

**Improvising with technology in a jazz context through composition,
performance and recording**

Sean Foran
MArts (Perf)

Queensland Conservatorium
Arts, Education and Law Group
Griffith University

Submitted in partial fulfilment of the requirements of the degree of
Doctor of Musical Arts

February 2021

Abstract

This project investigates the process of creating new works for two jazz trio ensembles, with a particular emphasis on improvisation with acoustic instruments and technology. Utilising a practice-based research model the project documents and outlines the conceptual basis for the work, reflects on a series of public performances and examines studio recording sessions. By analysing the musical content, use of technology, and the musician's reflections on their decision making, the overall goal is to articulate the musical potential of improvising with technology in a jazz context.

Exploring technology and developing extended techniques towards a hybrid acoustic-electronic "group sound" that is distinct but still recognisable as jazz, is a core focus of this research. Specific software, hardware controllers, and audio effects are identified, and an analysis of the ways in which technologies are engaged by each musician is presented. Artistic reference points identify current and historical practice within this area and a range of case studies give context for how the music created here is relevant to contemporary jazz in Australia. The resulting musical output is documented in audio and video formats and includes multiple performer analyses, enabling detailed examination by the reader of how each musician merges improvisation using acoustic instruments and improvisation with technology.

Ultimately this research has allowed two professional jazz ensembles to forge new musical pathways, creating expanded practical skills for the author and the musicians involved. This research will be of interest to jazz musicians seeking to broaden their practice through improvisation with technology. Additionally, the project is relevant to any reader/musician engaged with improvisation in contemporary music more broadly.

Statement of Authenticity

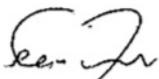
The work contained in this exegesis is that of Sean Foran and has not previously been submitted for an award at any other higher education institution. To the best of my knowledge and belief, no material previously published or written by another person has been included except where due reference is made.

Selected material drawn from this exegesis that is the original work of the author, has been previously published during the course of completing this work.

Foran, S & Goold L. (2020). The Changing Nature of Jazz Artists within the Recording Technology Space, *Riffs*, 4(1). <https://riffsjournal.org/2020/07/23/the-changing-nature-of-jazz-artists-within-the-recording-technology-space-lachlan-goold-sean-foran/>

Selections from this paper are included in Chapter Three and Chapter Seven

In addition to the statements above, permission to include the published material has been granted by the corresponding author.



Sean Foran 15/02/21

Table of Contents

Abstract	2
Statement of Authenticity	3
Table of Contents	4
List of Figures	8
List of Tables	10
Imagery, video & recording credits	11
Documentation	12
Acknowledgements	14
PART A	16
CHAPTER ONE: INTRODUCTION	16
1.2 My Background	16
1.2 Main research question	17
1.2.1 Primary research aims	18
1.2.2 Sub questions	19
1.3 Structure of the Dissertation	19
1.4 Practice based research	21
1.5 The impact of technology on the Creative process	23
1.6 Chapter Conclusion	24
CHAPTER TWO: RESEARCH METHODS	25
2.1 Overview	25
2.2 Flexible design	29
2.2.1 Creation of new work	31
2.2.2 Composition and improvisation	34
2.3 Notation	36
2.3.1 Moving away from the lead sheet	37
2.3.2 My approach to notation	39
2.4 Reflective practice	42
2.4.1 Development	42
2.4.2 Final Works	43
2.4.3 Audio Visual Analysis	44
2.4.4 Graphic Representation of the final works	45
2.5 Summary - Methodological Relationships	47
CHAPTER THREE: LITERATURE REVIEW	49
3.1 Introduction to the review	49
3.2 Live Electronics	49
3.2.1 Language and Influence	52
3.2.2 Pre-Imagining Sound	54
3.2.3 Performance models for improvisation with acoustic instrumentation and technology	55
3.2.4 Effects	57
3.3 Electronic Jazz	59
3.4 Literature Review - Chapter Conclusion	63

CHAPTER FOUR: IMPROVISATION AND CASE STUDIES	64
4.1 Overview	64
4.2 Improvisation: tools, concepts and flow	64
4.3 Adapting the groups – uncertain sounds	67
4.4 Four case studies	69
4.4.1 The Norwegian Scene	70
a) Bugge Wesseltoft	70
c) Morten Qvenild	72
c) Thomas Strønen	75
d) Supersilent and Nils Petter Molvær	77
4.4.2 Outside Norway	77
a) Evan Parker Electro-Acoustic Ensemble	77
b) Hauschka	78
c) Franziska Baumann	79
4.4.3 An Australian focus	79
a) Tangents	80
b) Peter Knight	80
4.5 Chapter Conclusion	81
CHAPTER FIVE: CHOICE OF TECHNOLOGY	82
5.1 Overview	82
5.2 The nature of the trio	83
5.2.1 The piano trio	83
a) Trichotomy	84
5.2.2 Piano/tenor saxophone/vocal trio	84
a) Berardi/Foran/Karlen	85
5.3 My principles	86
5.4 Monitoring	87
5.5 Technical Setups	89
5.6 Piano	90
5.6.1 Critter & Guitari - Organelle	91
5.6.2 Korg–Kaoss Pad KP3	92
5.6.3 Ableton Live	93
5.6.4 Max for Live	93
5.6.5 MIDI Control devices	94
5.6.6 Volume pedal - Boss FV-50	100
5.7 Double Bass	101
5.7.1 Zoom–B3 multi-effect unit	102
5.7.2 Boss/Roland–Space Echo RE-20	103
5.7.3 TC Electronic–Ditto X4 looper	103
5.8 Drum Kit	104
5.8.1 Boss–RC-505 Loop Station	105
5.8.2 Korg–Kaoss Pad Quad	106
5.8.3 Hungry Robot–The Karman Line	106
5.9 Vocal	107
5.9.1 Boss–RC-505 Loop station	108
5.9.2 Hungry Robot–The Stargazer	109
5.9.3 Greenhouse Effects–Retro Sky	109
5.9.4 Radial–Voco-Loco	110
5.10 Saxophone	111
5.10.1 Boss–ME-50 multi-effects Pedal	112
5.10.2 Boss–RC-30 Loop Station	112
5.10.3 Boss/Roland–Space Echo RE-20	113
5.10.4 Radial–Voco Loco	113
5.11 Chapter Conclusion	113

