi-factorial set of conditions that are systemic within the field of Western mainstream popular music. Notwithstanding the powerful influence of the “louder is better” paradigm, to which there is ample evidence to suggest that the origins of loudness as a commercial mechanism to influence the consumer were originally derived from this phenomenon, it has been argued that this no longer represents the only motivation. Understanding why agents engage with hyper-compression, apart from being a marketing mechanism or a form of competition to be the loudest has been the central aim of this study. Furthermore, of considerable interest is why agents engage with the practice when considerable scientific knowledge exists, detailing deleterious consequences to the audio signal, and the perceptual coding and reproduction of these audio signals. In addition, there is much anecdotal evidence to suggest that hyper-compression is detrimental to musicality by removing dynamic variability which has been said to be an integral part of the emotive value of music as a human expression. This removal of dynamic variation is also claimed to be causal of a psychophysical condition known as listener fatigue of which, although unsubstantiated, the ‘anecdotal evidence is quite compelling’ (Vickers 2010a, p. 10). Detractors of hyper-compression as practice have used these undesirable products of the process as the basis of their argument against its use. The question has been raised as to what kind of legacy is being left behind for future generations to experience if the process is both damaging and irreversible. Thomas Lund, in particular, describes the phenomenon as the “destruction of an entire musical

heritage” (i/v, 2015). Despite these concerns, hyper-compression continues to propagate within the realm of music production. Previous research into the area was unable to adequately clarify why. The intention of this research project was to address the subject from a more comprehensive perspective than previous studies, investigating the audio practitioner who utilises hyper-compression operating within a sociocultural context. This perspective takes into consideration the multiple factors that may influence the audio practitioner’s agency from within the social and cultural system.

To facilitate the aims of the research project, a theoretical framework and synergetic methodology was devised to investigate the topic from a systems perspective that addressed both subjective (agency) and objective (structural) conditions. Addressing one without the other, which has generally been the direction adopted previously, has proven an inadequate approach in gaining an understanding of the use of hyper-compression. Hyper-compression can be viewed both as practice and a structure for creativity to occur in the production of music as cultural works. It exists within a social system and a system of knowledge that makes action possible. Therefore, it is argued that hyper-compression should be examined as such.

Three complementary theories were chosen, that of Csikszentmihalyi, Bourdieu and Rogers to provide a framework for this classification of investigation. All three theories pay attention to forces that are exerted on the agent and their agency through social, cultural and physical structures that operate within a system. While Csikszentmihalyi’s systems model of creativity provides an understanding of the mechanisms of the social system which make creativity possible, Bourdieu’s field theory provides the means to deconstruct the social system into constituent elements and examine interrelationships

that bind them together. Importantly, both theorists contend that creativity and cultural production is not the product of the individual, but it emerges from the structured system that they exist within. It is also evident that within the narrative of hyper-compression, the introduction of various forms of technology has played a significant role in changes to the social system. It is here that Rogers' theory of the diffusion of innovation has been instrumental in gaining an understanding of the mechanisms and modes of communication of how this social change may or may not occur.

The ontological positioning underpinning the methodology was that of constructionism which places subjective and objective viewpoints on two sides of the same coin. The underlying principal of constructionism is that truth and meaning is not within or without the object. Instead we construct meaning through our interaction with the object. Multi-strategy methods utilising both quantitative and qualitative approaches were adopted in line with this ontological stance. A combination of signal analysis and ethnography representing what Robson describes as a 'sequential transformative design' was conducted in which the results were integrated during interpretation and guided by the theoretical perspective (2011, p. 166).

A signal analysis was conducted on a corpus of 210 music recordings. Semi-structured interviews and participant observation were conducted with twenty-nine music industries identities from seven countries which provided an insight into the use of hyper-compression in Western mainstream popular music. These interviews also provided an extensive and in-depth insight into a universe of habitus, capital, agency and doxa of agents that provide the means for action and maintaining various positions within the field. When integrated for interpretation in the analysis stage, both quantitative and

qualitative methods facilitated a systematic examination of the many factors that facilitate the propagation of hyper-compression as a dominant structure in music production.

What can firstly be surmised is that the endemic use of hyper-compression, representing a high magnitude of the commonly used practice of dynamic range compression, is fundamentally the result of a change in the domain structure resulting, in part, from the introduction of digital audio technologies. A creative act, or a series of creative acts introduced hyper-compression into the domain, changing the domain's structure which therefore changed further practice of agents. As a case study, Oasis's (*What's the Story?*) *Morning Glory* (1995) presents, by definition, an act of creativity in which a novel idea (a very loud album) was introduced to the field, transforming the domain. Whether this album was indeed the definitive catalyst for this new form of extreme compression, which Inglis described as a 'devastating new weapon' in record production, is open for debate (2010). There are, however, many that ascribe to this assertion and attribute the album's success as a response in part to its extreme loudness. The introduction of various forms of digital technology that fed into the actions of the social system punctuated change in audio production practice which in turn can be identified as changes in the domain and symbolised as artefacts. For example, the Apogee AD-500 arguably made possible the loudness of Oasis' (*What's the Story?*) *Morning Glory* by use of the soft limit function. An investigation of the domain as a field of works and space of possibles provides an opportunity to identify moments in history where the introduction of this technology corresponds with an average increase in loudness levels. This was evident in the quantitative analysis of the objective properties of the music corpus of 210 recordings from 1955 to 2016 which directly corresponds with previous research by Ortner (2012) and Deruty and Tardieu (2014). Markers along this timeline correspond with the

introduction of various forms of digital technology during a period in which the methods of production available at the time, actively encouraged the use of hyper-compression. We can therefore position the start of this increase in loudness levels in the early 1990's with a subsequent peak in the mid to late 2000s, followed by a modest reduction. We can also attribute the establishment of hyper-compression within the social system to the increased use of digital audio workstations during the 2000s, making many of the processes that enabled loudness maximisation available to the wider audio community and the consumer.

How hyper-compression became such a dominant structure in music production practice, therefore, has been viewed as largely attributable to the introduction of the technology mentioned. However, it is argued that although this technology can be seen as a distinct catalyst, it is not the ultimate cause of hyper-compression as a necessary structural feature of contemporary music. It was the engagement of this technology by choice-making agents in practice which helped cause a change in the domain's structure. This technology only provided agents with further possibilities of action. It did not force them to use it. It is also argued that hyper-compression became such a dominant structural factor through a gradual transformation of the domain which occurred via a recursive process of change over time. As agents engaged with the technology and created hyper-compressed music recordings, and the field deemed them worthy of inclusion into both the knowledge and symbolic structure of the domain, this situation influenced the possibilities of action of other agents. Hence, action is transformative of the domain, which in turn, is transformative of further action. This can be recognised as indicative of the circular causality of Csikszentmihalyi's systems model of creativity.

As hyper-compression developed into a structure presenting possibilities of action within audio production practice, agents then refined loudness-inducing processes in conjunction with, and as a response to, ongoing developments in technology. This situation created further changes in the knowledge system of the domain. These ongoing changes became evident in the artefacts of the domain, acting as a space of possibles. As such, we have seen examples where the habitus of agents such as Bob Horn has had to adapt accordingly to these changes in the domain structure to help maintain his position within the field. These changes in the domain structure also created changes in the structure of the field itself in a Bourdieusian sense. Mediating the loudness of a music recording was no longer exclusively the role of the mastering engineer in the final process of mastering. Authority over loudness had moved into other stages of the production process which caused considerable tension between agents, and this is particularly evident in what Bob Ludwig terms the “pre-master”. Mix engineers particularly felt the need to engage with hyper-compression to influence the decision-makers, represented as the artists and various management, in the production process to maintain their positions. Loudness as a consideration had in fact regressed further back in production stages where the loudness level in some cases had been established long before mixing or mastering. We can also include the prosumer in this equation as they had also entered the field as a force and also assumed authority to use loudness as they saw fit.

A structure of such dominance in the field of Western mainstream popular music most likely cannot be singularly attributed to one single act of creativity, despite there being evidence that the Oasis album was a significant tipping point. There are most likely many examples of hyper-compressed recordings which proliferated during this period as loudness was not some inspirationalist act of genius by Oasis’s producer Owen Morris, it

had always been a significant consideration historically in the production of music and commercial broadcast. The “louder is better” paradigm was a salient mechanism for producers of music to employ in a commercial sense. With the kind of increase afforded by digital technology, and the advantage over others that was achievable, it makes perfect sense that loudness would proliferate and continued to do so to such an extent where all recordings that were destined for the field of large-scale production in the field of Western mainstream popular music were eventually hyper-compressed to some degree.

Another important example presented of this transformation was of top-40 music producers who, due to the fact that loudness had managed to significantly alter the domain, were required to redefine their habitus and agency to accommodate this change. In turn, the expectations of the field had accordingly reconfigured itself to accommodate for loudness and therefore judgements on whether or not an agent’s music was considered worthy of inclusion into the domain were arguably dependent to a large degree on whether it was loud enough. With this process in mind, it is therefore argued that to remove hyper-compression as a structure, the same gradual recursive process would be required in which alternative technology may act as a catalyst for change. We could therefore envisage the technology of loudness normalisation as providing a *loudness normalised space of possible* in which the loudness bias of the “louder is better” paradigm is negated by agents engaging with this new technology. However, as was extensively discussed, there are many more factors that need to be taken into consideration as loudness bias is one amongst a multi-factorial system at work. Furthermore, we know that there was a salient incentive for agents to hyper-compress as the original level increases experienced at the outset of the period known as the Loudness War would have matched those represented in the listener preference experiments reported in (Taylor 2018) which had a

significant influence on listener responses. The question then to be raised is whether a loudness normalised paradigm offers as vigorous an incentive as loudness bias for agents to stop using hyper-compression since the factors that hold hyper-compression in place as a dominant structure in the field are many and their forces powerful in both a sociocultural and socioeconomic sense.

From within the system that was examined, technology has also strongly affected the previous business model of the music industries, exacerbating what Frith described as a ‘strategy of risk avoidance’ (2001, p. 46). This strategy was in place well before the transformation from physical to digital modes of music delivery and reproduction came into being. This process of risk avoidance can now also be identified in the reliance upon hyper-compression as a pre-condition of preparing a recording for entry into the market. The transformation of the music industries and the devaluation of music according to global sales figures no doubt created an environment of intense insecurity and a competition in expectations of loudness, which was evident from the responses of *every* interview participant. This insecurity forms one of the most compelling outcomes of the research project and due to its pervasiveness in said responses, is difficult to ignore.

According to Scott Horscroft, head of the A&R team at EMI Australia, as part of this transformation, loudness now plays a lesser role in the audition stage of finding artists as opposed to artists who already have a significant existing on-line presence. This can be considered as part of a strategy of risk avoidance by selecting artists who already have a large audience base on-line, which, admittedly, goes against what many still believe is an ongoing concern in the A&R gatekeeping process. Regardless of this shift in priorities, Horscroft importantly asserts that loudness plays an even more significant role in the final

product that is designed for the new forms of dissemination via web-based channels. As part of the transformation of the industry itself, these web-based channels of marketing and music streaming have shifted emphasis from the album to a series of single songs which short, intense promotional campaigns could be based around. This leads consumers to construct their own albums of various songs by different artists in a playlist. Within the playlist, there is a constant comparison between songs which is also seen as a major factor in the use of hyper-compression. In this case Horscoft believes loudness normalisation will have little immediate impact on the practice of releasing loud recordings. To summarise this sentiment, there are more important factors to consider than to risk not hyper-compressing a recording for the sake of proposed audio quality, or if the case may be, being the first to do so.

Not only is there a sense of insecurity for artists and their entourage of management and record company, but there is a palpable sense of insecurity emanating from the audio practitioner who has little autonomy in the field of large-scale production. As Dave Pensado has mentioned on several occasions, agents have lost positions on productions due to their work not being loud enough to impress the relevant decision makers on a project. Most agents interviewed who identified as producers or mix engineers admitted to being complicit in maintaining loud levels throughout the various stages of production by loudness maximising anything that is to be evaluated by these decision makers. They fear that the decision makers will consider a softer recording as inferior work. As John Dent maintains, 'you get A&R people that won't listen to stuff unless it's been maximised, or they think it's a demo. They think people are not serious', and furthermore, if a recording at any stage of production is not as loud as the previous "rough" or demo, 'it sounds like the band hasn't finished the work' (i/v, 2015). This predicament is particularly

felt by the mastering engineer who may consider a superior outcome corresponding to a lower level only to find the client, who has become familiar over time with a louder previous “rough” version or “pre-master”, will reject the mastered version for not sounding as exciting. From interview responses, this set of circumstances seems to be endemic in music production. Managing client expectations and mediating loudness levels appears to be a central theme and one that is the primary source of frustration amongst mastering engineers in particular.

Continuing on the theme of gatekeepers, despite there being no apparent correlation with loudness and increased sales, it is widely agreed that the loudness of a music recording may significantly influence the decision makers of these broadcast companies as to what tracks will be featured (Viney 2008, p. 54). These broadcast companies are considered as a vital part of marketing the product to the consumer, hence, the radio program director has been traditionally recognised as one of the most influential gatekeepers throughout the history of commercialised mainstream popular music. According to Negus, radio broadcast is ‘one of the most important promotional outlets for popular music’ that has considerable ‘influence on the type of music recorded and the way in which artists are acquired, developed and presented’ (1992, p. 101). It appears to remain so. There is a commonly held belief that the loudness of a recording is a substantial influencing factor in the audition process, in which the radio program director may have many recordings to evaluate on a weekly basis. It is reported that the recording must make a strong impression within the first 30 seconds and the track must ‘leap out’ which generally equates to it being louder than others if possible (Horscroft i/v, 2016). It was also noted that this gatekeeping process has extended to music streaming platforms in a similar way.

Attaining featured positions for artists on specific sections of the site that brings prominence to the consumer is of equal importance to radio airplay.

This gatekeeping process of both radio and music streaming programming is largely seen as playing a distinct role in the propagation of hyper-compression. However, ironically, the advantage that loudness may present as a method of influence during this process is largely negated due to the loudness normalisation incorporated into music streaming platforms and it also works counter productively with radio station output processing. Once a hyper-compressed recording is broadcast on radio, it is effectively hyper-compressed once again through the station's own aggressive output processing, often with undesirable results. It was mentioned that record companies are under the misconception that loud masters will sound louder during broadcast which is not necessarily the case. Most agents interviewed agree that recordings that are lower in compression level, generally sound better and louder on radio than those that are excessively hyper-compressed. It may well be that the mindset that louder recordings will translate to sounding louder than other softer recordings on radio, is a myth that in reality has the opposite effect.

One of the most compelling factors uncovered that both enables hyper-compression to remain as a structure and presents a distinct challenge for its displacement is that it has become a significant part of the agent's habitus as an aesthetic. As outlined in Chapter 8, despite the arguments against hyper-compression being founded upon scientific knowledge and suggested acoustic realism, it could be counter argued that this reasoning has little bearing upon what constitutes an agent's artistic processes and aesthetic sensibility. An excellent example was that of Cem Oral and the Berlin underground music

scene in which hyper-compression is said to provide an appropriate mechanism for creating the right attitude in the music that may involve a significant amount of signal degradation. This attitude may well be what the designated recipients of the music, being either other producers or discerning consumers of these genres of music might expect. Other agents such as Dave Pensado also feel as though hyper-compression performs an important function in helping create a form of acoustic fiction that is removed from the kind of realism that audio purists may find more authentic or appealing. These agents strongly rebuke any form of restriction of their agency by the opinions of others that may be of an opposing doxical spectrum. They view hyper-compression as delivering both what they envisage the client and the consumer wants and as such, some of these agents also refute the very concept of a Loudness War and label it as an inappropriate symbolisation of something that has always been an important factor in music production.

Underlying this view that hyper-compression performs a function in a creative sense is what Susan Rogers elucidates as being utilitarian in engaging the market with ‘properties of other successful stimuli’ and that ‘if you're making something that's too much of an outlier, it's unaccepted in the market place’ (i/v, 2015). Clearly, many agents who have adopted hyper-compression as part of their habitus consider it necessary to satisfy requirements of the field. Pensado and others, for example, believe that the adoption of hyper-compression can be considered as similar to other historical inclusions to culture that proved controversial at the time. Hence, hyper-compression and loud recordings are just part of a natural evolution in audio production that is tethered to the culture of the times. As part of a cultural shift that can be categorised by the use of the internet and a dramatic increase in the speed and volume of information disseminated, some believe it requires adaptation to the requirements of these delivery systems, methods of

reproduction and developing trends. Creating a connection with the audience requires strategic thinking that takes into account the audience on a cultural level that they understand, and also one that suits the world that they live in. It could be argued that creating this connection is far beyond a simplistic commercial mechanism that depends on fooling the consumer into liking something by way of the “louder is better” paradigm. Therefore, there is a feeling amongst agents that scientific reasoning alone or seemingly outdated modes of thought concerning the culture of music have little place in the supply of music to audiences that have expectations beyond these more traditional ways of thinking. Andrew Scheps makes the point that using hyper-compression has been accepted by the consumer as an artistic outcome that they have embraced. Whether this statement is correct is unclear, however, he does present a robust argument that if loud recordings were rejected by the audience in general than it most likely would have disappeared from music production as an unsuccessful artistic statement. In support of this argument, one has to look no further than the example of excessive hyper-compression regularly illustrated by Thomas Lund that is identified in the track *Demons* by U.S. group Imagine Dragons which has attracted over 600 million views on YouTube<sup>51</sup>. Therefore, these agents justify their agency as representative of a cultural shift in music production that has adopted hyper-compression as a legitimate form of expression. This, of course, is in complete opposition to those that consider hyper-compression as the “destruction of an entire musical heritage” such as members of the MLA.

---

<sup>51</sup> [https://www.youtube.com/watch?v=mWRsgZuwf\\_8](https://www.youtube.com/watch?v=mWRsgZuwf_8)

In an attempt to understand this dichotomy between those that are in support of and those against the use of hyper-compression, highlighted from the investigation, a tension was identified between those that view cultural objects as commodities and those that view them as symbolic objects (Bourdieu 1993, p. 113). A struggle therefore exists for authority over the use of hyper-compression between sub-fields of the field of record production/audio engineering. It was stated that this tension is at the core of the issue of hyper-compression between agents whose habitus is more aligned to the field they represent. It can be argued that agents who consider hyper-compression to be part of their aesthetic intent represent the field of large-scale production in which music is viewed as a commodity for mass consumption. These agents' habitus are aligned with the expectations of this field to maintain positions and are required so as to adapt to changes within the field and domain. In contrast, are those that view music primarily as a symbolic object that requires wide dynamic variation more suitable for the field of restricted production – not necessarily as a commodity for mass consumption. These agents are representative of the AES and MLA who are against the use of hyper-compression and consider audio purity as a prerequisite in music production. This latter stance is seemingly incompatible with the field of Western mainstream popular music which is deeply rooted within the field of large-scale production. As an example, Bob Katz readily admits that without succumbing to the use of hyper-compression, he could 'not compete with the recordings of anybody, literally anyone else in the field' of large-scale production which puts him at a distinct disadvantage within this field (i/v, 2015). That said, Katz has forged a considerable career by offering services to those artists that identify as part of the field of restricted production. These artists do not necessarily wish to compete under the same conditions as those that identify as mainstream popular music. A distinction may be based upon genre for instance, in which hyper-compression may not be a culturally valid

expression. Katz has had to develop the required habitus to exist within this field which involves considerable expertise in processes that provide a more audiophile outcome.

It was suggested that the concept of doxa was useful in gaining an understanding of the underlying motivation behind these varying habitus which enable the agent to occupy positions within the respective fields of large-scale and restricted production. Doxa can be explained as an internalised belief system that is not unlike an ideology that delimits an agent's habitus. Agents have contrasting doxic stances concerning the use of hyper-compression, which can be positioned on a scale between orthodoxy (firmly against hyper-compression) and heterodoxy (affirmative to hyper-compression). It is here that the struggle for authority over the use of hyper-compression exists between these opposing ends of the doxic scale. Agents can, however, identify with varying positions along this doxic scale to maintain positions within these fields, however, it is necessary for the agent to have the appropriate doxa that is representative of the field which they intend to exist within. For example, it is highly unlikely that an agent could become a member of the MLA if they have a conflicting doxical stance on hyper-compression.

It could be argued that neither opposing stance on this doxic spectrum is an absolute truth, but represents a necessary acceptance of the naturalised ideas that exist within a selected field. Many interview participants from both doxical perspectives agreed that outcomes of the hyper-compression process hinge largely around its correct and appropriate use which is largely a subjective and complex decision. As Alan Moulder suggested 'some people are great at it and some aren't' (i/v, 2015). Apart from examples where professional engineers have pushed the boundaries of what is considered appropriate in certain circumstances, the prosumer is considered a major issue in the propagation of hyper-

compression. The prosumer, who although can be found anywhere along the doxic spectrum, is perhaps the most accused of what has been termed “abuses” of the process in which loudness is used as a substitute for specialised knowledge in audio production and a method to achieve a perceived quality. Many mastering engineers are finding the prosumer becoming an increasing part of their clientele which is proving problematic in dealing with this inexperience; ‘they already trash the masters in the amount of level and distortion, and energy which is extremely hard to handle’ (Engelmann i/v, 2015). Loudness in this instance is equated with quality and the mastering process is reduced to the act of achieving loudness. It is the prosumer who the professional engineer must compete against in this new era, much like the mastering engineer now needs to compete with the loudness maximised “rough” mix or “pre-master”.

To further add to this complexity, the reproduction systems that the artist employs also plays a role in this complex scenario, reducing the evaluation process made in the mastering suite to an audition through laptop speakers, compared to another favoured recording. Lachlan Mitchell’s example of this scenario was illuminating where he describes a mix that ‘just turned into this screechy horribleness that became the single, and you think, “Well, what’s the point?”’ (i/v, 2015). Alan Moulder’s assertion that loudness is ‘like audio crack [...] you know, once you’ve had it you can’t do without it’ is apt in the circumstance where the artist’s insecurity collides with the intense competitiveness of the music environment they are about to release their music into (i/v, 2015). Like Moulder, Thomas Lund, one of the high-profile proponents against the use of hyper-compression, agrees that ‘hyper-compression is contagious’ but does not deny agents ‘aesthetic reasons for using hyper-compression, as a way of expressing yourself’ (i/v, 2015). However, he suggests to ‘crush everything as much as you like if you think it

sounds better that way, but the key is to not make the crushing contagious' (ibid). Despite sounding like an oxymoron, Lund's rather impossible challenge is most likely possible if reproduction is loudness normalised, removing loudness bias from the equation.

Possibly the most significant issue currently under discussion in the audio community is the possibility of loudness normalisation mediating the use of hyper-compression. It could be said that this is largely originating from members of the MLA who are acting as opinion leaders and change agents by definition of Rogers' theory of the diffusion of innovation. The possibility of this new technology redefining hyper-compression as a less dominant structure was discussed extensively in Chapter 4 and it was argued that a complex set of conditions would be required to create such a significant social change.

The most obvious and logical of these conditions is the removal of loudness bias in reproduction, which on the surface represents the primary motivation for hyper-compression, being the "louder is better" paradigm. An analysis of the output of five dominant music streaming platforms revealed that in comparison to the international standard of loudness measurement offered by ITU BS.1770 (ITU 2012), these outputs showed a less than optimal correlation (Taylor 2017). Of particular concern was YouTube, 'the most used music service' (IFPI 2016, p. 3), with a loudness level differential of 9.6LU between content, and Tidal which appeared to have no operational loudness normalisation in evidence with a considerable differential of 12.7LU. The other services examined (Pandora, Spotify and Apple) all showed a relatively consistent and robust loudness mediation of content. It is suggested that the implementation of loudness normalisation across these platforms that are representative of varying algorithms employed, are in a state of flux during this period of transformation to a loudness

normalised condition. This also is evident in these platforms adopting various target loudness levels. In addition, of considerable concern is whether loudness normalisation is activated by default which would compensate for the average consumer being possibly ignorant of its benefits. It is therefore argued that until these issues are addressed, and some mode of conformity exists between these platforms, it may be premature to consider loudness normalisation having the desired effect on production practice at this time.

It was also made clear that music streaming as a web-based technology has been in a state of economic and operational volatility which could be explained as a period of natural adjustment due its rapid transformation. Therefore, inconsistencies of loudness normalisation within these platforms could be considered a part of this transformation and it may take time to improve this aspect of their operation. It was therefore argued that in the interests of best possible practise that the various platforms adopt the ITU standard which has been successful in regulating broadcast audio. This in turn would provide the optimum condition to affect change in audio production practice. It is furthermore suggested that these platforms consider adopting the AES TD1004.1.12-10 (AES 2015) recommendations which advise a target loudness level of -18 to -20LUFS. Adopting these target levels would not only accommodate a wide range of dynamic variability, the widespread adoption of the ITU algorithm itself would further assist in negating any residual effect of loudness bias between platforms. It's important to note, however, that the implementation of loudness normalisation into these platforms is not primarily in the interest of mediating the use of hyper-compression, but to provide a service to their customers in mediating levels between music content of differing eras and loudness levels. It may be challenging to convince these multi-national companies of the potential benefit to the music industries in the *possible* flow-on effect loudness normalisation *may*

present in mediating the use of hyper-compression; benefits that are not in these company's own immediate interest and may be costly to implement.

The second condition mentioned is the widespread diffusion of this music streaming as a technology that creates the environment whereby loudness bias is removed sufficiently from the social system to provide a change in the objective conditions that present possibilities for action by agents. This has been previously described as presenting a loudness normalised space of possibles. It is evident from the trajectory of music streaming as a form of music delivery, which acts as the vehicle for the diffusion of loudness normalisation, that it is rapidly dominating the social system. Despite the global revenue of digital sales surpassing physical for the first time in 2015 and music streaming being viewed as the largest sector of growth (IFPI 2017, p.p. 10-11), there is no evidence to suggest that it has had a significant influence on the use of hyper-compression. Hence, it is suggested that the diffusion of this technology has not yet reached a critical point of adoption and it is difficult to predict at what point change to the use of hyper-compression will be facilitated, if at all. As a further complication, considering what was previously discussed, inconsistent loudness normalisation between platforms that enables some degree of loudness bias to remain could have an impact on the adoption rate required.

Of particular interest to this discussion are the consumers of music, the listeners and their preferences for hyper-compression. Extensive research has been conducted in this area and this was examined 2.4.2.10. This research indicated that listeners have difficulty in discriminating the relatively weak perceptual cues of the DRC process and therefore have difficulty in reaching a compelling consensus for either hyper-compressed or non-compressed music that is loudness normalised. Furthermore, this circumstance is

exacerbated with un-trained listeners who are representative of the global audience. The experiments conducted as an adjunct to this research project that are outlined in (Taylor 2018) indicated similar conclusions. It has been argued in this research that it is necessary to take into account the multi-dimensional nature of music and also that no one dominant auditory attribute is under question in a preference test, hence it is open to question whether this contributed to this lack of consensus. Due to the weak and multifarious nature of the perceptual cues of DRC in general, it is suggested that listeners use myriad other abstract cognitive structures to form their decision-making strategy.

A relevant outcome, however, specifically from the listener preference experiments conducted in (Taylor 2018) was related to the “louder is better” paradigm. As a point of difference to all other studies in this area, an alternative listening test was conducted in conjunction to those that presented loudness normalised stimulus in the preference tasks, where the loudness differential that represents an ecologically valid by-product of the compression process was retained. In contrast to the loudness normalised stimuli, subjects formed a distinct consensus for the louder music suggesting that the “louder is better” paradigm has a tangible influence on preferences and loudness per se is a powerful perceptual cue. The level differential reported was approximately 10-12dB, so we can assume this is adequate for loudness to have a distinct influence on listener preferences. It would be logical to assume that below this 10-12dB, preferences would return to that of more random inconclusive nature as that reported. At what specific level increase that this influence on preferences starts to take effect is unknown and therefore it is recommended that further research is required on this topic. It is suggested that this type of research may be of significant value in deterring those in record production from using *excessive* hyper-compression that causes significant signal degradation for reasons that

are known to have no credible influence on listener preference. Put simply, a small increase in loudness may not be enough to have any effect. The commonly held belief by some in record production that an extra 1-3dB louder than other already hyper-compressed music will make a difference to listener responses may be unfounded and will only lead to needless degradation of both the signal and musicality.

In addition, the crucial information gained from the research mentioned above, that is directly relevant to the potential for loudness normalisation to mediate the use of hyper-compression, is that regardless of whether music recordings have been hyper-compressed or not, the average consumer is unlikely to perceive any substantial difference when music is loudness normalised. This in itself presents a compelling argument that supports claims made by the MLA. If there is no direct benefit in making loud recordings due to the removal of loudness bias, and the average listener is largely unable to discriminate between a hyper-compressed or non-compressed recording, then justifications for the use of hyper-compression should retreat to those only concerning aesthetic decisions. Despite this revelation, it has been argued throughout this research project that hyper-compression, representing a dominant structure in audio practice, is not the product of one singular factor but is representative of a multi-factorial set of conditions that are systemic. These factors have been extensively explored and the removal of loudness bias does not necessarily also remove the significance of the others.

However, this new paradigm of music reproduction could offer the agent with a new set of objective possibilities, presenting a catalyst for the necessary gradual, recursive change in the domain where these factors, one by one, may be overcome. There is more research to be done. A change in reproduction processes presents the potential opportunity for

agents to discover precedence in less hyper-compressed artefacts. Less compressed recordings, could in turn influence other agents to produce less compressed recordings if there is a benefit in doing so. At present, with music streaming's ongoing trajectory, and the fact that there is little precedence in other cultural product that displays attributes of less compression, agents are unlikely to venture outside the limits of the structures they are accustomed to. What is required is a creative act, or a series of creative acts like those that introduced hyper-compression into the domain, changing its structure which therefore changed further practice of agents. A process that Bob Horn aptly describes in the following:

It seems like, because of the way humans are, once every piece of equipment that plays back music is normalising maybe people will forget to check for loudness because it's just always right, it's always the loudness that they want. Then we can finally start backing off the level a bit and they won't know because it's all level matched. Maybe that's the only way the war will end. Then in secret all the mix engineers are turning their stuff down cause they like it! Yeah, maybe like after five years, somebody will ask "how loud is that?" and it's like, "not that loud, it doesn't need to be" and everyone will be in shock! Or maybe we just never tell them! (i/v, 2015)

# 10 REFERENCES

- Accattatis, M 2010, 'The loudness race: a post-human interpretation', Essay.
- AES, website, 'about/our story', viewed 7 January 2017. <http://www.aes.org/about/>
- AES 2012, 'Loudness Wars: the wrong drug?', workshop seminar, *the 133<sup>rd</sup> convention of the Audio Engineering Society*, October, San Francisco.  
<http://www.aes.org/events/133/workshops/>
- AES 2015, TD1004.1.12-10 *Recommendations for Loudness of Audio Streaming and Network File Playback*, technical document.
- AES 2016, 'This is a mix! This is a master!', student career event, *the 14<sup>st</sup> convention of the Audio Engineering Society*, October, Los Angeles.  
<http://www.aes.org/events/141/students/?ID=5249>
- AES 2017, *Student recording competition rules*, rules and policies, viewed 7 August 2017. <http://www.aes.org/students/awards/recording/>
- Agilent Technologies 2000, 'The fundamentals of signal analysis', Application note 243, viewed 19 March 2014.  
<http://www.modalshop.com/techlibrary/Fundamentals%20of%20DSP.pdf>
- AIST (National Institute of Advanced Industrial Science and Technology) 2003, 'Full revision of international standards for equal-loudness level contours', viewed 21 March 2014, [http://www.aist.go.jp/aist\\_e/latest\\_research/2003/20031114/20031114.html](http://www.aist.go.jp/aist_e/latest_research/2003/20031114/20031114.html)
- All Access Media Group (Staff writer) 2012, 'Worldwide radio summit industry awards – congrats to all!', *All Access Media Group*, Malibu, CA, USA, 30 April, viewed 11 January 2016. <https://www.allaccess.com/net-news/archive/story/105262/worldwide-radio-summit-industry-award-winners----c>
- Alten, SR 2014, *Audio in media*, tenth edition, Wadsworth, Cengage Learning, United States.
- Anderson, T 2008, 'Will the Loudness Wars result in quieter CDs?', *The Guardian*, Guardian News and Media Limited, London, UK, 10 January, viewed 15 May 2015.  
<http://www.guardian.co.uk/technology/2008/jan/10/digitalmusic>
- Andry, T 2009, 'How to skew a blind listening test', *Audioholics*, 8 September, viewed 13 March 2013. <https://www.audioholics.com/how-to-shop/how-to-skew-a-blind-listening-test>

- AppAnnie 2015, 'Mobile music streaming: driving the next digital revolution', market research, San Francisco, USA, 1 December, viewed 27 July 2016.  
<https://www.appannie.com/en/insights/mobile-music-streaming-driving-the-next-digital-revolution/>
- Atari Teenage Riot 1999, *Sixty Second Wipe Out* [CD] Digital Hardcore Recordings.
- Athens, C 2008, blog comment on 'Death Magnetic', gearslutz.com, 12 September, viewed 18 May 2014. <https://www.gearslutz.com/board/mastering-forum/327786-death-magnetic.html>
- ATSC (Advanced Television Systems Committee) 2013, *Recommended Practice: Techniques for Establishing and Maintaining Audio Loudness for Digital Television* (A/85:2013).
- Barthel, M 2011, 'The Loudness Wars: is music's noisy arms race over?', *The Atlantic*, 21 July, viewed 13 October 2015.  
<http://www.theatlantic.com/entertainment/archive/2011/07/the-loudness-wars-is-musics-noisy-arms-race-over/242293/>
- Bartley, D 2015, interview, Blaxland, New South Wales, Australia, 3 June.
- Bech, S & Zacharov, N 2006, *Perceptual audio evaluation-theory, method and application*, John Wiley & Sons Ltd, Chichester, UK.
- Benfer, A 2014, 'Vinyl is cool again. That doesn't mean record collectors have to get all hipster?' *The Guardian*, Australian edition, 21 June, viewed 29 March 2016.  
<https://www.theguardian.com/commentisfree/2014/jun/21/vinyl-record-collector-sales-jack-white>
- Benjamin, E 2004, 'Preferred listening levels and acceptance windows for dialog reproduction in the domestic environment', *proceedings of the 117<sup>th</sup> Audio Engineering Society*, October, San Francisco.
- Berland, J 2003, 'Radio space and industrial time: the case of music formats', in Lewis, J & Miller, T (eds), *Critical cultural policy studies: a reader*, Blackwell Publishing, Malden, MA.
- Blake, J 2016, *The colour in everything* [digital], Polydor.
- Blau, M 2010, *These go go eleven! An exploratory analysis of the 'Loudness War' within audio recordings*, BA Hons thesis, Emory University.
- Blauert, J & Guski, R 2008, 'Critique of pure psychoacoustics', *NAG/DAGA*, Rotterdam, pp. 1518-1519.
- Blauert, J & Jekosch, U 2012, 'A layer model of sound quality', *Journal of the Audio Engineering Society*, vol. 60, no. 1/2, January/February, pp. 4-12.
- Blauert, J 2012, 'A perceptionist's view on Psychoacoustics', *Archives of Acoustics*, vol. 37, no. 3, pp. 365-371.