PART B	115
CHAPTER SIX: DEVELOPMENT THROUGH LIVE PERFORMANCE	115
6.1 From practice to performance	115
6.1.1 Developing control	117
6.1.2 Balance	120
6.1.3 Individual Testing	121
6.1.4 Ensemble Rehearsals	123
6.2 Live concert performances	124
6.2.1 On the stage and in rehearsal	125
6.2.2 Trichotomy live performances	126
a) Live recording #1: 'In Times Past and Present'	127
b) Live recording #2: 'Reassemble'	128
c) Live recording #4: 'Mercury'	132
d) Live recording #5: 'Stream'	132
6.2.3 Berardi/Foran/Karlen live performances	133
a) Live recording #11: 'Double Take'	133
b) Live recording #12: 'Stretch'	135
c) Live recording #13: 'Don't Fade Away'	136
d) Live recording #15: 'Don't Fade Away'	137
6.3 Chapter Conclusion	138
CHAPTER SEVEN: ANALYSIS THROUGH STUDIO RECORDING	140
7.1 Overview	140
7.2 Jazz studio recordings	141
7.2.1 Trichotomy studio recording	143
7.2.2 Berardi/Foran/Karlen studio recording	146
7.3 Studio recording analysis concepts	148
7.4.1 'Reassemble'	150
7.4.2 'Stream'	161
7.4.3 Trichotomy recording session summary	171
7.5 Berardi/Foran/Karlen analysis	172
7.5.1 'Forward Motion'	172
7.5.2 'Don't Fade Away'	183
7.5.3 Berardi/Foran/Karlen recording session summary	192
7.6 Ensemble comparison.	193
7.7 Chapter Conclusion	195
PART C	197
CHAPTER EIGHT: CONCLUSIONS	197
8.1 Reflections and achievements	197
8.2 Research sub questions	201
8.3 Future directions	203
8.4 Concluding thoughts	206
PART D	209
APPENDICIES	209
Appendix 1: Studio Recording Session - Multi-camera videos	209
Appendix 2: Scores	210
Appendix 3: Technology setups & instrument specifics	211
Appendix 4: Concert video recordings	218
Appendix 5: Complete performer decision analysis	220
Appendix 6: Testing sessions	257

Improvising with technology in a jazz context	7
Appendix 7: Ensemble biographies	261
Appendix 8: Post performance performer interviews	264
References	268

List of Figures

FIGURE 1: STRUCTURE OF DISSERTATION	20
FIGURE 2: CONCEPTUAL SPACE & EXPLORATORY CREATIVITY	23
FIGURE 3: TACIT DIMENSION OF MUSICIAN'S ACTS (CRISPIN, 2013, P. 50).	26
FIGURE 4: GRAY C. AND MALINS J. (2004) REFLECTION FOR ACTION—ADAPTED FROM COWAN	28
FIGURE 5: GRAPHIC REPRESENTATION OF THE RECURSIVE, REITERATIVE CHARACTER OF THIS PHENOMENOLOGY (BLUMENFELD-JONES, P. 326).	33
FIGURE 6: THE VARIOUS WAYS OF AWARENESS UNDERLYING A FEELING WAY OF AWARENESS (BLUMENFELD-JONES, P. 331).	33
FIGURE 7: 4X2 TYPES OF WRITTEN MUSIC NOTATION (BHAGWATI, 2013, P. 172).	40
FIGURE 8: EXAMPLE OF COUPRIE'S VISUAL-SOUND GRAPHICS (COUPRIE, 2004, P.111).	45
FIGURE 9: METHODOLOGICAL RELATIONSHIPS	48
FIGURE 10: TONE ÅSE & THOMAS STRØNEN PERFORMING AT THE JAZZ FESTIVAL UMEA (ALL ABOUT JAZZ. HTTPS://WWW.ALLABOUTJAZZ.COM/2012-UMEA-JAZZ-FESTIVAL-UMEA-SWEDEN-OCTOBER-24-28-2012-BY-JOHN-KELMAN.PHP)	54
FIGURE 11: PESTOVA'S MODEL FOR PERFORMER TO AUDIENCE CONNECTION (2009)	56
FIGURE 12: PESTOVA'S MODEL FOR PERFORMER TO AUDIENCE CONNECTION INCLUDING LIVE ELECTRONICS (2009)	56
FIGURE 13: CHOICES IN IMPROVISATION (MACDONALD & WILSON, 2016, P. 1035).	68
FIGURE 14: BUGGE WESSELTOFT PERFORMING LIVE (HTTPS://FRIENDROCK.WORDPRESS.COM/2011/10/10/PATTERNS-THE-LOUCHE-F-C-BUGGE-WESSELTOFT-GREG-WILSON/)	71
FIGURE 15: MORTEN QVENILD PERFORMING ON THE HYPERSONAL PIANO (HTTP://WWW.MORTYQ.COM/)	73
FIGURE 16: THOMAS STRØNEN RECORDING (HTTPS://WWW.BBC.CO.UK/PROGRAMMES/P03BLPGK/P03BLN90)	75
FIGURE 17: HAUSCHKA'S PIANO PERFORMANCE SETUP (HTTP://EEMAGAZINE.NET/ENTREVISTAS/AN-INTERVIEW-WITH-HAUSCHKA-AT-THE-ARSFUTURA)	79
FIGURE 18: TRICHOTOMY ELECTRONIC SETUP	89
FIGURE 19: BERARDI/FORAN/KARLEN ELECTRONIC SETUP	90
FIGURE 20: PIANO ELECTRONIC DEVICE SETUP DURING THE RECORDING SESSION	90
FIGURE 21: CRITTER & GUITARI ORGANELLE	91
FIGURE 22: KORG KAOSS PAD - KP3	92
FIGURE 23: SCREENSHOT OF ABLETON LIVE	93
FIGURE 24: SCREENSHOT OF LEMUR TEMPLATE – PAGE 1 ON IPAD	95
FIGURE 25: SCREENSHOT OF LEMUR TEMPLATE ON IPAD - PAGE 2	96
FIGURE 26: LOGIDY 3 BUTTON MIDI CONTROLLER	96
FIGURE 27: LOGIDY POSITIONED UNDER THE PIANO WITH OTHER FOOT CONTROLLERS-VOLUME AND ORGANELLE FOOTSWITCH	97
FIGURE 28: KEITH MCMILLEN 12 STEP MIDI CONTROLLER	97
FIGURE 29: RECORDING SETUP INDICATING POSITION OF 12 STEP UNDER PIANO	98
FIGURE 30: OWOW WIGGLE GESTURAL CONTROLLER	99
FIGURE 31: OWOW WIGGLE DURING REHEARSAL	99
FIGURE 32: BOSS FV-50 VOLUME PEDAL	100
FIGURE 33: SAMUEL VINCENT DURING A LIVE PERFORMANCE AT THE QLD CONSERVATORIUM	101
FIGURE 34: SAM'S ELECTRONIC DEVICES DURING A PERFORMANCE AT THE QLD CONSERVATORIUM	102
FIGURE 35: ZOOM B3 MULTI-EFFECT UNIT	102
FIGURE 36: BOSS/ROLAND SPACE ECHO RE-20	103
FIGURE 37: TC ELECTRONIC DITTO X4 LOOPER	103
FIGURE 38: JOHN PARKER DURING A LIVE PERFORMANCE AT THE QLD CONSERVATORIUM	104
FIGURE 39: PLACEMENT OF DRUM ELECTRONIC DEVICES DURING REHEARSAL.	105
FIGURE 40: BOSS RC-505 LOOP STATION	105
FIGURE 41: KORG KAOSS PAD QUAD	106
FIGURE 42: THE KARMAN LINE PEDAL	106
FIGURE 43: LIVE PERFORMANCE AT ORANGE STUDIOS CHRISTCHURCH INDICATING POSITIONING OF VOCAL EFFECT DEVICES	107