- Bourdieu, P 1977, *Outline of a theory in practice*, Cambridge University Press, Cambridge.
- Bourdieu, P 1986a 'The forms of capital', in Richardson, J (ed) *Handbook of Theory and Research for the Sociology of Education*, Greenwood, New York.
- Bourdieu, P 1986b, 'The production of belief: contribution to an economy of symbolic goods', in R. Collins, J. Curran, N. Garnham St P. Scannell (eds), *Media, Culture and Society: A Critical Reader*, Sage, London.
- Bourdieu, P 1990, *The logic of practice*, Polity Press, Cambridge.
- Bourdieu, P 1993, *The field of cultural production*, Columbia University Press and Polity Press in association with Blackwell Publishers, US, UK.
- Bourdieu, P 1996, *The rules of art genesis and structure of the literary field*, Polity Press, Cambridge.
- Bourdieu, P 1998, *On television and journalism*, Pluto Press, London.
- Bowden, W 2015, interview, Hobart, Tasmania, Australia, 25 June.
- Brabazon, T 2012, *Popular music: topics, trends & trajectories*, Sage, London.
- Been, C 2013, 'Why the iTunes Store succeeded', *Macworld*, IDG Communication Inc., 26 April, viewed 14 July 2016. <http://www.macworld.com/article/2036361/why-the-itunes-store-succeeded.html>
- Brewster, B & Broughton, F 2006, *Last night a DJ saved my life: the history of the disc jockey*, Headline, London.
- Broyhill, E 2015, interview, Stockholm, Sweden, 13 October 2015.
- Bryman, A 1988, *Quantity and quality in social research*, Routledge, London.
- Bryman, A. (ed) 2001, *Ethnography: volume 1*, Sage Publications, London.
- Bruns, A 2008, 'The future is user-led: The paths towards widespread produsage', *Fibreculture Journal*, vol. 11.
- Burdiel, E, Vetter, L, Simpson, AJR, Terrell, MJ, McPherson, A & Sandler, M 2012, 'Real-time implementation of Glasberg & Moore's loudness model for time-varying sound', *proceedings of the 133<sup>rd</sup> Audio Engineering Society Convention*, October, San Francisco.
- Calbi, G 2015, interview, New York, USA, 2 November.
- Campbell, W, Toulson, R & Paterson, J 2010, 'The effect of dynamic range compression on the psychoacoustic quality and loudness of commercial music', *proceedings of the Internoise conference*, June, Lisbon, Portugal.

- Capstick, Z 2014, 'The amazing story of Oasis' '(What's The Story) Morning Glory?' – in numbers', *NME*, Time Inc. (UK) Ltd., 12 September, viewed 26 August 2016. <http://www.nme.com/photos/the-amazing-story-of-oasis-what-s-the-story-morning-glory-in-numbers-1421587>
- Chae, S 2011, Sound pressure analyse and dynamic range transition of K-Pop music, Masters Dissertation, Graduate School of Business Administration, Sungmin University, Seoul, Republic of South Korea.
- Chae, S 2013, interview, Seoul, Republic of South Korea, 31 May.
- Chae, S 2015, interview, Seoul, Republic of South Korea, 10 October.
- Chanan, M 1995, *Repeated takes: a short history of recordings and its effects on music*, Verso, London.
- Chemical Brothers 1995, *Exit planet dust* [CD], Astralwerks.
- Chen, C 2004, *Signals and systems*, Oxford University Press, New York.
- Clark, C 2009, 'The Loudness Wars: why music sounds worse', *NPR Music*, National Public Radio Inc, Washington D. C., USA, 31 December, viewed 21 May 2013. <http://www.npr.org/2009/12/31/122114058/the-loudness-wars-why-music-sounds-worse>
- Clarke, N 2014, 'Calling the tune', *Sydney Morning Herald*, Fairfax Media, Sydney, Australia, 11 January, viewed 11 January 2014. <http://www.smh.com.au/entertainment/music/calling-the-tune-20140111-30nmk.html>
- Cole, SJ 2016, 'The prosumer and the project studio: the battle for distinction in the field of music recording', *Journal of Sociology*, vol. 43, issue 3, pp. 447-463
- Colletti, J 2012, 'How to win the Loudness War', *Trust Me I'm a Scientist*, 2 April, viewed 13 October 2015. <http://www.trustmeimascientist.com/2012/04/02/how-to-win-the-loudness-war/>
- Comer, E 2011, 'Contextualizing and critiquing the fantastic prosumer: power, alienation and hegemony', *Journal of Critical Sociology*, vol. 37, issue 3, pp. 309-327.
- Copsey, R 2016, 'The UK's official biggest selling albums of all time revealed', *Official Charts*, The Official UK Charts Company, 4 July, viewed 26 August 2016. [http://www.officialcharts.com/chart-news/the-uks-60-official-biggest-selling-albums-of-all-time-revealed\\_\\_15551/](http://www.officialcharts.com/chart-news/the-uks-60-official-biggest-selling-albums-of-all-time-revealed__15551/)
- Corona, E 2003, *ME231 Measurements Laboratory, Basic Signal Analysis: study guide*, University of Notre Dame, Notre Dame, IN, USA, viewed 2 February 2016. <https://www3.nd.edu/~pdunn/www.ame250/ECbasiganal.pdf>
- Crotty, M 1988, *The Foundations of Social Research*, Allen & Unwin, Sydney.
- Csikszentmihalyi, M 1988, 'Society, culture and person: a system's view of creativity' in Sternberg, R. (ed), *The nature of creativity: contemporary psychological perspectives*, Cambridge University Press, New York.

Csikszentmihalyi, M 1997, *Creativity: flow and the psychology of discovery and invention*, Harper Collins, New York.

Csikszentmihalyi, M 1999, 'Implications of a systems perspective for the study of creativity' in Sternberg, R (ed) *Handbook of creativity*, Cambridge University Press, New York, pp. 313-35.

Croghan, BH, Kates, JM & Arehart, KH 2012, 'Quality and loudness judgments for music subjected to compression limiting', *The Journal of the Acoustical Society of America*, vol. 132, issue 2, August.

Daft Punk 2013, *Get lucky* [digital], Columbia.

Deer, C 2014, 'Doxa' in Grenfell, M (ed), *Pierre Bourdieu key concepts*, second edition, Routledge, New York.

Dennis, B n.d., 'Motown heritage - Mastering Seminars', viewed 15 November 2016. <http://www.recordinginstitute.com/motownheritagepics/masteringseminars/seminar1/mastsem1.htm>

Dent, J 2015, interview, Taunton, Devon, UK, 24 October.

Deruty, E 2011, 'Dynamic range and the Loudness War', *Sound on Sound*, SOS Publications Group, Cambridge, UK, September edition, viewed 2 February 2013. <http://www.soundonsound.com/sound-advice/dynamic-range-loudness-war>

Deruty, E & Tardieu, D 2014, 'About dynamic processing in mainstream music', *the Journal of the Audio Engineering Society*, vol. 62, no. 1/2, pp. 42-55, January/February.

Deruty, E & Pachet, F 2015, 'The MIR perspective on the evolution of dynamics in mainstream music', proceedings of the 16<sup>th</sup> International Society for Music Information Retrieval Conference, Malaga, Spain, October, pp. 722-727.

Dilger, DE 2011, 'iTunes Store quietly generates record revenues of \$1.4 billion', *AppleInsider*, Quiller Media Inc., 21 April, viewed 14 July 2016. [http://appleinsider.com/articles/11/04/21/itunes\\_store\\_quietly\\_generates\\_record\\_revenues\\_of\\_1\\_4\\_billion.html](http://appleinsider.com/articles/11/04/21/itunes_store_quietly_generates_record_revenues_of_1_4_billion.html)

Donahue, M 2010, 'The Loudness War', *Performer*, Performer Publications Inc, Somerville, MA, USA, 5 July, 2010, viewed 27 July 2014. <http://performermag.com/Archives/loudness.php>

Dredge, S 2013, 'Streaming music payments: how much do artist really receive?', *The Guardian*, Australian edition, Guardian News and Media Limited, Sydney, Australia, 19 August, viewed 21 July 2016. <https://www.theguardian.com/technology/2013/aug/19/zoe-keating-spotify-streaming-royalties>

EBU (European Broadcast Union) 2014a, *EBU Recommendation R-128 loudness normalization and permitted maximum levels of audio signals*, Geneva, Switzerland, August.

EBU (European Broadcast Union) 2014b, *EBU Recommendation R-128 s1 loudness parameters for short-form content (adverts, promos etc.)*, Geneva, Switzerland, November.

EBU (European Broadcast Union) 2016a, *EBU Tech 3341 version 3.0 - Loudness Metering: 'EBU Mode' Metering to Supplement Loudness Normalisation in Accordance with EBU R-128*, Geneva, Switzerland, January.

EBU (European Broadcast Union) 2016b, *EBU Tech 3342 version 3.0 - Loudness Range: A Measure to Supplement Loudness Normalisation in Accordance with EBU R-128*, Geneva, Switzerland, January.

EBU (European Broadcast Union) 2016c, *EBU Tech 3343 version 3.0 - Practical Guidelines for Production and Implementation in Accordance with EBU R-128*, Geneva, Switzerland, January.

EBU (European Broadcast Union) 2016d, *EBU Tech 3344 version 2.1 - Practical Guidelines for Distribution Systems in Accordance with EBU R-128*, Geneva, Switzerland, July.

EBU (European Broadcast Union) 2012, *EBU Technology Fact-Sheet - Loudness V1.0.*" Geneva, Switzerland.

Eggerton, J 2014, 'FCC Updates Calm Act to Further Quiet Commercial', *Broadcast and Cable*, Newbay Media, New York, USA, 6 April, viewed 12 February 2016. <http://www.broadcastingcable.com/news/washington/fcc-updates-calm-act-further-quiet-commercials/131571>

Emerson, RM 1987, 'Four ways to improve the craft of fieldwork', *Journal of Contemporary Ethnography*, vol. 16, no. 1, pp. 69—89.

Emery, C 2007, 'Audio gain in volume signals loss for listeners', *The Baltimore Sun*, 25 November, viewed 17 May 2015. [http://articles.baltimoresun.com/2007-11-25/news/0711250027\\_1\\_hearing-loss-sound-engineer-seldon-plan](http://articles.baltimoresun.com/2007-11-25/news/0711250027_1_hearing-loss-sound-engineer-seldon-plan)

Engelmann, B 2015, interview, Stockholm, Sweden, 14 October.

Essling C, Koenen J & Peukert C 2015, *Another Loudness War: how record labels release singles to compete for consumer attention in the digital age*, working paper, The University of Zurich, Switzerland. [https://editorialexpress.com/cgi-bin/conference/download.cgi?db\\_name=EARIE42&paper\\_id=64](https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=EARIE42&paper_id=64)

Evans, E 2014, 'Why have vinyl records become so popular in Germany?' *BBC*, 21, October, viewed 28 March 2016. <http://www.bbc.com/culture/story/20131216-breaking-records-german-vinyl>

Fastl, H & Zwicker, E 2007, *Psychoacoustics – Facts and Models*, Springer, Berlin. 2007.

Fetterman, DM 1989, *Applied social research methods series: volume 17, ethnography – step by step*, first edition, Sage Publications, Newbury Park, CA.

- Fetterman, DM 2010, *Ethnography – step by step*, third edition, Sage Publications, Thousand Oaks, CA.
- Fielder, LD 1995, 'Dynamic-range issues in the modern digital audio environment', *the Journal of the Audio Engineering Society*, vol. 43, no. 5, pp. 322-339, May.
- Fischetti, A, Hemim, Y & Jouhaneau, J 1993, 'Differences between headphones and loudspeakers listening in spatial properties of sound perception', *Applied Acoustics*, vol. 39, pp. 291-305.
- Fitzsimons 2014, 'Triple J fire back following media attack', *The Music*, Street Press Australia, Melbourne, 13 January, viewed 14 January 2014.  
<http://themusic.com.au/news/all/2014/01/13/triple-j-fire-back-following-media-attack/>
- Fletcher, H & Munson, WA 1933, 'Loudness, its definition, measurement and calculation', *the Journal of the Acoustical Society of America*, vol. 5, pp. 82-108.
- Fletcher, H 1942, 'Hearing, the determining factor for high fidelity transmission' *proceedings of the IRE*, vol. 30, no. 6, June.
- Free TV 2012, *Measurement and Management of Loudness in Soundtracks for Television Broadcasting - operational practice OP- 59*, Australia.
- Frith, S 1983, *Sound effects: youth, leisure and the politics of rock and roll*, Pantheon, London.
- Frith, S 1986, 'Art versus technology: the strange case of popular music', *Media, Culture & Society*, vol. 8, pp. 263-79.
- Frith, S & Goodwin, A 1990, 'Groundworks', in Frith, S & Goodwin, A (eds), Frith, S. and Goodwin, A. *On Record: Rock, Pop and the Written Word*. Routledge, London.
- Frith, S 2001, 'The popular music industry', in Frith, S (ed), *The Cambridge companion to pop and rock*, Cambridge University Press, Cambridge.
- Frith, S & Zagorski-Thomas, S (eds) 2012, *The art of record production: an introductory reader for a new academic field*, Ashgate, Surry, UK.
- Ferguson, S, Cabrera, D & Schubert, E 2010, 'Comparing continuous subjective loudness responses and computational models of loudness for temporally varying sounds', *proceedings of the 129<sup>th</sup> Audio Engineering Society Convention*, November, San Francisco.
- Gabrielsson, A & Sjögren, H 1979, 'Perceived sound quality of sound-reproducing systems', *Journal of the Acoustical Society of America*, vol. 65, pp. 1019-1033.
- Giannoulis, D, Massberg, M & Reiss, JD 2012, 'Digital dynamic range compressor design - a tutorial and analysis', *the Journal of the Audio Engineering Society*, vol. 60, no. 6, pp. 339-408, June.
- Giddens, A 1984, *The constitution of society*, University of California Press, Los Angeles.

Gil, L n.d., 'History of streaming', *Sutori*, personal blog, viewed 14 July 2016. <https://www.sutori.com/story/history-of-music-streaming>

Glasberg, BR & Moore, BCJ 2002, 'A model of loudness applicable to time-varying sounds', *the Journal of the Acoustic Society of America*, vol.50, no.5, March, pp. 331-342.

Goldmark, PC, Sneyvangers, R & Bachman, WS 1949, 'The Columbia long-playing microgroove recording system', *proceedings of the IRE*, vol. 37, no. 8, August.

Goldstein, EB 2002, *Sensation and perception*, 6<sup>th</sup> edition, Wadsworth, Pacific Grove, California.

GOTYE 2011, *Somebody That I Used to Know* [CD], Eleven.

Granville-Fall, N 2015, The mastering loudness war: can the effects of hyper-compression and increasing loudness in commercially released and broadcast music be reduced?, Bachelor Dissertation, London Metropolitan University.

Grix, J 2010, *The foundations of research*, second edition, Palmgrave Macmillan, London.

Hammersley, M & Atkinson, P 1995, *Ethnography*, second edition, Routledge, London.

Hardy, C 2014, 'Social Space' in Grenfell (ed), *Pierre Bourdieu key concepts*, second edition, Routledge, New York.

Haralambos, M & Holborn, M 2013, *Sociology - themes and perspectives*, eighth edition, Collins, London.

Harris, M 2016, 'What is Replay Gain?', Lifewire.com, 19 June, viewed 15 January 2017. <https://www.lifewire.com/what-is-replaygain-2438575>

Harvey, S 2015, 'ASCAP offers music-makers information and inspiration', ProSound Network, New Bay Media, New York, 4 June, viewed 11 January 2016. <http://www.prosoundnetwork.com/business/ascap-offers-music-makers-information-and-inspiration/44688>

Hebdige, D 1979, *Subculture: the meaning of style*, Routledge, New York.

Hennessey, BA, Amabile TM 2010, 'Creativity', *Annual Review of Psychology*, vol. 61, pp. 569–98.

Hennion, A 1990, "The production of success: an antimusicology of the pop song' in Simon Frith & Andrew Goodwin (eds) *On record*, Pantheon Books, New York.

Hirsch, P 1970, *The Structure of the Popular Music Industry: The Filtering Process by which Records are Preselected for Public Consumption*, Ann Arbor: Institute for Social Research, University of Michigan.

- Hjortkjær, J & Walther-Hansen, M 2014, 'Perceptual effects of dynamic range compression in popular music recordings', *Journal of the Audio Engineering Society*, vol. 60, no. 1/2, 37-41, January/February.
- Hogan, M 2017, 'The SoundCloud you love is doomed', *Pitchfork*, Condé Nast, New York, USA, 26 July, viewed 28 July 2017. <http://pitchfork.com/thepitch/the-soundcloud-you-loved-is-doomed/>
- Horn, B 2015, interview, Los Angeles, USA, 12 November.
- Horscroft, S 2016, Somersby, New South Wales, Australia, 4 February.
- Howe, KR 1988, 'Against the quantitative - qualitative incompatibility thesis: or dogmas die hard', *Educational Researcher*, vol. 19, pp. 10-16.
- Huggins, D 2011, 'Owen Morris: how I mastered Morning Glory', *Oasis recording information: how their early albums were mixed and mastered*, viewed 8 Jan 2014. [http://www.oasis-recordinginfo.co.uk/?page\\_id=6](http://www.oasis-recordinginfo.co.uk/?page_id=6)
- Imagine Dragons 2012, *Demons* [digital] KIDinaKORNER/Interscope Records.
- Ingham, T 2017, 'Google mulling Soundcloud buyout, say whispers - as Sony and Universal's stakes are revealed' Music Business Worldwide, London, UK, 3 January, viewed 21 January 2017. <https://www.musicbusinessworldwide.com/google-mulling-soundcloud-buyout-say-whispers-sony-universals-stakes-revealed/>
- Inglis, S 2010, '25 productions that made history', *Sound on Sound*, SOS Publications Group, Cambridge, UK, November edition, viewed 13 March 2015. <http://www.soundonsound.com/techniques/25-productions-made-history>
- Inglis, S 2011, 'Is loud music better?', *Sound on Sound*, SOS Publications Group, Cambridge, UK, March edition, viewed 13 March 2015. <http://www.soundonsound.com/sos/mar11/articles/loudness.htm>
- IFPI (International Federation of the Phonographic Industry) 2013, 'Sweden: A Market Transformed', viewed 21 January 2016. <http://ifpi.org/sweden.php>
- IFPI (International Federation of the Phonographic Industry) 2014, *IFPI published digital music report 2014; lighting up new markets*.
- IFPI (International Federation of the Phonographic Industry) 2015, *IFPI digital music report 2015: charting the path to sustainable growth*.
- IFPI (International Federation of the Phonographic Industry) 2016a, *Global music report: music consumption exploding worldwide - state of the industry overview 2016*.
- IFPI (International Federation of the Phonographic Industry) 2016b, *Music consumer insight report 2016*.
- IFPI (International Federation of the Phonographic Industry) 2016c, *Investing in Music: the value of record companies*.

IFPI (International Federation of the Phonographic Industry) 2017, *Global music report 2017: annual state of the industry*.

ISO (International Organisation of Standards) 2003, 'Acoustics—normal equal-loudness-level contours', Switzerland.

ITU (International Telecommunication Union) 2012, 'IT-R BS.1770-3 - Algorithm to measure audio programme loudness and true-peak audio level', Geneva.

Jenkins, JJ 2003, 'Masters on mastering', *Electronic Musician*, New Bay Media, New York, NY, USA, 1 September, viewed 10 June 2015.  
<http://www.emusician.com/artists/1333/masters-on-mastering/33363>

Jones, S 1992, *Rock formation: music, technology and mass communication*, Sage, Newbury Park, CA.

Jones, S 2005, 'The big squeeze: mastering engineers debate music's Loudness Wars', *Mix Magazine*, New Bay Media, New York, NY, USA, 1 December, viewed 13 March 2015. [http://mixonline.com/mag/audio\\_big\\_squeeze/](http://mixonline.com/mag/audio_big_squeeze/)

Johnston, JD 2008, 'Testing loudness models—real vs artificial content', *proceedings of the 125<sup>th</sup> Audio Engineering Society Convention*, October, San Francisco.

Kallinen, K & Ravaja, N 2004, 'Comparing speakers versus headphones in listening to news from a computer – individual differences and psychophysiological responses', *Computers in Human Behaviour*, vol. 23, pp. 303-317.

Karp, I & Kendall, M 1982, 'Reflexivity in field work', in Secord, P. (ed), *Explaining human behavior: consciousness, human action, and social structure*, Sage Publications, Beverley Hills, CA.

Kassabian, A 1999, 'Popular', in Normer, B & Swiss, T, Key terms in popular music culture, *Blackwell, Oxford*.

Katz, B 2015, interview, New York, USA, 1 November.

Katz, B 2015, *Mastering audio—the art and the science*, third edition, Focal Press, Burlington, Massachusetts.

Katz, M 2010, *Capturing sound: how technology has changed music*, revised edition, University of California Press, CA.

Kornelis, C 2015, 'Why CDs may actually sound better than Vinyl', *LA Weekly*, Los Angeles, USA, 27 January, viewed 13 March 2016.  
<http://www.laweekly.com/music/why-cds-may-actually-sound-better-than-vinyl-5352162>

Kozinn, A 2013, 'Weaned on CDs, they're reaching for vinyl', *The New York Times*, 9 June, viewed 29 March 2016. [http://www.nytimes.com/2013/06/10/arts/music/vinyl-records-are-making-a-comeback.html?\\_r=1](http://www.nytimes.com/2013/06/10/arts/music/vinyl-records-are-making-a-comeback.html?_r=1)

Kruse, H 1988, 'Fields of practice: music production, public policy, and the market', in Swiss, T et al. (eds), *Mapping the beat: popular music and contemporary theory*, Blackwell, Malden, MA.

Lalér, J 2012, Perceived sound quality of dynamic range reduced and loudness normalized popular music, Bachelor Thesis, Luleå University of Technology, Sweden.

Lamere, P 2009, 'The Loudness War analysed', *Music Machinery*, personal blog, 3 March, viewed 27 Jan 2014. <http://musicmachinery.com/2009/03/23/the-loudness-war/>

LeCompte, MD & Schensul, JJ 2010, *Designing & conducting ethnographic research: an introduction*, second edition, AltaMira Press, Lanham, Maryland, USA.

Levine, R 2007, 'The death of high fidelity', *Rolling Stone Magazine*, 27 December, viewed 12 February 2013. <https://beatpatrol.wordpress.com/2009/01/25/robert-levine-the-death-of-high-fidelity-2007/>

Leyshon, A 2001, 'Time-space (and digital) compression: software formats, musical networks, and the reorganisation of the music industry', *Environment and Planning A*, vol. 33, pp. 49-77.

Low, V 2015, 'Ear splitting princess of pop is louder than AC/DC', *The Times*, Times Newspapers Limited, London, UK, 27 April, viewed 20 October 2016. <https://www.thetimes.co.uk/article/ear-splitting-princess-of-pop-is-louder-than-acdc-jc8hkhx92dj>

Luborsky, MR & Rubenstein, RL 1995, 'Sampling in qualitative research: rationale, issues, and methods', *Research on Aging*, vol. 17, issue. 1, pp. 89-113.

Ludwig, B 2015, interview, New York, USA, 30 October.

Luce, RD 1993, *Sound and hearing—a conceptual introduction*, Lawrence Erlbaum, London.

Lund, T 2004, 'Distortion to the people', *proceedings of the Tonmeistertagung 23*, November, Leipzig, Germany.

Lund, T 2006, 'Stop counting samples', *proceedings of the 121<sup>st</sup> Audio Engineering Society Convention*, October, San Francisco.

Lund, T 2011, 'ITU-R BS.1770 revisited', *proceedings of the NAB Conference*, April, Las Vegas.

Lund, T 2012, interview with Rudolph Ortner, via Skype, 29 June.

Lund, T 2015, interview, New York, USA, 1 November.

Lund, T 2016a, 'The tipping point', seminar presented at the 141<sup>st</sup> Audio Engineering Society Convention, October, Los Angeles.

Lund, T 2016b, personal correspondence, 15 February.

- Lunney, GS 2014, 'Copyright on the internet: consumers copying and collectives', in Frankel, S & Gervais D (eds), *The evolution and equilibrium of copyright in the digital age*, Cambridge University Press, Cambridge, UK.
- Magee, S 2015, interview, London, UK, 28 October.
- Marsh, J 2015, 'Who really buys vinyl? The answer will surprise you', *The Telegraph*, Telegraph Media Group, United Kingdom, 4 June, viewed 29 March 2016.  
<http://www.telegraph.co.uk/goodlife/11592082/Who-really-buys-vinyl-The-answer-will-surprise-you.html>
- Martin, G & Pearson, P 2005, *With a little help from my friends: the making of Sgt Pepper*, Little Brown & Co., London.
- Masterton, K 2008, 'Loudness War stirs quiet revolution by audio engineers', *Chicago Tribune*, Chicago, USA, 4 January, viewed 15 May 2015.  
[http://articles.chicagotribune.com/2008-01-01/news/0801010011\\_1\\_loud-compressed-recording](http://articles.chicagotribune.com/2008-01-01/news/0801010011_1_loud-compressed-recording)
- Maton, K 2014, 'Habitus', in Grenfell, M (ed), *Pierre Bourdieu key concepts*, second edition, Routledge, New York.
- Martin, R 1999, *Living 'La Vida Loca* [CD], Columbia.
- Mauch, M 2011, 'Anatomy of the uk charts. part 4: survival of the flattest' *Last HQ* blog, lastfm.com, London, UK, 15 July, viewed 27 June 2014.  
<http://blog.last.fm/2011/07/15/anatomy-of-the-uk-charts-part-4-survival-of-the-flattest>
- Melodisio 2008, blog comment on 'Death Magnetic', gearslutz.com, 12 September, viewed 18 May 2014. <https://www.gearslutz.com/board/mastering-forum/327786-death-magnetic.html>
- Metallica 2008, *Death Magnetic* [CD], Warner Bros, Vertigo.
- Michaels, S 2008, 'Metallica album latest victim in "Loudness War"?'', *The Guardian*, Australian edition, 17 September, viewed 5 January 2008.  
<https://www.theguardian.com/music/2008/sep/17/metallica.guitar.hero.loudness.war>
- Millard, AJ 1995, *America on record: a history of recorded sound*, Cambridge University Press, Cambridge.
- Milner, G 2009, *Perfecting sound forever—the story of recorded music*, Granta, London.
- Moore, R 2014, 'Capital' in Grenfell, M (ed), *Pierre Bourdieu key concepts*, second edition, Routledge, New York.
- Moore, BCJ 1989, *An introduction to the psychology of hearing*, 3<sup>rd</sup> edition, Academic Press, London.
- Moore, BCJ 2003, *An introduction to the psychology of hearing*, 5<sup>th</sup> edition, Academic Press, London.

Moore, BCJ, Glasberg, BR & Baer, T 1997, 'A model for the prediction of thresholds, loudness and partial loudness', *the Journal of the Acoustic Society of America*, vol. 45, no.4, March, pp. 224-240.

Moulder, A 2015, interview, London, UK, 26 October.

McCabe, K 2017, 'Pandora Music shuts down its Australian and New Zealand headquarters and streaming service', *news.com.au*, News Limited, Sydney, Australia, 14 July, viewed 14 July. <http://www.news.com.au/entertainment/music/pandora-music-shuts-down-its-australian-and-new-zealand-headquarters/news-story/698d1f50970da5b0d1df4055cd628d6b>

McIntyre, P 1995a, 'Newcastle songwriters: locally rooted but world citizens', *Tolerance, Diversity and Social Inequality: The Australian Sociological Association (TASA) National Conference*, December 4-8, Newcastle.

McIntyre, P 1995b, 'The creative processes of published songwriters in Newcastle N.S.W.' *Popular Music: Places and Spaces, IASPM Australian-New Zealand Conference*, June, Melbourne.

McIntyre, P 1997, 'Songwriting, the internet and cultural production' Sites and Sounds: Popular Music in the Age of the Internet. *IASPM Australian-New Zealand 5th Annual Conference*, July 21-23, University of Technology, Sydney.

McIntyre, P 2006, 'Radio program directors, music directors and the creation of popular music', in Healy, S, Berryman, B & Goodman, D (eds), *Radio in the world: Radio conference 2005*, RMIT Publishing, Melbourne.

McIntyre, P & Paton, B 2008, 'The mastering process and the systems model of creativity', *Perfect Beat*, vol. 8, no. 4, January.

McIntyre, P 2008, 'The systems model of creativity: analyzing the distribution of power in the studio', the *4th Art of Record Production Conference*, 14th – 16th November, The University of Massachusetts Lowell.

McIntyre, P 2012a, *Creativity and cultural production: Issues for media practice*, Palgrave Macmillan, Hampshire, UK.

McIntyre, P 2012b, 'How are messages created? Changes in thinking about communication theory leading to a new synthesis', *proceedings of the ANZCA Conference*. Adelaide, South Australia.

McIntyre, P 2012c, 'Rethinking Creativity: Record Production and the Systems Model', in Frith, S & Zagorski-Thomas, S (eds), *The art of record production - an introductory reader for a new academic field*, Ashgate, Surrey, England.

McIntyre, P & Morey, J 2012, 'Examining the impact of multiple technological, legal, social and cultural factors on the creative practice of sampling record producers in Britain', *the Journal on the Art of Record Production*, vol. 7.

McKercher, P 2013, interview, Sydney, Australia, 13 June.

- Michaels, S 2012, 'Pop music these days: it all sounds the same, survey reveals', *The Guardian*, Guardian News and Media Limited, London, UK, 27 July, viewed 13 March 2014.  
<http://www.guardian.co.uk/music/2012/jul/27/pop-music-sounds-same-survey-reveals>
- Mitchell, L 2016, interview, Sydney, Australia, 4 February.
- MLA 2012, *Loudness normalization: the future of file-based playback*, viewed 17 May 2016. <https://music-loudness.com/Music-Loudness-Alliance-White-Paper-v1.pdf>
- Murchison, J 2010, *Ethnography essentials: Designing, conducting and presenting your research*, Jossey-Bass, San Francisco, CA.
- Munro, K 2015, 'Vinyl records regain popularity among collectors with sales doubling', *The Sydney Morning Herald*, 6 June, viewed 29 March 2016.  
<http://www.smh.com.au/entertainment/music/vinyl-records-regain-popularity-among-collectors-with-album-sales-doubling-20150605-ghgunj.html>
- Neal, C 2010, 'Into the Red', *Music & Musicians*, January/February, viewed 12 February 2013.
- Negus, K 1992, *Producing pop: culture and conflict in the popular music industry*, A Hodder Arnold publication, London.
- Negus, K 1996, *Popular Music in Theory*, Polity Press, Cambridge, UK.
- Nielsen, SH & Lund, T 2000, '0dBFS+ Levels in digital mastering', *proceedings of the 109<sup>th</sup> Audio Engineering Convention*, September, Los Angeles.
- Nielsen, SH & Lund, T 2003, 'Overload in signal conversion', *proceedings of the 23<sup>rd</sup> Audio Engineering Conference*, May, Copenhagen.
- Nine Inch Nails 1999, *Fragile* [CD], Interscope Records.
- Oasis 1995, *What's the Story Morning Glory?* [CD], Creation Records.
- O'Leary, Z 2010, *The essential guide to doing your research project*, Sage Publications, London.
- Olive, SE 1982, 'A method for training listeners and selecting program material for listening tests', *proceedings of the 97<sup>th</sup> Audio Engineering Conference*, November, San Francisco.
- Olive, SE 2003, 'Differences in performance and preference of trained versus untrained listeners in loudspeaker tests: A case study', *Journal of the Audio Engineering Society*, vol. 51, no. 9, pp. 806–825.
- Oppenheim, AV, & Willsky, AS 1997, *Signals and Systems*, second edition, Simon and Shuster, New Jersey.

Oral, C 2013, interview, Berlin, Germany, 21 June 2013.

Oral, C 2015, interview, Berlin, Germany, 17 October.

Osbourne, R 2012, *Vinyl: A history of the analogue record*, Ashgate, Surrey, United Kingdom.

Ortner, RM 2012, *Je lauter desto bumm! – The evolution of loud*. Untersuchung zur Evolution der Lautheit und Klangcharakteristik in Jahren westlicher Populärmusik, in Zentrum für zeitgenössische Musik. Donau Universität.