FIGURE 44: KRISTIN BERARDI PERFORMING AT THE JAZZ LAB IN MELBOURNE UTILISING TECHNOLOGY	108
FIGURE 45: HUNGRY ROBOT - THE STARGAZER, REVERB EFFECT UNIT	109
FIGURE 46: GREENHOUSE EFFECTS RETRO SKY DELAY PEDAL	109
FIGURE 47: RADIAL VOCO LOCO VOCAL PREAMPLIFIER AND EFFECTS LOOP PEDAL	110
FIGURE 48: RAFAEL KARLEN PERFORMING AT THE JAZZ LAB MELBOURNE, WITH FLOOR POSITIONED PEDALS	111
FIGURE 49: RAFAEL KARLEN ADJUSTING PARAMETERS DURING A PERFORMANCE.	111
FIGURE 50: BOSS ME-50 MULTIPLE EFFECTS UNIT	112
FIGURE 51: BOSS RC-30 LOOP STATION	112
FIGURE 52: BOSS/ ROLAND SPACE ECHO RE-20	113
FIGURE 53: PROJECT PROCESS FOR ENSEMBLE AND INDIVIDUAL FLUIDITY	116
FIGURE 54: BERARDI/FORAN/KARLEN PERFORMING AT THE QLD CONSERVATORIUM	124
FIGURE 55: LEVELS OF GESTURAL CONTROL OF MUSIC (SCHLOSS, 2003, P. 241).	126
FIGURE 56: SEAN FORAN PERFORMING AT THE QLD CONSERVATORIUM	127
FIGURE 57: SEAN FORAN AND SAMUEL VINCENT PERFORMING 'REASSEMBLE'	130
FIGURE 58: JOHN PARKER PERFORMING 'REASSEMBLE' AT THE QLD CONSERVATORIUM	131
FIGURE 59: BERARDI/FORAN/KARLEN PERFORMING IN CHRISTCHURCH	134
FIGURE 60: BERARDI/FORAN/KARLEN PERFORMING AT THE QLD CONSERVATORIUM	137
FIGURE 61: STILL FROM MULTI-CAMERA RECORDING OF TRICHOTOMY STUDIO SESSION	141
FIGURE 62: THE KAWAI GL-40 IN THE TRICHOTOMY STUDIO	144
FIGURE 63: LACHLAN GOOLD & JOHN PARKER SETTING UP	145
FIGURE 64: BERARDI/FORAN/KARLEN WITH ENGINEER ADDISON JOY	147
FIGURE 65: SEAN FORAN AND SAMUEL VINCENT RECORDING	150
FIGURE 66: EXCERPT FROM <i>REASSEMBLE</i> - C SECTION	151
FIGURE 67: PIANO 'REASSEMBLE' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	155
FIGURE 68: THE AUTHOR, SEAN FORAN AT THE PIANO DURING THE TRICHOTOMY RECORDING SESSION	156
FIGURE 69: DOUBLE BASS ELECTRONIC SETUP DURING RECORDING	156
FIGURE 70: DOUBLE BASS 'REASSEMBLE' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	157
FIGURE 71: DRUM SETUP DURING THE TRICHOTOMY RECORDING SHOWING PLACEMENT OF DEVICES	158
FIGURE 72: DRUM DECISION 'REASSEMBLE' ANALYSIS SHOWING DECISIONS OVER TIME	159
FIGURE 73: GRAPH INDICATING BAND DECISION ANALYSIS FOR 'REASSEMBLE'	160
FIGURE 74: EXCERPT FROM STREAM LEAD SHEET - OPENING PIANO OSTINATO	162
FIGURE 75: PIANO 'STREAM' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	166
FIGURE 76: DOUBLE BASS 'STREAM' DECISION ANALYSIS SHOWING DECISIONS OVER TIME.	167
FIGURE 77: DRUM 'STREAM' DECISION ANALYSIS SHOWING DECISIONS OVER TIME.	168
FIGURE 78: GRAPH INDICATING BAND DECISION ANALYSIS FOR 'STREAM'	169
FIGURE 79: GRAPH INDICATING TRACK BREAKDOWN OF DECISION ANALYSIS FOR TRICHOTOMY RECORDING	171
FIGURE 80: THE AUTHOR, SEAN FORAN AT THE PIANO DURING THE BERARDI/FORAN/KARLEN RECORDING	176
FIGURE 81: PIANO 'FORWARD MOTION' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	177
FIGURE 82: KRISTIN BERARDI DURING THE BERARDI/FORAN/KARLEN RECORDING SESSION	177
FIGURE 83: VOCALS 'FORWARD MOTION' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	178
FIGURE 84: RAFAEL KARLEN DURING THE BERARDI/FORAN/KARLEN RECORDING SESSION	179
FIGURE 85: SAXOPHONE 'FORWARD MOTION' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	180
FIGURE 86: GRAPH INDICATING BAND DECISION ANALYSIS FOR 'FORWARD MOTION'	181
FIGURE 87: OSTINATO PATTERN #1 IN 'DON'T FADE AWAY'	184
FIGURE 88: OSTINATO PATTERN #2 IN 'DON'T FADE AWAY'	185
FIGURE 89: PIANO 'DON'T FADE AWAY' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	188
FIGURE 90: VOCAL 'DON'T FADE AWAY' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	189
FIGURE 91: SAXOPHONE VOCAL 'DON'T FADE AWAY' DECISION ANALYSIS SHOWING DECISIONS OVER TIME	190
FIGURE 92: GRAPH INDICATING BAND DECISION ANALYSIS FOR 'DON'T FADE AWAY'	192
FIGURE 93: GRAPH INDICATING TRACK BREAKDOWN OF DECISION ANALYSIS FOR BERARDI/FORAN/KARLEN RECORDING	193
FIGURE 94: ENSEMBLE DECISION ANALYSIS COMPARISON	194

List of Tables

TABLE 1: RESEARCH PROCESS	26
TABLE 2: PRACTITIONER-RESEARCH PRAXIS ALIGNMENT	30
TABLE 3: RESEARCH ACTIVITY BREAKDOWN	31
TABLE 4: NOTATIONAL STYLES	42
TABLE 5: CATEGORIES OF EFFECTS (ELSA, 2013, P. 95)	58
TABLE 6: ELECTRONIC MUSIC TECHNIQUES USED IN JAZZ (HOLMES & PENDER, 2018, P. 7).	60
TABLE 10: KRISTIN BERARDI – VOCAL ELECTRONIC DEVICE LEARNING PROCESS	123
TABLE 11: <i>REASSEMBLE</i> – MUSICAL FORM	152
TABLE 12: ELECTRONIC SOUNDS USED IN 'REASSEMBLE'	153
TABLE 13: PERFORMATIVE VS OPERATIONAL TASKS IN 'REASSEMBLE'	154
TABLE 14: <i>STREAM</i> MUSICAL FORM	163
TABLE 15: ELECTRONIC SOUNDS USED IN 'STREAM'	165
TABLE 16: PERFORMATIVE VS OPERATIONAL TASKS IN 'STREAM'	166
TABLE 17: <i>FORWARD MOTION</i> - MUSICAL FORM	173
TABLE 18: ELECTRONIC SOUNDS USED IN 'FORWARD MOTION'	174
TABLE 19: PERFORMATIVE VS OPERATIONAL TASKS IN 'FORWARD MOTION'	175
TABLE 20: <i>DON'T FADE AWAY</i> - MUSICAL FORM	184
TABLE 21: ELECTRONIC SOUNDS USED IN 'DON'T FADE AWAY'	186
TABLE 22: TRICHOTOMY INSTRUMENT DECISION SUMMARY	195
TABLE 23: BERARDI/FORAN/KARLEN INSTRUMENT DECISION SUMMARY	195

Imagery, video & recording credits

Photo credits:

The images of the groups Trichotomy and Berardi/Foran/Karlen throughout this dissertation have been taken by Sean Foran, Michelle Secis, Daniel Spirovski (Brisbane live concert photography), and Stuart Buchanan - Third Life Photography (Melbourne live concert photography).