Otis, R n.d., *Radio's revolution*, viewed 14 February 2015.  
<http://www.reelradio.com/storz/index.html>

Payne, G & Payne, J 2004, *Key concepts in social research*, Sage Publications, London.

Paul, J 2011, 'Reduced by Rick Rubin- Production Process Pitfalls and Impacts', Bachelor of Arts, Music, Honors Thesis, Wesleyan University, Middletown, Connecticut, USA.

Pearsons, KS, Bennet, RL & Fidell, S 1977, 'Speech levels in various noise environments', Report No. EPA-600/1-77-025, Washington.

Pensado, D 2016, interview, Los Angeles, USA, 25 January.

Pensado's Place 2017, 'Mastering engineer Jonathan Wyner', episode #298, 19 January, viewed 25 January 2017. <https://www.youtube.com/watch?v=YkYVQ44mnJw>

Peoples, G & Crupnick, R 2014, 'The true story of how vinyl spun its way back from near-extinction', *Billboard*, 17 December, viewed 29 March 2016.  
<http://www.billboard.com/articles/business/6406630/vinyl-records-comeback-music-industry-record-store-day>

Plambeck, J 2010, 'In mobile age, sound quality steps back', *The New York Times*, The New York Times Company, NY, 9 May, viewed 1 October 2014.  
<http://www.nytimes.com/2010/05/10/business/media/10audio.html?mcubz=0>

Pohlmann, KC 2011, *Principles of digital audio*, sixth edition, McGraw-Hill, New York.

Powell, D 2009, 'Reducing the Volume of Ads', *Inside Science*, American Institute of Physics, Maryland, United States, 17 September, viewed 23 February 2016.  
<https://www.insidescience.org/content/reducing-volume-tv-ads/1324>

Richardson, M 2013, 'Does vinyl really sound better?', *The Pitch*, *Pitchfork*, Condé Nast Entertainment, 29 July, viewed 13 March 2016.  
<http://pitchfork.com/thepitch/29-does-vinyl-really-sound-better/>

Romanowski, M 2015, interview, New York, USA, 31 October.

- Ronan, M, Sazdov, R & Ward, N 2014a, 'Loudness normalisation: paradigm shift or placebo for the use of hyper-compression in pop music?', *proceedings of the Sound and Music Computing Conference*, September, Athens.
- Ronan, M, Sazdov, R & Ward, N 2014b, 'Factors influencing listener preference for dynamic range compression', *proceedings of the 137<sup>th</sup> Audio Engineering Society Convention*, October, New York.
- Ronan, M, Sazdov, R & Ward, N 2015a, 'Exploring the sound quality dimensions of hyper-compression', *proceedings of the Innovation in Music conference*, June, Anglia Ruskin University, Cambridge.
- Ronan, M, Ward, N & Sazdov, R 2015b, 'Identifying and validating program material: a hyper-compression perspective', *proceedings of the 139<sup>th</sup> Audio Engineering Society Convention*, October, New York.
- Ronan, M, Ward, N & Sazdov, R 2016, 'The perception of hyper-compression by untrained listeners', *proceedings of the 60<sup>th</sup> Audio Engineering Society Conference*, February, Leuven, Belgium.
- Rothenberg, A & Hausmann, C (eds) 1976, *The creativity question: A reader*, Duke University Press, Durham, NC, USA.
- Red Hot Chili Peppers 1999, *Californication* [CD], Warner Bros.
- Reierson, G 2011, 'The Loudness War is over', *Mix Magazine*, New Bay Media, New York, NY, USA, 8 February, viewed 13 May 2015.  
<http://www.mixonline.com/news/mixline/loudness-war-over/420885>
- Riedmiller, JC, Lyman, S & Robinson, C 2003 'Intelligent program loudness measurement and control: what satisfies listeners?', *proceedings of the 115<sup>th</sup> Audio Engineering Society Convention*, October, New York, NY.
- Riesman, D. (1990) 'Listening to Popular Music', in Frith, S & Goodwin, A (eds), *On Record: Rock, Pop and the Written Word*, Routledge, London.
- Resnikoff, P 2013, 'How iTunes Radio is single handedly ending the "Loudness Wars"', *Digital Music News*, Toronto, 28 October, viewed 5 January 2016.  
<http://www.digitalmusicnews.com/2013/10/28/itunesloudness/>
- Resnikoff, P 2016, 'Apple terminating music downloads within 2 years', *Digital Music News*, Toronto, 11 May, viewed 4 January 2017.  
<http://www.digitalmusicnews.com/2016/05/11/apple-terminating-music-downloads-two-yearff>
- Ritzer, G & Jurgenson, N 2010, 'Production, consumption and prosumption: the nature of capitalism in the age of the digital 'prosumer'', *Journal of Consumer Culture*, vol. 10, issue 1, pp. 13-36.

- Robjohns, H 2014, 'The end of the Loudness War?', *Sound On Sound*, SOS Publications Group, Cambridge, UK, February edition, viewed 28 November 2015. <http://www.soundonsound.com/sos/feb14/articles/loudness-war.htm>
- Robson, C 2011, *Real World Research*, third edition, Wiley & Sons, Chichester, UK.
- Rogers, EM 2003, *The diffusion of innovation*, The Free Press, Simon & Schuster, New York.
- Rogers, EM & Kincaid, DL 1981, *Communication networks: toward a new paradigm for research*, The Free Press, Macmillan Publishing, London.
- Rogers, S 2015, interview, Philadelphia, USA, 8 November.
- Rugh, WJ 2005, 'Notes for Signals and systems', *Department of Electrical and Computer Engineering: study guide*, John Hopkins University, Baltimore.
- Rumsey, F 2008, 'If it's loud does it mean it's bad?', *the Journal of the Audio Engineering Society*, vol. 56, no. 6, pp. 493-498, June.
- Rumsey, F 2010, 'Mastering in an ever-expanding universe', *The Journal of the Audio Engineering Society*, vol. 58, no. 1/2, January/February, pp. 65-71.
- Sarantakos, S 2005 *Social research*, third edition, Palgrave Macmillan, New York.
- Sawyer, RK 2006, *Explaining Creativity: The Science of Human Innovation*, Oxford University Press, New York.
- Sawyer, RK 2012, *Explaining Creativity: The Science of Human Innovation*, second edition, Oxford University Press, New York.
- Scheps, A 2016, interview, London, UK, 23 March.
- Schiffman, HR 2001, *Sensation and perception: an integrated approach*, John Wiley & Sons, New York.
- Schmidt, JC & Rutledge, JC 1996, 'Multi-channel dynamic range compression for music signals', *IEEE International Conference*, Atlanta, vol. 2, May, pp. 1013-1016.
- Seefeldt, A, Crockett, B & Smithers, M 2004, 'A new objective measure of perceived loudness', *Proceedings of the 117<sup>th</sup> Audio Engineering Society Convention*, October, San Francisco.
- Senior, M 2011, *Mixing secrets for the small studio*, Focal Press, Burlington, MA, USA.
- Serra, J, Corral, A, Bogun ~a, M, Haro, M & Arcos, J. 2012, 'Measuring the evolution of contemporary western popular music', *Scientific Reports*, no. 2, article no. 521, July, pp. 1-6.
- Shah, N 2014, 'The biggest come-back of 2014: vinyl records', *The Wall Street Journal*, 11 December, viewed 29 March 2016. <http://www.wsj.com/articles/the-biggest-music-comeback-of-2014-vinyl-records-1418323133>

Shepherd, I 2009, 'How Spotify will end the Loudness War', *Production Advice*, blog post, 23 October, viewed 29 March 2014. <http://productionadvice.co.uk/spotify-loudness-war/>

Shepherd, I 2011, 'Multi-band compression - the mastering engineer's secret weapon', *Production Advice*, blog post, 31 October, viewed 5 March 2015. <http://productionadvice.co.uk/multiband-compression-for-mastering/>

Shepherd, I 2015, 'YouTube just put the final nail in the Loudness War's coffin', *Production Advice*, blog post, 17 March, viewed 19 April 2015. <http://productionadvice.co.uk/youtube-loudness/>

Shepherd, I 2016, interview, London, UK, 20 October.

Shepherd, I 2016b, 'Tidal implements loudness normalisation - but there's a catch', *Production Advice*, blog post, 17 November, viewed 20 November 2016. <http://productionadvice.co.uk/tidal-loudness/>

Shepherd, I 2016c, 'Spotify just reduced its playback level!', *Production Advice*, blog post, 22 May, viewed 25 May 2016. <http://productionadvice.co.uk/spotify-reduced-loudness/>

Sherwin, A 2007, 'Why music really is getting louder', *The Times*, 4 June, viewed 12 February 2013. [http://entertainment.timesonline.co.uk/tol/arts\\_and\\_entertainment/music/article1878724.ec](http://entertainment.timesonline.co.uk/tol/arts_and_entertainment/music/article1878724.ec)

Shuker, R 2016, *Understanding popular music culture*, fifth edition, Routledge, New York.

Siegel, R 2009, 'All things considered - the Loudness Wars: why music sounds worse', *NPR music*, 31 December, viewed 22 November 2014. <http://www.npr.org/2009/12/31/122114058/the-loudness-wars-why-music-sounds-worse?sc=nl&cc=mn-20100102>

Silverman, D 2006, *Interpreting qualitative data: Methods for analysing talk, text and interaction*, Sage Publications, London.

Skovenborg, E & Nielsen, S 2004, 'Evaluation of different loudness models with music and speech material', *proceedings of the 117<sup>th</sup> Audio Engineering Society Convention*, October, San Francisco.

Slobin, M & Titon, JT 2001, 'The music-culture as a world music', in Triton, JT (ed), *Worlds of music - an introduction to the music of the World's people's*, second edition, Shirmer Books, New York.

Soulodre, GA, Lavoie, MC & Norcross, SG 2003, 'The subjective loudness of typical program material', *proceedings of the 115<sup>th</sup> Audio Engineering Society Convention*, October, New York.

Smith, E 2007, 'Sales of Music, Long in Decline, Plunge Sharply', *The Wall Street Journal*, 21 March, viewed 17 March 2013.

[http://online.wsj.com/article\\_email/SB117444575607043728-1MyQjAxMDE3NzI0MTQyNDE1Wj.html](http://online.wsj.com/article_email/SB117444575607043728-1MyQjAxMDE3NzI0MTQyNDE1Wj.html)

Smith, E 2008, 'Even heavy-metal fans complain that today's music is too loud!!!' *The Wall Street Journal*, 25 September, viewed 17 March 2013.

<http://online.wsj.com/article/SB122228767729272339.html>

Soulodre, GA, Lavoie, MC & Norcross, SG 2003, 'The subjective loudness of typical program material', *proceedings of the 115<sup>th</sup> Audio Engineering Society Convention*, October, New York.

Soulodre, GA & Norcross, SG 2003, 'Objective measures of loudness', *proceedings of the 115<sup>th</sup> Audio Engineering Society Convention*, October, New York.

Southall, N 2006, 'Imperfect sound forever', *Stylus Magazine*, 5 January, viewed 10 March 2014. [http://www.stylusmagazine.com/articles/weekly\\_article/imperfect-sound-forever.htm](http://www.stylusmagazine.com/articles/weekly_article/imperfect-sound-forever.htm)

SPL 1999, 'Manual - Loudness maximiser, model 9632, digital dynamics processor', SPL electronics, Germany.

Sreedhar, S 2007, 'The Future of Music: tearing down the wall of noise', *IEEE Spectrum*, IEEE, New York, August, viewed 15 May 2015.

<http://spectrum.ieee.org/computing/software/the-future-of-music>

Sternberg, R (Ed) 1999, *Handbook of creativity*, Cambridge University Press, Cambridge.

Stevens, SS 1957, 'On the psychophysical law', *The Psychological Review*, vol. 64, no. 3, May, pp. 153-181.

Strasser, R 2009, 'The devaluation of recorded music: a new business model for the music industry', in Sickels, RC (ed), *The business of entertainment: popular music*, Greenwood Press, Westport, CT.

Stutz, C 2015, 'Spotify tops Pandora as world's most popular music streaming app', *Billboard*, Billboards-Hollywood Reporter Media Group, Los Angeles, 12 January, viewed 19 February 2016. <http://www.billboard.com/articles/news/6784774/spotify-pandora-most-popular-music-streaming-app-worldwide>

Sweet, Matthew 1991, *Girlfriend* [CD], Zoo Entertainment.

Talbot-Smith, M 1999, *Audio engineer's reference book*, second edition, Focal Press, Oxford.

Taylor, RW and Martens, WL 2014, 'Hyper-compression in music production: listener preferences on dynamic range', *proceedings of the 136<sup>th</sup> Convention of the Audio Engineering Society*, April, Berlin.

Taylor, RW & Miranda, L 2016, 'Hyper-compression, environmental noise and preferences for the earbud listening experience', *proceedings of the 141<sup>st</sup> Convention of the Audio Engineering Society*, September-October, New York.

Taylor RW 2017, 'Hyper-compression in music production: the loudness normalisation revolution and implications for music streaming delivery platforms', in McIntyre, P & Fulton, J (eds), *Creating the fifth estate*, Cambridge Scholars Publishing, Newcastle upon Tyne, UK.

Taylor RW 2017, 'Towards Standardised Loudness Normalisation in Music Streaming', conference paper, HDR Congress, School of Creative Industries, The university of Newcastle, November, Newcastle, Australia.

[https://docs.wixstatic.com/ugd/7618d8\\_77482277aea149c09cefe0d89c060cf9.pdf](https://docs.wixstatic.com/ugd/7618d8_77482277aea149c09cefe0d89c060cf9.pdf)

Taylor, RW 2018, 'Hyper-compression in Music Production: Testing the "Louder is Better Paradigm"', *proceedings of the 145<sup>th</sup> Convention of the Audio Engineering Society*, October, New York, USA.

Taylor, B 2014, 'By the numbers: the streaming war (and who's winning)', *Time*, Time Inc., 14 August, Viewed 10 February 2016. <http://time.com/3109273/streaming-music-services-compared/>

Théberge, P 1997, *Any sound you can imagine: music making/consuming technology*, Wesleyan University Press, Hanover.

Théberge, P 1999, 'Technology', in Horner, B & Swiss, T. (eds), *Key terms in popular music and culture*, Wiley-Blackwell, Oxford.

Théberge, P 2012, 'The end of the world as we know it: the changing role of the studio in the age of the internet', in Frith, S & Zargorski-Thomas (eds), *The art of record production - an introductory reader for a new academic field*, Ashgate, Surry, UK.

The Music (Staff writer) 2017, 'Richard Kingsmill steps aside as Triple J music director', *The Music*, Street Press Australia, Melbourne, 19 April, viewed 21 April 2017. <http://themusic.com.au/news/all/2017/04/19/richard-kingsmill-steps-down-as-triple-j-music-director/>

Thiele, N 2005, 'Some thoughts on the dynamics of reproduced sound', *The Journal of the Audio Engineering Society*, vol. 53, no. 1/2, pp. 130-132, January/February.

Thomson, P 2014, 'Field' in Grenfell, M (ed), *Pierre Bourdieu key concepts*, second edition, Routledge, New York.

Thompson, P 2016, 'Scalability of the creative system in the recording studio' in McIntyre, P, Fulton, J & Paton, E (eds), *The creative system in action*, Palmgrave Macmillan, Basingstoke, Hampshire, UK.

Toffler, A 1980, *The third wave*, William Morrow & Company, New York.

Toole, FE 1982, 'Listening tests-turning opinion into fact', *the Journal of the Audio Engineering Society*, vol. 30, no. 6, June, pp. 431-445.

- Thorburn, D & Jenkins, H (eds) 2003, *Rethinking media change: the aesthetics of transition*, The MIT Press, Cambridge, MA.
- Toynbee, J 2000, *Making popular music: musicians, creativity and institutions*, Arnold Publishers, London.
- Truax, B 2001, *Acoustic communication*, second edition, Ablex Publishing, London.
- ultimateguitar.com 2015, 'Loudness Wars: Metallica is officially the loudest band of all time', 25 April, viewed 5 January 2016. [https://www.ultimate-guitar.com/news/general\\_music\\_news/loudness\\_wars\\_metallica\\_is\\_officially\\_the\\_loudest\\_band\\_of\\_all\\_time.html](https://www.ultimate-guitar.com/news/general_music_news/loudness_wars_metallica_is_officially_the_loudest_band_of_all_time.html)
- Van Maanen, J 1988, *Tales of the field: on writing ethnography*, University of Chicago Press, Chicago.
- Vickers, E 2010a, 'The Loudness War: background, speculation and recommendations', *proceedings of the 129<sup>th</sup> Convention of the Audio Engineering Society*, November, San Francisco.
- Vickers, E 2010b, 'Metrics for qualifying loudness and dynamics', *proceedings of the 129<sup>th</sup> Convention of the Audio Engineering Society*, November, San Francisco.
- Vickers, E 2010c, 'The non-flat and continually changing frequency response of multi-band compressors', *proceedings of the 129<sup>th</sup> Convention of the Audio Engineering Society*, November, San Francisco.
- Vickers, E 2011, The Loudness War—do louder, hyper-compressed recordings sell better?, *the Journal of the Audio Engineering Society*, vol. 59, no. 5, pp. 346-351, May.
- Viney, D 2008, 'The obsession with compression', Master of music technology thesis, London College of Music, Thames Valley University.
- von Ruschkowski, A 2008, 'Loudness War', in Albrecht Schneider (ed), *Systematic and comparative musicology: concepts, methods, findings*, Peter Lang Publisher.
- Watkinson, J 1998, *The art of sound reproduction*, Focal Press, Woburn, MA, USA.
- Wendl, M & Lee, H 2014, 'The effect of dynamic range compression on loudness and quality perception in relation to crest factor', *proceedings of the 136<sup>th</sup> Convention of the Audio Engineering Society*, April, Berlin, Germany.
- Weymouth, D 2012, *The Loudness War: a game and market theory analysis*, essay, GRIN, Munich.
- Wikstrom, P 2009, *The music industry: music in the cloud*, Polity Press, Cambridge, UK.
- Wikstrom, P 2013, *The music industry: music in the cloud*, second edition, Polity Press, Cambridge, UK.