Additionally, selected still images have been created from the video footage noted below.

Audio/Video production credits:

- b) May 2018 performance by Trichotomy at Griffith University - audio production by Connor Anderson. Video production by Sean Foran
- c) March 2017 performance by Trichotomy at Griffith University - audio and video production by Matt Sorensen.
- d) November 2018 performance by Berardi/Foran/Karlen at Griffith University – audio and video production by Michelle Secis
- e) December 2018 performance by Berardi/Foran/Karlen at the Peggy Glanville Hicks House – audio production by Peter Nelson
- f) All other concert recordings – audio and video production by Sean Foran
- g) Trichotomy studio recording – recorded by Lachlan Goold
- h) Berardi/Foran/Karlen studio recording – recorded by Addison Joy
- i) All studio photography – Michelle Secis and Sean Foran
- j) All Multicamera studio video production by Sean Foran

Documentation

The information in this thesis is presented via a PDF file with active hyperlinks. By clicking on the hyperlinks, the video media and scores will open in a web browser. An internet connection is required to access this media. To fully engage with the material in this research project, it is intended that the written exegesis, video and scored material are experienced concurrently. For the purposes of examination, links to the various pieces of multimedia are included below. Once the thesis has been accepted, the entire research project will be available at: <https://www.seanforanmusic.info/research>

1. Video examples:

The selected musical material in this research range from individual testing sessions and rehearsals, live concert recordings and studio recordings. The testing sessions and live concert recordings are part of the development phases and the final studio recordings represent the culmination of work in this project over a number of years. The final studio recordings consist of twelve audio visual recordings, six from each ensemble. Each recording has an accompanying performer analysis with selected recordings containing a more comprehensive musical analysis. Viewing the audio and video examples is an important part in understanding the process for the musicians and production of the resultant work. They also help contextualise the written discourse, and give coherency to the comments made by the musician participants in the research.

The final studio recordings are found here:

a) Trichotomy studio recordings:

<https://www.dropbox.com/sh/2v7hj2d5yakp29t/AAAMxAan2BoXTMDIYv86UhSSa?dl=0>

b) Berardi/Foran/Karlen studio recordings:

<https://www.dropbox.com/sh/7hklcc4um581e9t/AACXmI4LPKEx17RIpSZmRM-Ra?dl=0>

The development phase concert recordings are found here:

<https://www.dropbox.com/sh/na1gb2s0worzkip6/AADVt9XOUjrcWxnlaUaCpXJua?dl=0>

Testing sessions are found here:

https://www.dropbox.com/sh/uu5wpgd3ktnl2lp/AAAQIW9UqYYL4vVJhTXLT_ra?dl=0

Additionally, these links are found in the appendix with further information on the studio and live concert recordings.

2. Scores are provided to demonstrate what the musicians used in the studio recording.

They are found here:

<https://www.dropbox.com/sh/fi6mrwcerucnffw/AABeNx5TNyx8uBXLToFTPv1Va?dl=0>

3. Performer analysis decision streams: Each performer completed a decision stream analysis of their studio recording for each work. These decision streams can be read for a more complete understanding of performance thinking by each musician during the recording session.

They are found here:

<https://www.dropbox.com/sh/fla0kbuliqppp1y/AABEYPcSxXOlw3ToeumUvVNDa?dl=0>

A folder containing all of the above mentioned material can be downloaded here:

<https://www.dropbox.com/sh/o0xgyim82wgvvzt/AADVijJ3ncEELdqmwa9QgujWa?dl=0>

Acknowledgements

This construction of this dissertation and the accompanying recordings has been realised thanks to the support of many incredible people.

Firstly, I give my sincere thanks to the Queensland Conservatorium, Griffith University for giving me the opportunity to complete this research. The Recital Hall at the Conservatorium hosted multiple performances throughout this study, which was invaluable. I also attended national and international conferences with Griffith support, enabling the ideas presented here to flourish. I thank my supervisors, Dr Toby Gifford, Dr John Ferguson and Dr Steve Newcomb, whose trust, advice and attention to detail was unwavering. I also thank Professor Paul Draper whose insight in the early stages of this research helped me find out what this project could be. In devising an analysis method for the final studio recordings Rodrigo Constanzo has been exceedingly helpful and his work inspirational.

To the musicians – John Parker, Samuel Vincent, Kristin Berardi and Rafael Karlen. The music you hear in this research is evidence of their exceptional musical intuition and skill. I am extremely grateful for the time they contributed to this research and their willingness to come on this journey with me...even if they didn't really know what they were getting into.

I thank the staff at JMC Academy. To Dr John Martin Cass, Dr George Markakis, Dr Sue-Ann Stanford, Carol Miller, Kirstyn Fitzgerald, Dr Christina Ballico, Dr Vincent Perry, Dr Lachlan Goold and Dan Spirovski. You have all listened to me rave on about this music for some time now, but encouraged me consistently throughout this endeavour in a myriad of ways - supporting my attendance at international conferences, providing recording facilities, expertise, and time to write this dissertation.

Special thanks to Dr Lachlan Goold who co-published a paper with me during this candidature.

This doctoral study features a large amount of multimedia, and I am grateful for the assistance from Addison Joy, Dr Lachlan Goold and Michelle Secis. Your contribution has been invaluable. Numerous performances also occurred at a range of venues in Australia and New Zealand, and I thank all of them for supporting new music.

Finally, to my wonderful family, who have lived with me working on this project part time for many years. There's been a multitude of gigs, rehearsals, recording sessions, and countless hours writing and refining the thesis. To my parents, Gail and Dennis, who began this journey for me so many years ago with my childhood piano lessons, I am forever grateful. To Annie, Joseph, Nick, Roni, Edwina, Dylan, Patrick, Catherine - you've all been so positive and encouraging, and always been there to lend a hand in the complex life balance.

Mischa and Estelle, you bring me so much joy and inspiration. For all those weekends I spent working on this you were pretty cool with it. I love you both.

Chloe, this work only exists because of you. Your gift of time to complete this project is something that cannot be underestimated, and you always made me feel that I could get to the end of it! Balancing work, life and a thesis is a challenge – but you made it possible. I love you.

Honourable mention to Murphy, who appeared at the final stretch for moral support.

PART A

CHAPTER ONE: INTRODUCTION

1.2 My Background

As an improvising musician, the importance of having a wide palette of musical experiences and ideas to draw on was something I discovered early in my career. I believe engaging in a variety of musical genres, traditions, techniques and practices is useful in developing a rich language for improvised—and composed—music.

My studies in Brisbane, Australia and Leeds, UK, as well as professional experience collaborating with artists from around the world led me to engage with a variety of performance styles and groups within contemporary jazz. I became focused on writing for small ensembles, mainly the piano trio, where scope for improvisation and the variety of interactive possibilities between the three musicians is wide.

The small jazz ensemble, specifically the trio setting, is one that has been deeply probed by many musicians over the years. As a pianist, in my formative years I devoted many listening hours to classic piano trios, such as Bill Evans, Keith Jarrett and Errol Garner. I also found myself drawn to sounds from European pianists including Bobo Stenson, Tord Gustavsen and John Taylor. All of these musicians have been highly influential in my musical development, and inspired me in my own professional practice.

Throughout my professional career I have been regularly performing in two trios, a group called *Trichotomy*, comprising of piano, double bass and drum kit, and *Berardi/Foran/Karlen*, comprising of piano, vocals and tenor saxophone. I have performed with these musicians over many years, recorded multiple full-length albums and performed at venues and festivals in Australia and internationally. I find the trio format musically invigorating, as I am challenged by the improvising methods of each musician and the ideas they bring to the music. There is textural density and space possible in the music, and I love the musical intimacy that is created with just three musicians. After years of performing in these groups I began looking for more ways to vary the music that each trio creates, and what inventive concepts I could bring to each band. Working with guest artists to extend the instrumental combinations on stage was one strategy, and this was musically and socially successful, but I wanted to discover pathways that would continue to change and stimulate the music creation in solely the trio. How could I go further than just changing the musical

elements such as tempo, style, harmony, texture, dynamic and form? I wanted to create new sonic worlds within these trios.

Fascinated with the possibilities for expanding the trio sound world, in my performance practice I blended acoustic and electronic sounds; using electric and acoustic pianos on stage and modified the acoustic piano sound using single effect processors. I was the only musician in the trio using electronic devices on stage, and it often operated in a polar on/off method, performed at a set time in the work. Often I added the use of effect pedals to an existing piece, mostly to give new variety to something we had played live many times before.

I was inspired, and I felt that I had only scratched the surface of what could be possible. The other musicians in each trio were curious about the sonic possibilities on their instruments, and in a conscious decision to move the creative practice into unfamiliar territories, both groups started improvising with effect pedals in a more consistent and considered way during performances. All the musicians in these groups had little experience in using electronic effects, and so this pathway was one of unexplored territory with a multitude of questions from the musicians. What music would emerge? How would we get there? To explore these questions I devised this research project.

1.2 Main research question

This research project tracks and provides insight into the development, performance and recording of new work that combines acoustic improvising and improvising with technology in the two different trio ensembles - *Trichotomy* and *Berardi/Foran/Karlen*. I am interested in how skilled improvisers that are intimately familiar with the sound making capabilities of their instruments, will grapple with creative potential of new sonic possibilities. By improvising with technology and their acoustic instrument simultaneously the musicians will enact and extend instrumental performance techniques in performance and studio recording settings. The focus is firmly on how the sound of each acoustic instrument can be extended, with all technology based sounds derived directly from the acoustic sources. I believe the addition of electronic manipulations to acoustic improvisation can be designed and implemented in a way that enhances the creation and performance of semi-improvised music. As Roger Dean (2002) notes in *Hyperimprovisation*, “the musical output from electronic sound generators can give performers ambiguities, uncertainties, and variabilities” (p. 17). As part of my creative process, I use these increased sonic variabilities to widen the

scope of improvising practice and sound creation for all members of the ensembles, resulting in a changed trio sound for each group.

The principal goal of this research is to explore the process in creating new music for jazz trio that engages improvisation with acoustic instruments and improvisation with technology. I am curious to explore how performers can improvise with technology using various physical controllers, and combine this with acoustic improvising to increase sonic variety, but also retain the improvisational flow and group cohesion already present in the ensemble. Importantly, the newly created music is the central component of this research, and various media is used to present this work and provide experiential outcomes to extend the musical practice of these musicians. The written exegesis is used to provide an accompanying discussion to the music, with each part giving context to the other.

The original contribution to knowledge that this thesis provides is the investigation of how a group of acoustic jazz improvisers, with little background in using technology as part of their live jazz based performance and recording process, can extend their improvising scope and skill through improvising with technology in concert performance and studio recording settings. This research project was designed so that myself and my collaborators would develop as musicians, both in a practical and conceptual way. I envisioned it as a way for each group to transform their music making into something new, where each musician gathers a fresh set of physical performance skills, but also a new way of listening and reacting to each other within improvised music.

The emergence of the music in this research is borne out of my background, my musical experiences, the choice of ensembles for the research, the musicians in these ensembles and their musical histories, understandings and relationships.

1.2.1 Primary research aims

1. To explore the process in creating new jazz-based music using improvisation with acoustic instruments and improvisation with technology.
2. To reflect upon the relationship between the performers, the extended instruments and the music.
3. To use analysis and performer reflections to ascertain individual and ensemble performance styles and understand the resultant music.

1.2.2 Sub questions

In developing the primary research aim, sub questions have emerged:

1. What software and hardware devices are functional for performers of piano, double bass, drum kit, vocals and saxophone to modify their acoustic sounds during performance?
2. When improvising with technology, what sonic choices yield satisfying results in a jazz trio format?
3. Can the same depth of interaction between acoustic improvising and improvising with technology occur in both live concert and studio settings?
4. What kind of scoring practices will be effective to communicate new music that includes improvisation with technology to the participant musicians?

Finally, there is a little research in how contemporary jazz musicians engage with improvising using technology alongside their acoustic instrument performances and recordings. Current research into improvisation using technology in performance often emphasises musicians identifying with a western classical background, including experimental music. Research into jazz musicians using electronics is sparse, and it often focuses on solo musicians utilising electronics, rather than an entire ensemble. To further the benefit of this to the research community in Australia, this music and musicians involved with this research project are Australian professional practicing artists, and the resulting music will be made available in audio, video and scored formats. I hope that this research assists in highlighting the innovative music being created by these contemporary jazz based improvisers in Australia and helps create a pathway for other artists to broaden their professional practice similarly.

1.3 Structure of the Dissertation

This exegesis is a document that involves the use of mixed media. The audio, video and images throughout are critical parts to the overall project understanding and should be viewed along with the text. I have broken this document into four parts as outlined in this diagram, inspired by the research of Australian drummer Grant Collins (2013).