Williamson, J & Cloonan, M 2007, 'Rethinking the music industry', *the Journal of Popular Music*, vol. 26, no. 2, pp. 305-322.

Wolff, J 1975, *Hermeneutic philosophy and the sociology of art: An approach to some of the epistemological problems of the sociology of knowledge and the sociology of art and literature*, Routledge, London.

Wilde, O 1998 (first published in 1891), *The picture of Dorian Gray*, Random House - Modern Library, New York.

Wyner, J 2015, interview, Boston, USA, 23 May.

Yarm, M 2008, 'EXCLUSIVE: Metallica drummer Lars Ulrich breaks band's silence on Death Magnetic loudness controversy', blender.com, blog, 29 September, viewed 19 August 2015. <http://archive.is/FJFGz#selection-459.0-459.101>

Zac, AJ 2001, *The poetics of rock: cutting tracks, making records*, University of California Press, CA.

Zervos, L 2013, interview, Sydney, Australia, 3 April.

# 11 APPENDICES

APPENDIX 1 – MUSIC CORPUS SIGNAL ANALYSIS TABLE .....	453
APPENDIX 2 – MUSIC CORPUS SIGNAL ANALYSIS PLOTS.....	458
APPENDIX 3 – GRAPHS FROM ORTNER ANALYSIS 2012 .....	463
APPENDIX 4 – GRAPHS FROM DERUTY AND TARDIEU ANALYSIS 2014.....	465

## APPENDIX 1 – MUSIC CORPUS SIGNAL ANALYSIS TABLE

Year	Artist	Song Title	Leq (dBFS)	IL(LU)	LRA (LU)	DR	HLSD
1955	Bill Hayley and the Comets	Rock Around the Clock	-17.0084	-13.69	3.37	12	-5.4538
1957	Johnny Cash	Folsom Prison Blues	-17.9795	-14.92	3.82	13	-5.4011
1962	The Drifters	Please Stay	-15.9974	-13.27	4.29	11	-4.3514
1964	Simon and Garfunkel	The Sound Of Silence	-17.299	-14.34	6.1	12	-5.7599
1964	The Animals	House Of The Rising Sun	-15.2003	-12.18	6.43	10	-5.3644
1964	The Kinks	You Really Got Me	-15.5805	-12.5	5.57	11	-5.1641
1965	Bob Dylan	Like A Rolling Stone	-15.3126	-11.37	3.05	9	-5.8292
1965	Rolling Stones	(I Can't Get No) Satisfaction	-13.4323	-10.49	2.36	9	-3.5543
1966	Beach Boys	Good Vibrations	-16.8332	-13.99	6.01	12	-5.1911
1966	Beatles	Taxman	-15.1932	-12.6	3.82	10	-5.0147
1966	Easy Beats	She's So Fine	-17.9752	-13.96	2.75	12	-5.4918
1966	Easy Beats	Sorry	-15.9704	-11.06	3.3	10	-4.7324
1967	Beatles	Sgt. Pepper's Lonely Hearts Club Band	-16.8529	-12.86	2.74	11	-5.3622
1967	Jimi Hendrix	Purple Haze	-17.0982	-12.3	5.17	11	-6.0085
1967	Monkeys	I'm A Believer	-15.1811	-11.21	5.13	10	-5.1423
1967	Moody Blues	Nights In White Satin	-17.8273	-14.57	11	11	-6.27
1967	Procol Harem	A Whiter Shade Of Pale	-12.9344	-10.1	3.15	8	-4.1311
1967	The Byrds	Mr. Tambourine Man	-17.3834	-11.85	4.15	11	-5.8255
1967	The Troggs	Love Is All Around	-14.9789	-12.03	3.58	10	-6.2946
1967	Tom Jones	What's New Pussycat	-15.3591	-11.65	9.17	8	-4.4755
1968	Aretha Franklin	Say A Little Prayer	-14.3232	-12.71	6.01	10	-5.8855
1969	Led Zeppelin	Whole Lotta Love	-14.3232	-16.36	13.33	11	-6.3847
1970	Carpenters	Close To You	-18.8965	-14.76	13.14	11	-5.3427
1970	Diane Warwick	I'll Never Fall In Love Again	-18.0032	-14.51	6.71	11	-4.7369
1970	Tony Orlando and Dawn	Tie A Yellow Ribbon	-19.642	-15.98	5.09	12	-5.324
1971	America	A Horse With No Name	-16.9047	-14.12	8.58	11	-6.562
1971	Helen Reddy	I Am Woman	-16.6521	-12.91	5.44	10	-5.7054
1971	The Doors	Riders On The Storm	-17.3425	-15.08	10.41	12	-4.2621
1971	Carly Simon	You're So Vain	-19.5171	-15.54	7.59	14	-6.2719
1972	Carol King	I Feel The Earth Move	-14.7722	-12.45	4.64	10	-4.6921
1972	Deep Purple	Smoke On The Water	-18.4537	-15.94	5.4	14	-5.7246
1972	Lou Reed	Vicious	-13.4297	-16.98	2.99	14	-5.124
1972	Neil Diamond	Sweet Caroline	-13.4297	-10.4	8.48	8	-3.3179
1972	Neil Young	The Needle & The Damage Done	-17.4223	-15.07	7.03	12	-4.2034
1972	Stevie Wonder	Superstition	-16.9571	-13.74	5.08	12	-4.6689
1973	Elton John	Goodbye Yellow Brick Road	-15.223	-11.74	10.55	10	-4.0402
1973	Helen Reddy	Delta Dawn	-20.6717	-15.5	7.4	13	-6.6109
1974	Carl Douglas	Kung Fu Fighting	-18.0891	-14.52	7.38	13	-6.6171
1974	The Sweet	Fox On The Run	-17.3172	-13.43	3.27	12	-6.3487
1975	Alice Cooper	Department Of Youth	-16.6819	-13.42	6.09	12	-5.0235
1975	Hot chocolate	You Sexy Thing	-14.6643	-11.81	1.84	9	-5.8232
1975	KC and the Sunshine Band	Boogie Shoes	-16.6284	-13.93	2.43	12	-5.3424
1975	Pilot	January	-18.4682	-14.55	7.17	12	-5.9225
1976	Abba	Dancing Queen	-18.448	-14.35	4.69	13	-6.7023
1976	Chicago	If You Leave Me Now	-16.377	-14.75	4.02	11	-5.2905
1976	Roxy Music	Let's stick together	-19.3798	-15.56	3.86	14	-6.5891

**Understanding the Use of Hyper-compression in Music Production: A Systems Based Approach to Examining Innovative Change in the Field of Music Production**

<b>Year</b>	<b>Artist</b>	<b>Song Title</b>	<b>Leq (dBFS)</b>	<b>IL(LU)</b>	<b>LRA (LU)</b>	<b>DR</b>	<b>HLSD</b>
1976	Smokie	Living Next Door To Alice	-18.8132	-15.13	13.56	13	-5.7542
1976	The Saints	Stranded	-13.5914	-11.18	2.15	10	-4.7552
1977	Bee Gees	Stayin' Alive	-18.4828	-15.61	2.63	14	-6.3936
1977	Doctor Hook	Walk Right In	-18.6173	-14.68	3.52	13	-6.8926
1977	Eruption	Can't Stand The Rain	-15.8544	-12.58	5.57	10	-5.8004
1977	Tavares	More Than A Woman	-16.0405	-12.88	2.98	11	-5.7279
1977	The Sex Pistols	Anarchy In The UK	-13.1147	-9.23	2.14	9	-5.0025
1978	Blondie	Heart Of Glass	-19.4525	-16.4	4.17	14	-6.5379
1978	Boney M	Rivers Of Babylon	-18.2289	-14.85	7.41	13	-6.2713
1978	Chic	Le Freak	-22.5981	-18.76	3.4	18	-6.1589
1978	10CC	Dreadlock Holiday	-14.1659	-12.01	5.52	10	-4.4653
1978	The Commodores	Three Times a Lady	-21.4692	-18.6	12.35	13	6.0748
1978	Village People	Y.M.C.A.	-19.6485	-15.84	3.23	14	-6.097
1979	ACDC	Highway to Hell	-14.8293	-10.82	6.02	9	-3.6013
1979	KISS	I Was Made For Loving You	-18.7066	-15.39	4.28	14	-5.7899
1979	Martha and the Muffins	Echo Beach	-18.1768	-14.92	5.86	13	-5.2527
1979	Michael Jackson	Don't Stop Til' You Get Enough	-19.3978	-15.45	3.67	15	-5.7599
1979	Sister Sledge	We Are Family	-16.7192	-13.61	4.65	12	-4.2294
1979	The Boomtown Rats	Don't Like Mondays	-18.7778	-15.7	6.72	13	-5.6888
1979	The Knack	My Sharona	-16.2454	-12.52	2.73	10	-5.9328
1980	Adam and the Ants	Ant Music	-19.6261	-15.8	4.02	15	-5.6891
1980	Little River Band	Help Is On Its Way	-16.8639	-13.43	9.04	11	-5.4185
1980	The Vapours	Turning Japanese	-16.9516	-13.23	2.94	12	-5.9118
1980	Visage	Fade to grey	-16.5503	-13.62	9.95	11	-4.2085
1981	Depeche Mode	Just Can't Get Enough	-14.4293	-11.46	2.84	10	-3.1869
1981	Men at Work	Land Downunder	-17.0747	-13.42	3.86	13	-4.7988
1981	Rolling Stones	Start Me Up	-15.4182	-12.3	2.55	11	-3.6512
1982	Culture Club	Karma Chameleon	-14.4294	-11.05	5	9	-3.8008
1982	Duran Duran	Hungry like the Wolf	-14.857	-11.29	4.06	10	-3.6408
1982	Midnight Oil	Power And The Passion	-19.6052	-15.77	5.31	13	-5.6964
1982	Psychedelic Furs	Love My Way	-16.1182	-12.79	3.16	11	-5.7386
1982	Toto	Africa	-20.7739	-18.23	5.5	15	-5.9089
1982	XTC	Senses Working Overtime	-16.5383	-14	8.64	11	-4.307
1983	David Bowie	Let's Dance	-19.4807	-16.67	3.96	15	-5.5609
1983	Madonna	Burning Up	-18.7784	-15.34	3.16	14	-5.8466
1983	U2	New Year's Day	-17.5138	-14.11	3.59	13	-5.6095
1984	Bruce Springsteen	Born in the USA	-14.4648	-10.3	2.66	10	-3.9651
1984	Madonna	Material Girl	-16.4604	-13.39	3.69	12	-3.8741
1984	The Cure	Boys Don't Cry	-17.4405	-14.78	2.43	13	-5.51
1985	AHA	Take On Me	-14.6101	-11.85	6.16	10	-3.5328
1985	Bronski Beat	Small Town Boy	-17.4557	-14.66	6.8	11	-6.3024
1985	Prince	Raspberry Beret	-19.6763	-15.28	4.74	14	-5.821
1985	Sade	The Sweetest Taboo	-18.7029	-15.89	5.16	13	-6.0801
1985	The Smiths	How Soon Is Now	-16.6299	-13.53	3.38	12	-4.9024
1986	RUN DMC and Aerosmith	Walk This Way	-15.633	-12.27	3.89	11	-4.1126
1986	Crowded House	Don't Dream It's Over	-15.1446	-12.4	4.62	11	-3.8708
1986	Metallica	Master Of Puppets	-18.4681	-15.18	4.84	13	-6.3122
1986	Prince	Kiss	-19.6483	-17.21	4.73	15	-5.6397
1986	REM	Fall On Me	-18.4347	-14.25	4.01	12	-6.5714

Year	Artist	Song Title	Leq (dBFS)	IL(LU)	LRA (LU)	DR	HLSL
1987	Guns N Roses	Sweet Child O' Mine	-15.5181	-12.17	5.52	10	-5.188
1987	INXS	New Sensation	-19.1222	-15.03	3.6	15	-5.3216
1988	Metallica	...And Justice For All	-17.1297	-13.95	2.88	12	-5.5783
1989	Vanilla Ice	Ice Ice baby	-19.9785	-17.64	3.77	14	-6.5969
1990	Dee Lite	Groove Is In The Heart	-16.3354	-13.47	9.22	12	-4.6337
1990	Depeche Mode	Personal Jesus	-17.2831	-15.07	3.36	13	-5.8107
1990	Happy Mondays	Kinky Afro	-17.5949	-14.64	3.59	12	-6.2378
1990	MC Hammer	Can't Touch This	-18.5483	-16.28	2.68	14	-5.6501
1990	Public Enemy	911 Is A Joke	-16.0716	-14.64	2.66	12	-5.5588
1991	EMF	Unbelievable	-14.6752	-11.81	2.76	11	-5.2389
1991	Jane's Addiction	Been Caught Stealing	-11.9317	-8.38	1.77	8	-3.5971
1991	Nirvana	Smells Like Teen Spirit	-15.4357	-11.75	4.84	11	-5.1164
1991	Red Hot Chili Peppers	Under The Bridge	-20.8891	-17.42	9.35	14	-6.7655
1991	Sound Garden	Rusty Cage	-16.9453	-13.89	3.33	13	-6.0271
1991	Tina Turner	Simply the Best	-19.5466	-15.72	4.81	15	-5.4372
1992	L7	Pretend We're Dead	-15.1435	-10.92	3.55	10	-3.9899
1992	Pantera	Fucking Hostile	-14.0805	-9.68	2.48	10	-5.509
1992	Lenny Kravitz	Are You Gonna Go My Way	-16.7797	-12.78	6.02	11	-5.0975
1993	Prodigy	Voodoo People	-15.8428	-12.41	7.41	11	-3.6073
1993	RATM	Killing In The Name	-14.2375	-10.86	4.67	10	-3.9167
1993	Smashing Pumpkins	Cherub Rock	-14.0551	-10.94	1.6	10	-4.5247
1993	Suede	Animal Nitrate	-14.4556	-10.33	7.63	8	-5.6564
1994	Blur	Girls & Boys	-15.0568	-12.05	4.65	11	-4.08
1994	Green Day	When I Come Around	-11.4892	-9	2.22	8	-2.8026
1994	Jeff Buckley	Last Goodbye	-15.7427	-12.28	6.24	10	-4.1284
1994	NIN	Closer	-15.6179	-13.27	6.15	10	-5.1714
1995	Oasis	Morning Glory	-8.0253	-4.11	4.33	4	-1.8069
1995	Oasis	Wonderwall	-11.5934	-7.99	9.98	7	-2.7636
1996	George Michael	Fast Love	-14.7211	-11.96	7.59	11	-3.6492
1996	Prodigy	Firestarter	-12.6574	-10.36	9.18	8	-2.8108
1997	Chemical Brothers	Block Rockin' Beats	-11.5665	-6.61	6.57	4	-1.5255
1997	Oasis	D'You Know What I Mean?	-8.6054	-5.37	6.44	4	-1.6261
1997	Radiohead	Karma Police	-11.5665	-8.92	9.81	7	-2.9669
1997	Robbie Williams	Angels	-12.3944	-9.04	10.28	7	-2.8118
1997	The Verve	Sweet Symphony	-13.1932	-9.61	8.37	9	-3.8872
1998	Cher	Believe	-11.8638	-8.93	9.08	7	-3.1312
1998	Fat Boy Slim	Right Here Right Now	-12.203	-10.8	9.92	7	-2.6105
1998	Placebo	Pure Morning	-13.5884	-9.79	4.98	11	-3.502
1999	Atari Teenage Riot	Atari Teenage Riot II	-13.0715	-9.23	4.55	9	-3.666
1999	Destiny's Child	Say my Name	-10.3034	-7.83	4.82	8	-1.9157
1999	Eminem	My Name Is	-11.9152	-10.49	2.25	7	-2.0809
2000	Britney Spears	Oops I Did It Again	-12.1944	-8.65	7.71	8	-2.4955
2000	Dandy Wahols	Bohemian like you	-10.9625	-8.22	3.44	7	-2.4123
2000	Human Nature	He Don't Love you	-10.5095	-6.86	3.23	6	-2.1668
2000	Kelly Rowland	Can't Nobody	-11.1665	-8.81	4.73	6	-2.0286
2000	Westlife	When You're Looking Like That	-12.0741	-8.53	3.97	8	-3.7292
2001	Daft Punk	One More Time	-14.5295	-12.26	5.1	9	-2.7778
2001	Missy Elliot	Get Your Freak On	-9.9476	-8.68	3.67	6	-1.9625
2001	System of a Down	Chop Suey	-10.9768	-7.01	6.18	6	-2.2292
2001	No Doubt	Hella Good	-10.9454	-8.39	6.13	6	-1.8465
2002	Avril Lavigne	Sk8er Boi	-10.4988	-6.97	4.17	6	-2.5447