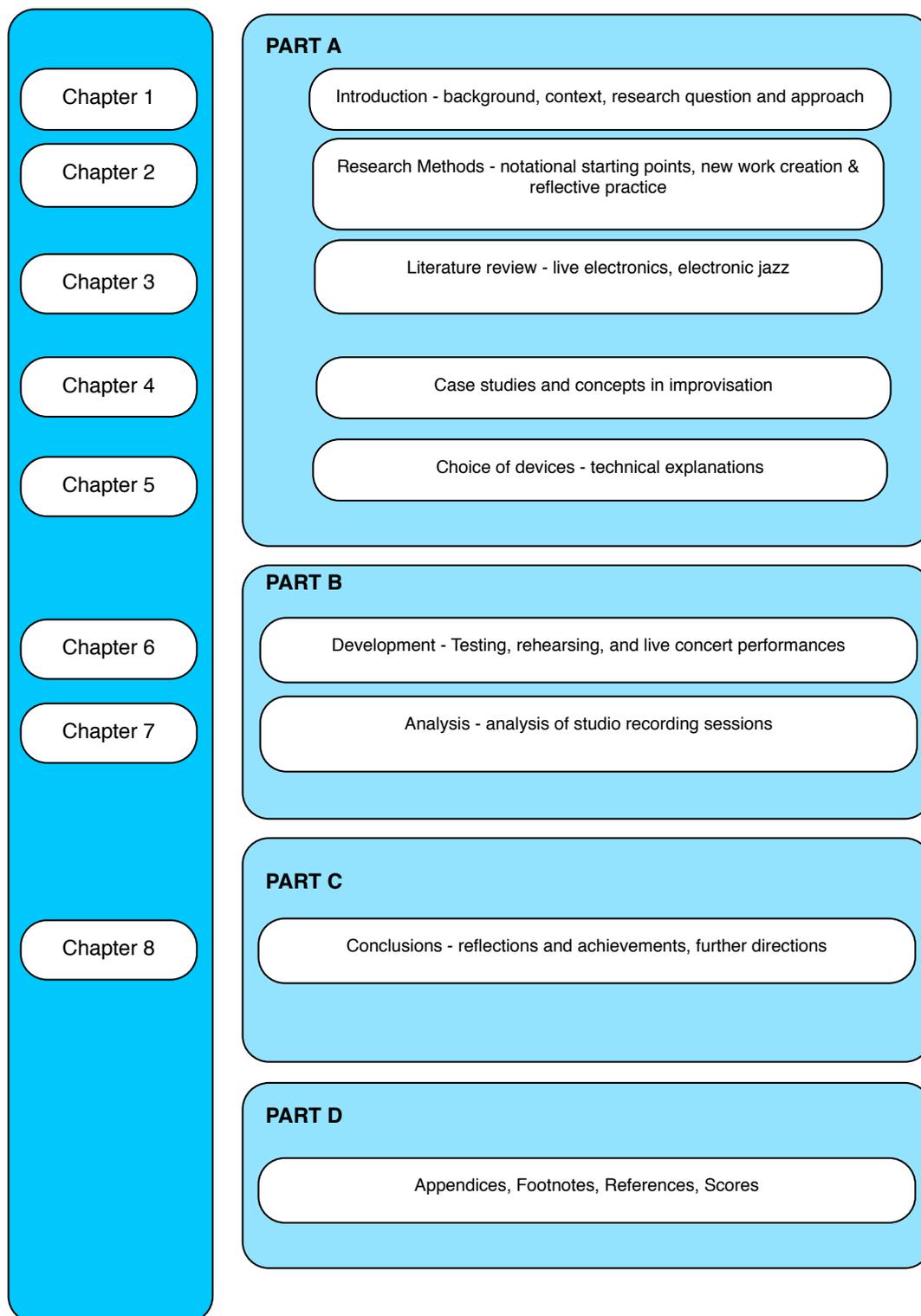


Figure 1: Structure of dissertation

1.4 Practice based research

I focus the design of this study around a practice-based research model, with this approach being highly useful for me in developing a greater understanding of my music creation process and how my ensembles develop, perform and record music together. In transitioning from a practitioner to a researcher, and situating my practice as research, I reflected on process, content, documentation and the artistic output. At the centre of the research is the work itself, and it needs to be experienced alongside the accompanying documentation to understand the insights gained within the creation and presentation of it. As Haseman and Mafe (2009) articulate though, it is important to remember that the creative work is only one part of the research, it needs to be co-joined with other critical findings for the research to become “truly emergent in its outcomes” (p. 220).

Robin Nelson (2013) presents a clear summary of likely inclusions in a Practice as Research submission, drawing attention to its design as a multi-modal form of research enquiry. Nelson suggests elements including:

1. A product with a durable record—audio/video
2. Documentation of process—photos/sketches/objects
3. Complementary writing—locating the practice within influences and a conceptual framework (p. 26).

This multi-modal approach is one that I take throughout this project, with each element of the multi-modal research forming a critical part of the complete understanding of the new insights and knowledge within this music. Nelson (2013) also asserts this statement, noting how in a multi-mode enquiry, “evidence may emerge beyond the practice itself”(p. 27) and that the insights are gained through the process of “making and doing” (p. 27). In my making and doing of music, improvisation is a critical component, and using my creative process to structure a research project, or creating a practice based musical research project, seemed like an obvious pathway. For me, creative music making always involves the production of something new. Margaret Boden (2015) defines creativity as “the ability to come up with ideas or artefacts that are new, surprising, and valuable” (as cited in Young, 2015, p. 151). It is my intention that both my music and research will create ideas and objects—music—that is new, surprising, and valuable. Boden also refers to the conceptual space, a system that underlies that domain and defines a certain “range of possibilities” (p. 151).

Boden notes that these conceptual spaces are cultural, not individual. My artistic

practice and research aims to create music with other musicians that extends their process and sound as improvisers. I hope that this process of development, skills acquisition and creation of new music will be valuable for the musicians in this project and have a wider impact on the groups in a broader sense, filtering out into the musical community that we engage with. The broadening of my skill, and theirs, results in continued new output for all artists and creates fresh experiences for audiences and valued music in the community.

To structure my practice based research, I have drawn on Boden's types of creative activity:

1. Combinatorial;
2. Exploratory;
3. Transformational (as cited in Young, 2015, p.151).

Boden suggests that musicians often work in a domain of exploratory creativity, working to illuminate some aspect of the space that was not previously apparent, or driving ideas to the limit of the space (as cited in Young, p. 152). Throughout this project I have been seeking a greater understanding of my artistic process, how it connects to the research sphere and what ongoing actions, or ways of awareness I engage in to create my work. This process has informed the final data collection and analysis phase of the project. Gray & Malins (2016) present some practice led research methods, and note how the methods need to utilise a practitioner-researcher who has a multifaceted role, moving between sometimes generating research material, sometimes self-observing, sometimes observing others, and being a facilitator of a collaborative project (p. 71).

Gray and Malins (2016) further specify that characteristics of artistic methodology involves the use of a multi-method technique and are ideally tailored to the individual project. The "methodology should be responsive, driven by the requirements of practice and the creative dynamic of the art/design work" (p. 71). It is essentially qualitative, naturalistic, reflective; acknowledging the actual experience and the complexity that comes with it. Mistakes are included, and importantly, the use of multimedia creates rich information from the experiential data.

In reflecting on these concepts of a creative practitioner using a combination of musical approaches, I found it useful to lay out the tools that will be used. Figure two visualises my thinking of my conceptual space and creativity.