**Understanding the Use of Hyper-compression in Music Production: A Systems Based Approach to Examining Innovative Change in the Field of Music Production**

<b>Year</b>	<b>Artist</b>	<b>Song Title</b>	<b>Leq (dBFS)</b>	<b>IL(LU)</b>	<b>LRA (LU)</b>	<b>DR</b>	<b>HLSD</b>
2002	Coldplay	Clocks	-11.0414	-8.4	4.42	6	-2.4892
2002	Flaming Lips	Do You Realise?	-8.4781	-5.19	3.01	4	-2.4168
2002	QOTSA	No One Knows	-9.2265	-7.01	6.73	4	-1.9249
2003	Basement Jaxx	Good Luck	-10.215	-7.04	9.96	5	-1.9177
2003	Electric Six	Gay Bar	-10.9114	-6.76	11.44	6	-2.0695
2003	Evanescence	Bring Me To Life	-9.4514	-6.14	7.46	5	-1.8379
2004	Prodigy	Spitfire	-8.1888	-6.39	4.66	4	-1.2907
2004	The Killers	Smile Like You Mean It	-9.1718	-5.79	2.83	5	-2.0229
2004	Franz Ferdinand	Take Me Out	-9.2729	-5.88	2.55	5	-2.0842
2004	The Vines	Ride	-7.0763	-4.32	3.63	3	-1.2525
2005	Pendulum	Slam	-9.6009	-7.7	5.99	5	-1.9868
2005	Wolfmother	Joker and the Thief	-9.0073	-5.94	4.9	5	-1.8391
2005	The Veronicas	4ever	-9.6797	-5.97	4.53	5	-1.9984
2006	Christina Aguilera	Ain't No Other Man	-9.9849	-8	2.28	6	-1.9819
2006	Justin Timberlake	Sexy Back	-10.0364	-8.28	3.74	6	-1.6191
2006	Snow Patrol	Chasing Cars	-10.7313	-7.31	11.84	4	-1.9245
2006	The Killers	When You Were Young	-10.02	-6.16	9.32	5	-1.8389
2006	Yeah Yeah Yeahs	Gold Lion	-8.7128	-5.94	7.96	3	-1.41
2007	Arctic Monkeys	Brianstorm	-10.7693	-7.35	4.18	6	-2.0206
2007	MGMT	Electric Feel	-10.1074	-7.39	2.95	5	-4.4052
2007	Kaiser Chiefs	Ruby	-8.9731	-5.99	2.93	5	-1.9958
2008	Metallica	My Apocalypse	-6.1854	-3.24	1.92	3	-1.4834
2008	Lady Hawke	My Delerium	-8.6559	-5.91	4.65	4	-1.8667
2009	Kelly Clarkson	Already Gone	-10.0239	-6.67	5.13	5	-2.2118
2009	Lady GaGa	Telephone	-11.3969	-8.5	14.52	7	-2.0319
2009	Prodigy	Omen	-10.9418	-8.17	9.08	6	-2.7272
2010	Pink	Raise Your Glass	-11.1073	-7.66	9.81	6	-2.0942
2010	Kesha	Take It Off	-9.9087	-8.21	3.48	6	-2.479
2010	Katy Perry	Firework	-11.5931	-8.74	5.02	6	-2.6135
2010	Justin Beiber	Baby	-10.0784	-8.56	4.66	6	-1.7933
2010	Wombats	Tokyo	-11.4095	-8.27	5.46	7	-2.5346
2011	Adelle	Rolling in the Deep	-11.3972	-8.81	9.36	5	-2.3118
2011	Dave Guetta	Titanium	-9.956	-6.4	6.11	5	-2.1024
2011	GOTYE	Somebody That I Used To Know	-12.0437	-9.69	10.98	5	-2.3397
2011	Skrillex	Bangarang feat. Sirah	-7.9517	-4.73	8.56	3	-1.485
2011	Florence and the Machine	Shake it Out	-9.6825	-6.8	8.96	4	-2.4174
2012	Flume	Holding On	-10.7643	-8.82	2.76	6	-2.4242
2012	Niki Minaj	Starships	-9.9578	-6.4	9.31	5	-1.762
2012	Muse	Madness	-10.3571	-8.81	7.36	5	-2.075
2012	Pink	Blow Me (one last kiss)	-8.9406	-5.84	3.87	5	-1.8433
2012	PSY	Gangnam Style	-9.1482	-6.5	5.05	5	-1.7078
2012	The Lumineers	Ho Hey	-14.2759	-10.97	9.14	8	-2.6348
2013	Avicii	Hey Brother	-10.2163	-7.18	4.51	6	-2.4555
2013	Daft Punk	Get Lucky	-12.4216	-10.86	3.75	8	-2.2302
2013	Lorde	Royals	-10.6566	-10.13	4.07	6	-2.1574
2013	Pit Bull Kesha	Timber	-9.5526	-6.96	4.56	5	-2.1332
2013	Robin Thicke Pharrell Williams	Blurred Lines	-12.397	-11.21	2.74	9	-2.4579
2014	Foo Fighters	The Feast and The Famine	-11.0049	-7.1	6.93	6	-2.3696
2014	Mark Ronson	Uptown Funk ft. Bruno Mars	-13.3003	-10.77	4.99	9	-2.9359
2014	Peking Duck	High	-10.0438	-6.08	13.73	4	-2.1574

Year	Artist	Song Title	Leq (dBFS)	IL(LU)	LRA (LU)	DR	HLS D
2014	New Pornographers	Brill Bruisers	-10.6539	-7.63	4.45	6	-2.593
2015	One Direction	Drag Me Down	-10.8814	-8.52	7.29	5	-2.0673
2015	Tame Impala	Let it Happen	-9.8026	-7.39	3	5	-2.136
2015	Twenty One Pilots	Stressed Out	-10.0585	-7.88	3.49	5	-2.2178
2015	Adele	Hello	-11.1279	-7.12	17.05	5	-2.1703
2015	Drake	Know Yourself	-12.9276	-10.7	13.93	7	-2.0585
2015	Rihanna	Bitch Better Have My Money	-11.4551	-9.53	5.87	6	-2.8859
2016	Beyoncé	Sorry	-11.7467	-11.37	3.36	7	-3.4263
2016	Prodigy	Nasty	-11.0301	-8.19	6.37	6	-2.3146
2016	Kyle	iSpy	-12.7996	-9.27	13.64	6	-2.2715
2016	Kayne West	Ultralight Beam	-11.2925	-9.06	7.41	6	-2.0769
2016	Shakira ft. Maluma	Chantaje	-8.9419	-6.79	3.23	5	-1.6569
2016	The Chainsmokers	Closer	-10.4145	-7.64	7.82	5	-1.9824
2016	The Weeknd	Starboy ft. Daft Punk	-9.9437	-9.03	4.3	6	-3.5343
2016	Beyoncé	Sorry	-11.7467	-11.37	3.36	7	-3.4263

## APPENDIX 2 – MUSIC CORPUS SIGNAL ANALYSIS PLOTS

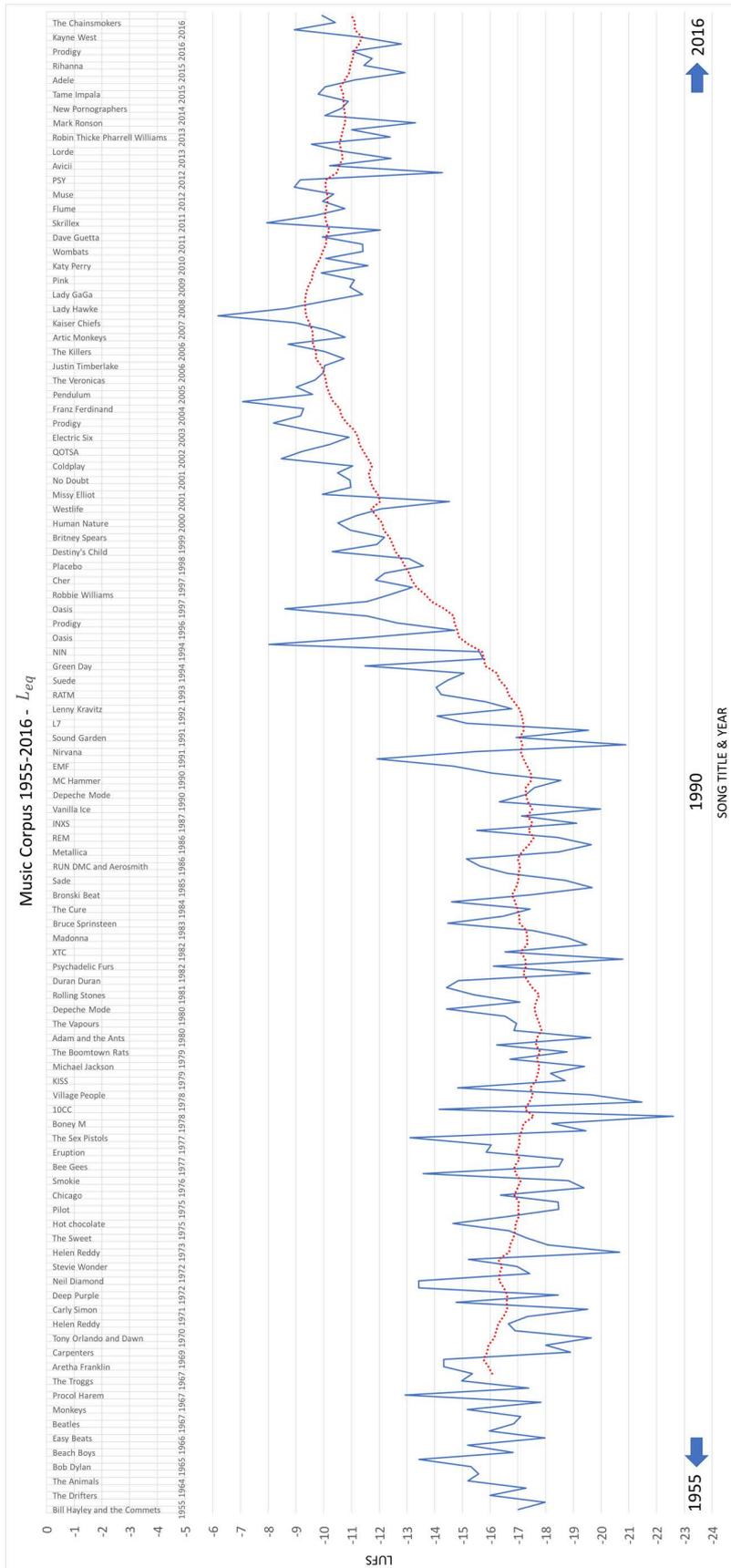


Figure 11.1: Music corpus represents 210 recordings from 1955-2016. This graph illustrates Leq in dBFS. Red dotted line is a running average.





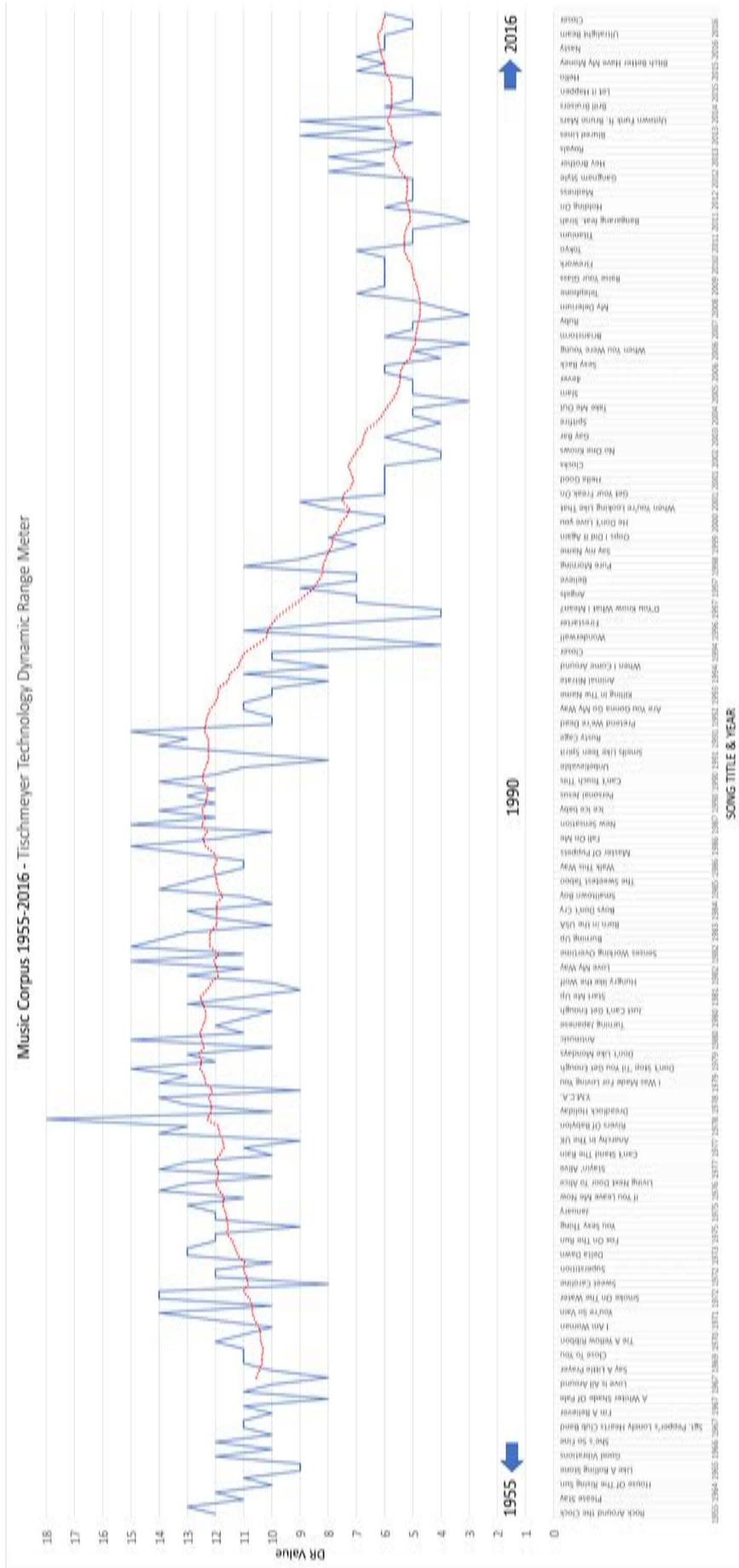


Figure 11.4: Music corpus represents 210 recordings from 1955-2016. This graphs illustrates DR values. Red dotted line is a running average.

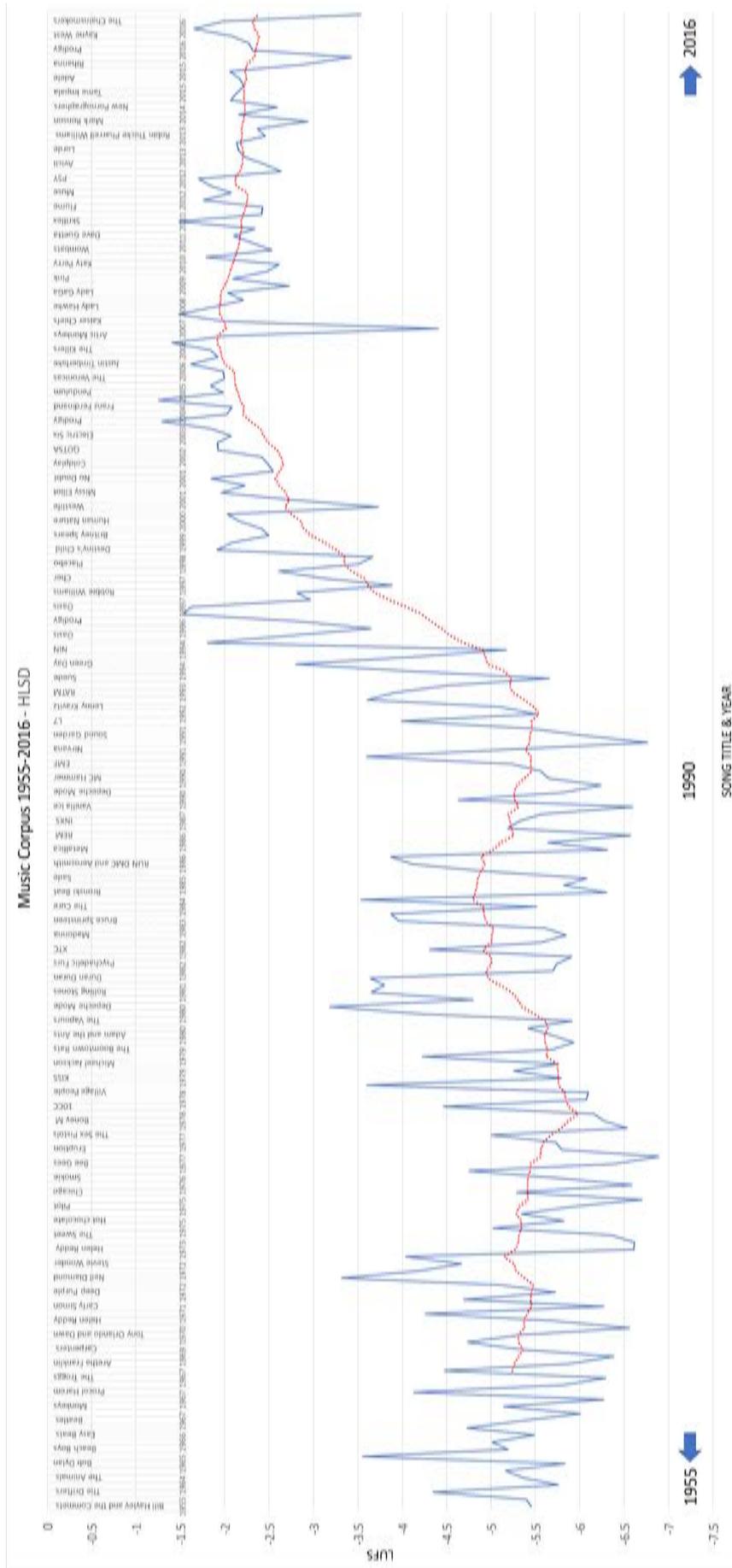
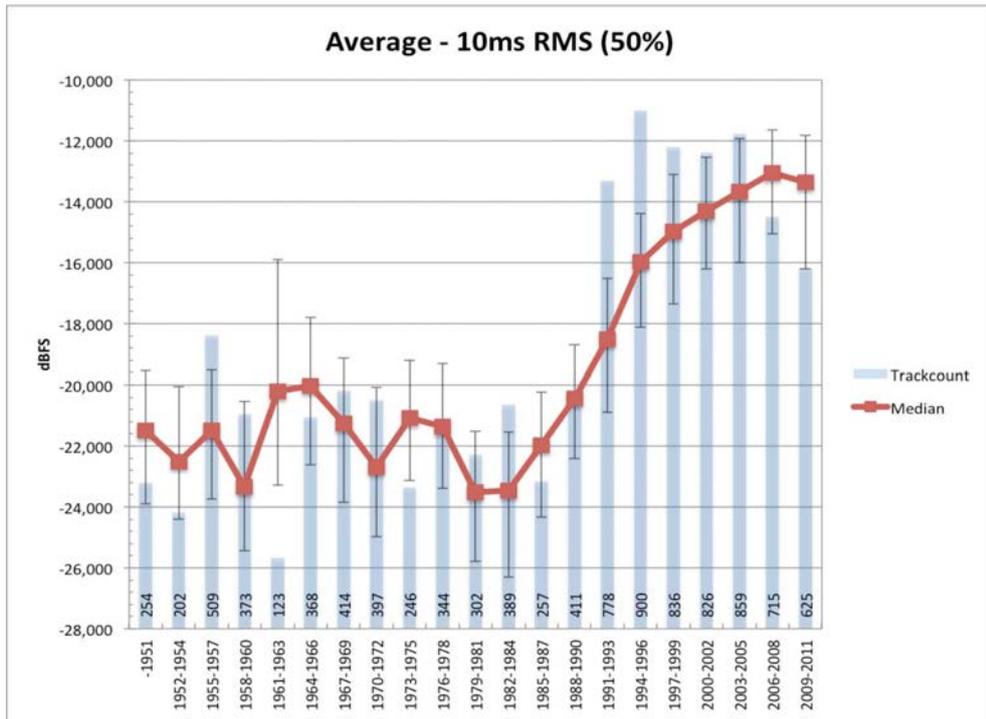
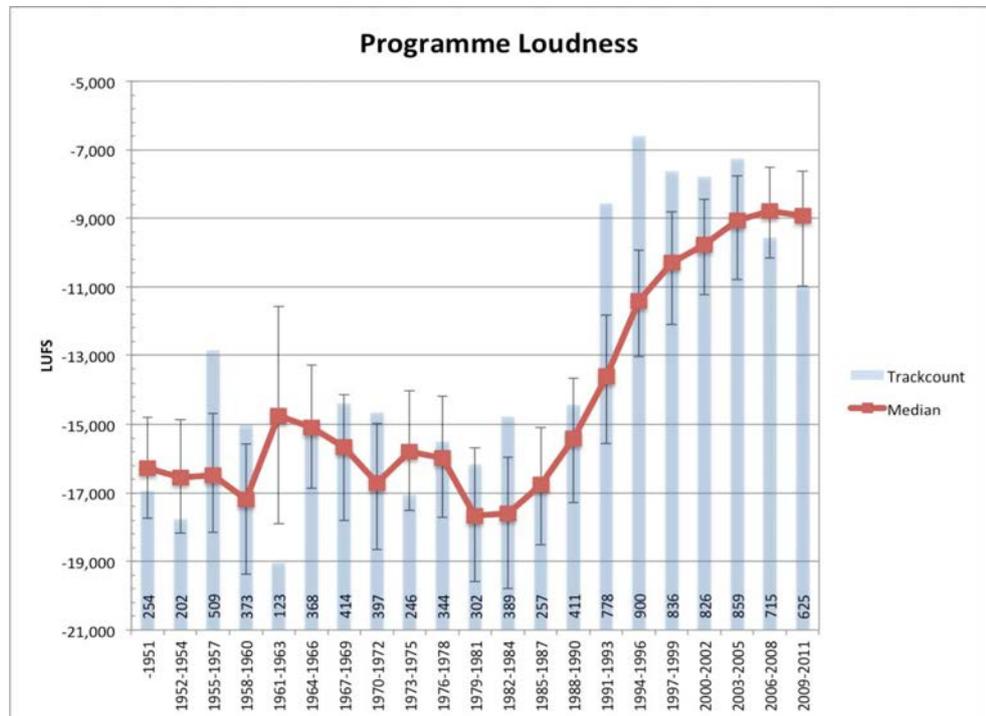


Figure 11.5: Music corpus represents 210 recordings from 1955-2016. This graphs illustrates high level sample density in dBFS. Red dotted line is a running average.

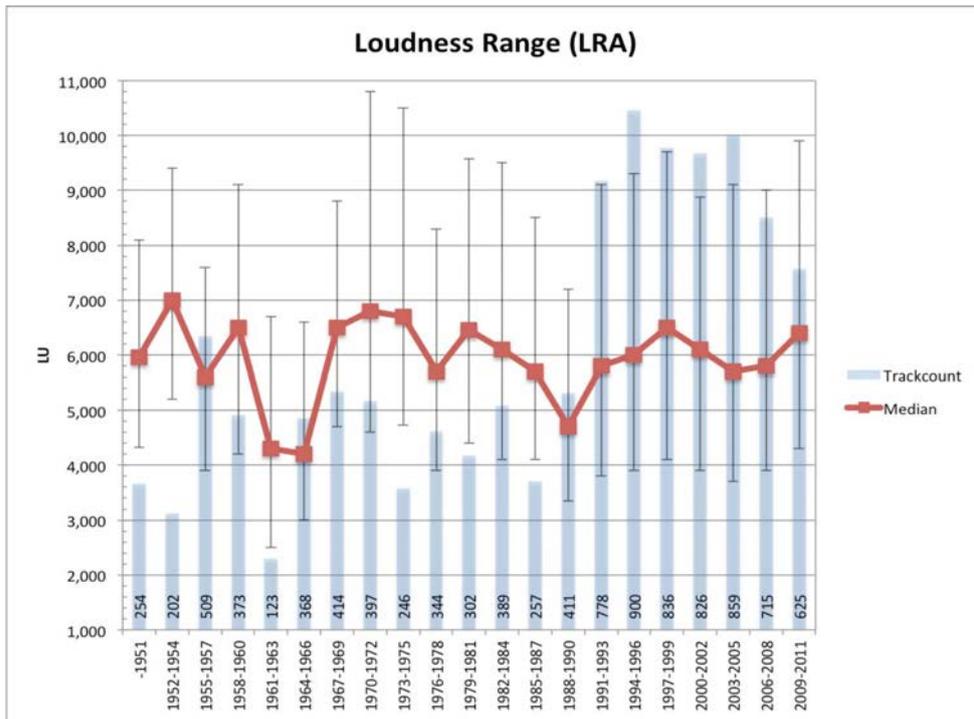
### APPENDIX 3 – GRAPHS FROM ORTNER ANALYSIS 2012



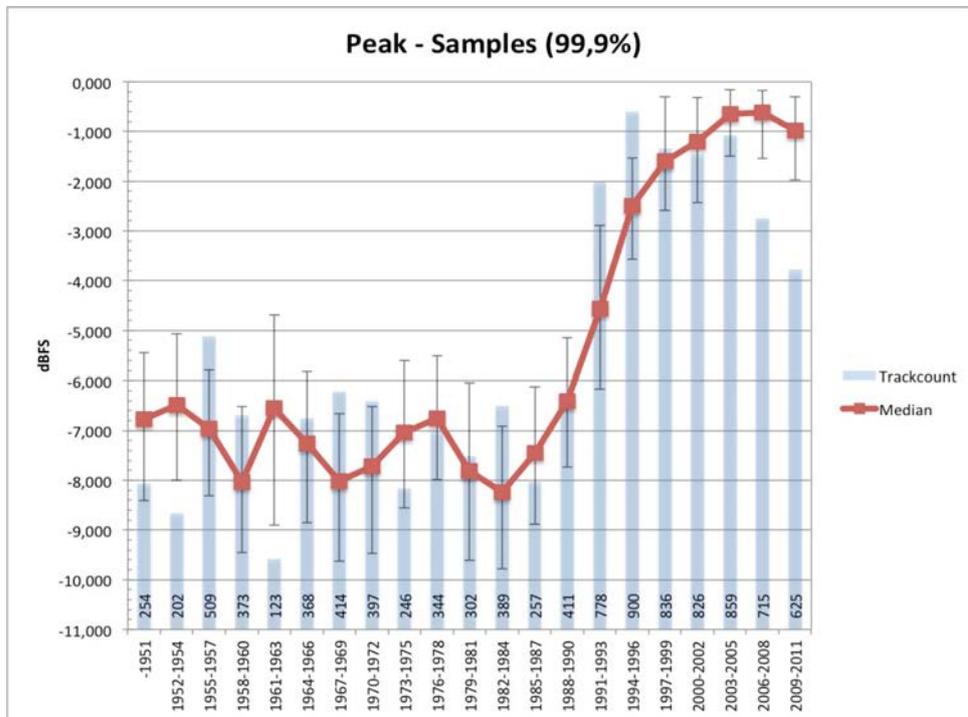
i)



ii)



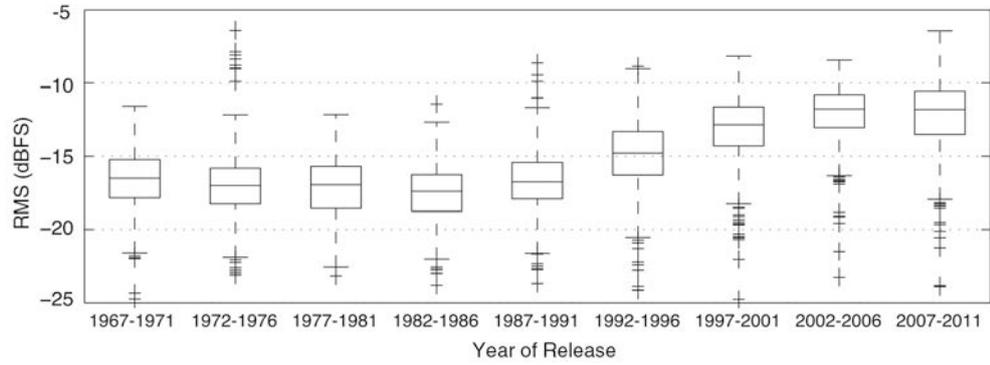
iii)



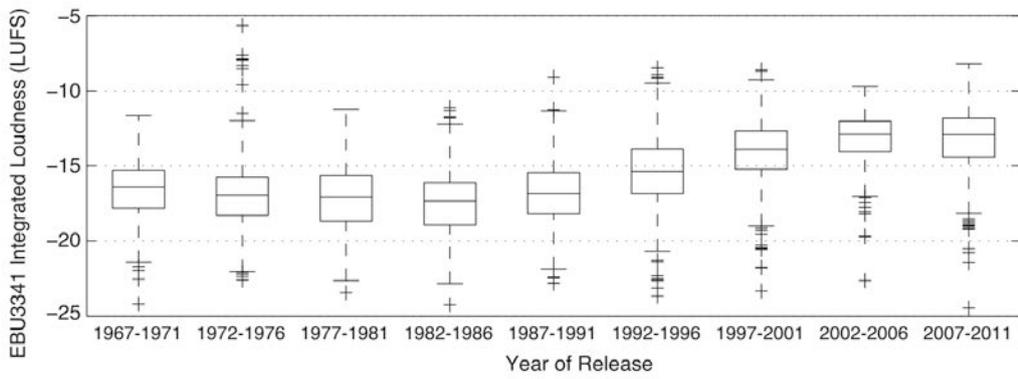
iv)

Figure 11.6: The 177 music recordings contained in the music corpus, assembled into five year groups. The five measurement procedures are then averaged: i) Leq (dBFS); ii) integrated loudness; iii) loudness range (LRA); and iv) High Level Sample Density (HLSD). (Source: Ortnier 2012)

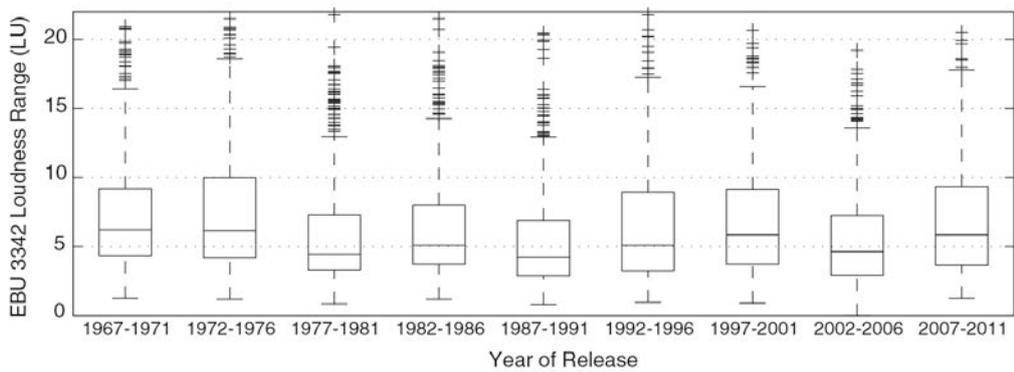
# APPENDIX 4 – GRAPHS FROM DERUTY AND TARDIEU ANALYSIS 2014



i)

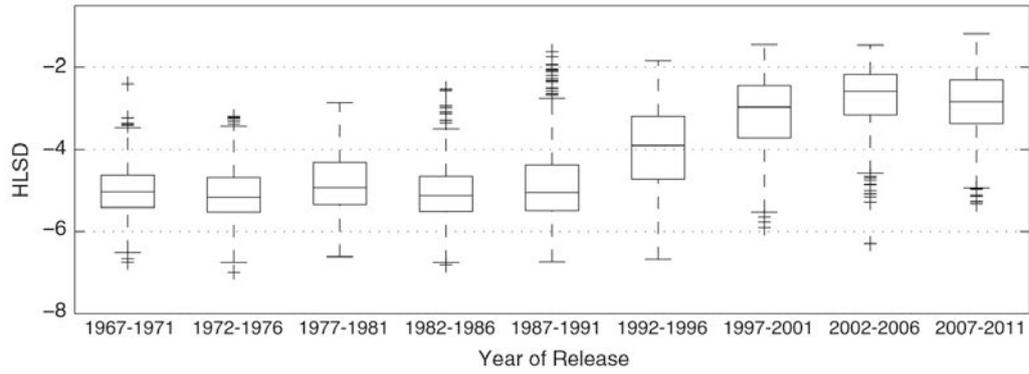


ii)



iii)

**Understanding** the Use of Hyper-compression in Music Production: A Systems Based Approach to Examining Innovative Change in the Field of Music Production



iv)

*Figure 11.7:* The 177 music recordings contained in the music corpus, assembled into five year groups. The five measurement procedures are then averaged: i) Leq (dBFS); ii) integrated loudness; iii) loudness range (LRA); and iv) High Level Sample Density (HLSD). (Source: Deruty & Tardieu 2014)