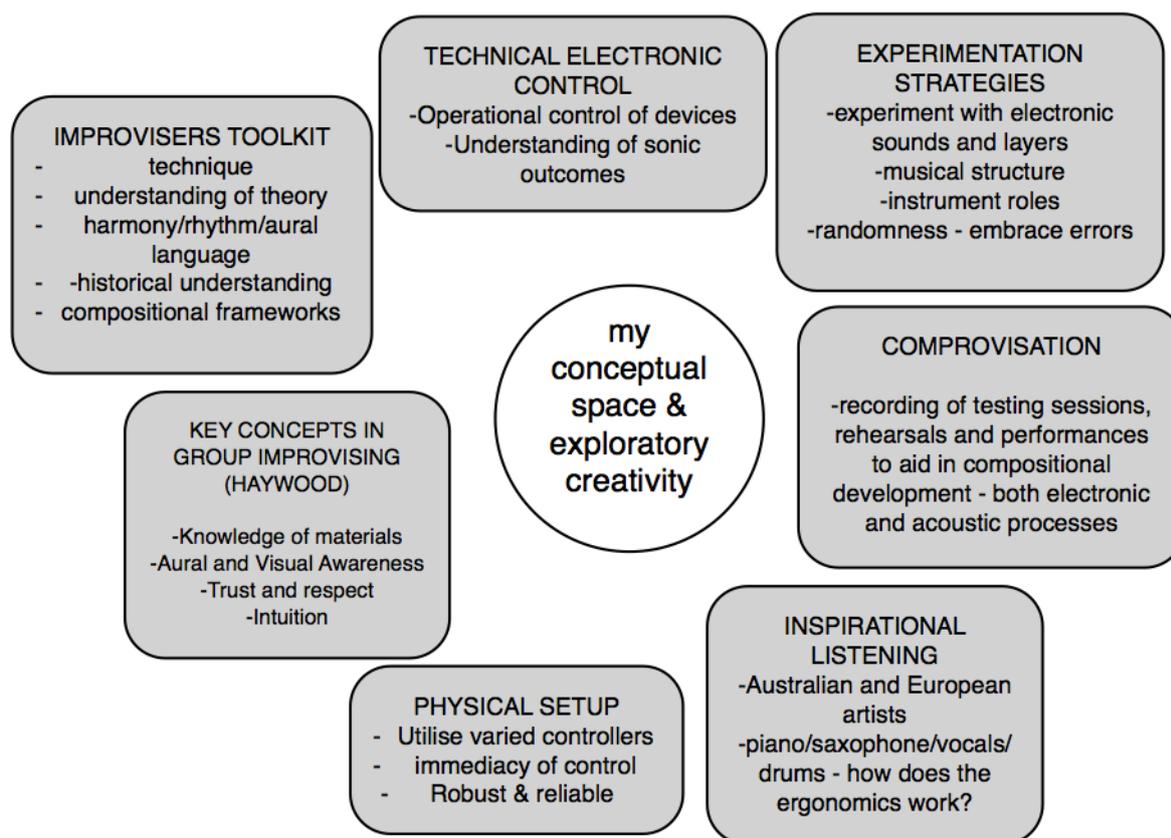


Figure 2: Conceptual space & exploratory creativity

1.5 The impact of technology on the Creative process

As technical capabilities change, more possibilities are created for composers and performers alike. It is the task of artists to create aesthetically valid and artistically meaningful environments, compositions and performances using these ever-changing tools - Brian Belet (2003).

This project uses technology as a core part of the creative artistic process and the outcome of the musical work. However, it is not a research project designed to find new or experimental technological outcomes, programs, processes or possibilities. I have designed the research to explore how improvising musicians can use existing electronic devices in a way that the technology can connect with the musical process, the composition, the improvisation and the performance. I am an improviser, a composer, a performer, and not a technologist. As Pauline Oliveros (2004) notes, there is a level of frustration in performing where you are required to control multiple performance parameters requiring the use of hands and feet. But often, the hands and feet are busy! Oliveros' answer is interactive software, one

part of her extensive career in electronic music. However for this project I looked to develop individual and ensemble techniques, to create new creative processes using existing commercially available music technologies. For my work as a creative practitioner, I want the technology to be a creative tool, one that can enhance my ideas, and allow new performance methods for these musicians to come into existence. The technology need not be new, or ground-breaking, but implementing it as part of our improvised process facilitates new musical outcomes. These outcomes enable many of the traits typically codified within the jazz cannon to remain, but with the inclusion of varied sounds from the acoustic instruments, changed through technology and a transformed ensemble performance process.

Even though this research does not focus on finding or using experimental or new technology, the choice of technology is core to the success of the research, and in Chapter Five I outline the technology chosen and the reasoning behind these choices. Technology is constantly changing though, and the choice of technologies in this research is guided by the desired musical outcomes for each musician, their ideal operational skill level and the musical context of each work. I purchased the electronic devices throughout the project and there was also a budgetary constraint. The performers could not have anything they wanted, or test a vast array of effect pedals, hardware devices and software programs. The time and cost involved in doing that would be extensive. For this research, in conjunction with the participant musicians I have chosen a selection of readily available commercial devices that are designed for stage use, with control surfaces that facilitate real time control of musical parameters.

1.6 Chapter Conclusion

Important to the scope of this practice-based research is that I am both the composer and performer in this project. This gives me a unique perspective on the outcomes of composing, performing and recording the work, with the resulting analysis and evidence being rich and deep. My experience as a performer allows me to delve out of the performances which of the cues are unique and significant, and my artistic performance based understanding will give a crucial critical interpretive tool. (Cox, 2013, p. 15). To give greater context to my experience, the views of my collaborator musicians are also included throughout, as their musical development throughout this project forms a significant part of the resultant music.

CHAPTER TWO: RESEARCH METHODS

2.1 Overview

In this project, the methodology of the research and development of the material is multidimensional, where the process, the work itself, the interaction with the participants and the re-application of knowledge throughout the study, combine to create a musical outcome containing new knowledge. Tremblay (2012) offers some valid insight into the nature of this kind of practice-based research, noting that the actual value of the project is only assessable through the main outcome. “If the music is not relevant to its community, and does not give by itself new proposals, original questions, clear hypothesis, and innovative answers, then it is of little use” (Tremblay, 2012, p. 2). I agree with his comments, as in my project the resulting music must engage with new creative ideas and processes, give innovative musical solutions to the musical stimuli, while remaining relevant and engaging to contemporary improvised music of today and to the participant musicians. It is my aim that other artists could use this research as inspiration for their own music, through varied ensembles and performance situations.

The creative work that sits at the centre of this project is driven by artistic research where the methodology is multimodal, responsive and highly dynamic, similar to the nature of the work itself. The process of doing, creating, and reworking concepts is analysed through a framework that utilises Nelson’s (2006) elements including critical reflections, conceptual frameworks, practitioner knowledge and the dynamic variations of the reflective practice and participant observations. I collected data in this project through a variety of means including reflective practice, interviews, draft materials, audio and video recordings, images, final scores, performance analyses, and theoretical research.

Ethical clearance has been gained (Ref #2016/853) and all materials including video, audio, interviews and still images have been used with permission. To answer the research questions the following process has been adopted:

- | |
|---------------------------------------------------------------------------------------------------------------------------------|
| 1. Conduct literature review and present case studies of selected relevant artists improvising with technology in jazz contexts |
| 2. Outline electronic devices selected and reasoning for selection. |
| 3. Create new music in varied structures for performance by two different jazz trio |

ensembles.
4. Test electronic devices with musicians and rehearse new music combining acoustic improvising and improvising with technology for two jazz trio ensembles.
5. Perform new work at a series of public performances—record and reflect on these activities.
6. Undertake recording session of a selection of musical works.
7. Interview participant musician after recording using specific analysis method.
8. Create musical and performer analysis of selected recorded works.

Table 1: Research process

The creation of this body of new work, and the media rich documentation of it forms the vital thread throughout this research project. Darla Crispin presents Coessen’s model for artistic research where the act of creation is the true subject of the research (Crispin, 2013, p. 50). Coessen’s model integrates multiple dimensions of understanding, with each dimension variably present in the creative process, but constantly reworked through performances, education, and explorations (p. 50). The engagement with these ideas allows the work to develop, and in my research the performers draw on their existing tacit dimensions allowing them to develop throughout the project. The musicians in this project have high levels of existing artistic skills and knowledge, and significant awareness of improvised music cultural practices. For more background on the individuals and music of the groups, please refer to the biographies in Appendix seven. This research enable the musicians to take these developed understandings and broaden them to include new artistic methods and abilities.

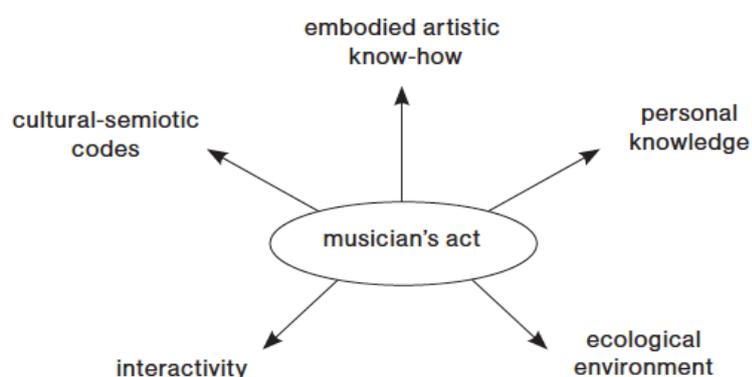


Figure 3: Tacit dimension of musician’s acts (Crispin, 2013, p. 50).

In structuring this creative activity into an artistic practice as research, the process is

non-linear. Multiple layers become apparent and the stream between thinking, creating, reflecting, becomes multifaceted. It all happens concurrently and although the process from testing to rehearsing then performing and finally recording is evident, this process often converges on itself, where each part of the process can occur in multiple occasions, with new learnings for the musicians and I gained from each experience. To assist in framing the reflective process multiple landmarks have been utilised, including a series of documented performances with selected performances analysed. Subsequently, the same musical works were recorded in a studio recording session and reflected on in greater detail. This strategy was designed to demonstrate the musical development of the work across these situations, with the studio recordings forming the focus of the reflective writing.

Moving through the process of exploring the musical material and refining this into a framework of analysis is challenging. Richard Vella (2004) refers to a concept of artistic practice as research operating on two layers:

1. Exploration—working with the material, the technology, the technique. Events can be unexplainable, contradictory. “Knowing is created by experience, sensation, awareness of technical limitations” (p. 3).
2. Systemisation—“the formalisation and representation of layer one into a system of signs, symbols, gesture, words, sounds, numbers” (p. 6). The work takes on a meaningfulness. Once layer two has emerged, themes and ideas are possible to identify, the work can be understood within a broader context and it can provide pathways for future directions.

It is important to give layer two the freedom to emerge with the musicians working in these ensembles. There is a clear relationship between the final reporting and analysis of the work and the work itself; but the existence of layer two need not dictate how layer one unfolds (Vella, 2004, p. 6). Throughout this project the musical creation, performance and recording was approached in a naturalistic way. This involves the ensembles creating and sharing music just as we would in any other artistic project—rehearsing, performing and recording. I designed the resultant systemisation of the musical analysis and performance reflections to give an detailed documentation of the work and the performers relationship to it over this period. The resultant music is non edited, with all recordings created live, utilising no postproduction elements. Performer reflections were completed soon after performances and recordings to enable musicians to accurately reflect, and not rely purely on the recording for stimulus. Layer two allows for an insight into the experience and the knowing explored by the musicians in layer one.

The reflective practice that I refer to later in this chapter explains how I express the ideas, process, experiences and content of the work developed during this project. The challenge here is communicating ideas about music while including the presence of the music in a linked, detailed and clear way. Words and images provide some perspective and content, but never can annotate the music perfectly. My analysis and reflective practice is multimodal and uses several forms of media to facilitate an increased opportunity to engage with the work. The process is dynamic, and involves reflection both on and in action, but also for action, see Figure 4 below. Carole Gray and Julian Malins (2004) refer to John Cowan's model that includes reflection for action, clearly showing how these methods refer to time. For my project, this continual reflection method and connection to future action has been useful. These various reflective timestamps connect with stages in this research, allowing the musicians to utilise their experience throughout the project to create a detailed and musically relevant final outcome.

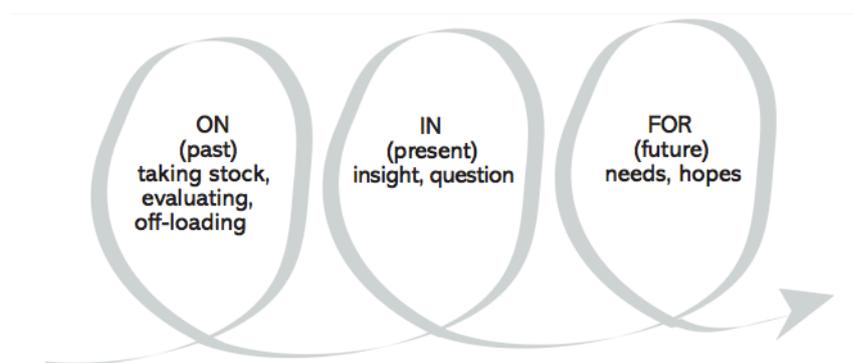


Figure 4: Gray C. and Malins J. (2004) Reflection for action—adapted from Cowan

The study is auto-ethnographic in its approach as I am a critical participant in the music creation. My personal experiences throughout the project steered the direction of the musical content—the music created has been conceived, composed and directed by me. In my design of this research I am focusing on my personal views and experiences, as the composer and performer, but also including the reflections of the other musicians, as they are critical co-creators throughout the project. As with much of the professional work I create, the response of the audience in performances, the influence of teachers, mentors and other musicians over this time, and the attitudes to these kinds of performances have helped shape the work created in the research (Boutard, 2016). The repeated performances throughout this project were strategically planned over time, utilising various venues across multiple cities.

2.2 Flexible design

In order to effectively deliver the practicalities of the research, this project is based around a flexible design approach. I have chosen this because the project contains elements including—researcher as participant, participant observation and multiple qualitative data collection techniques (Creswell in Robson, 2011, p. 132).

1. Researcher as participant:

I am a key creative part of the research, providing the musical content for the musicians and directing the groups in performance and recording scenarios. I am completing the musical analysis of the final recordings, and a personal analysis of my performance on those recordings. Drawing connections between practitioner knowledge, critical reflections and conceptual frameworks is also the way Nelson (2006) constructs a triangular model, with each of these element having mutual influence on the resulting research and with the work at the centre of the interactions.

2. Participant Observation:

The participants in this research are engaged with me on a professional basis outside this research project, and completing rehearsals, performances and recordings constitutes regular types of events for both of the groups participating in the project. By participating in the musical creation as a participant musician I have been able to observe the creation and transmission of the music in multiple scenarios, with a close observation of the musicians in action. In addition to this, the participant musicians engaged in a performance analysis of their final recordings, which was compared against mine, and each other's. This created triangulation to this analysis. Each performer analysis stream of their final recordings was completed individually, with the analysis streams compared for selected works to ascertain a sense of convergent validation (Fielding, 2012).

3. Multiple qualitative data collection techniques:

The resulting data collected in this research is presented as live video recordings of the recording sessions, a qualitative analysis of the recording sessions and a matching performer decision stream analysis of these works. These multiple data points when complemented by the literature review and documentation of technical development create a rich display of data within this research.

This research follows a clear multi-modal framework. In order to further break down the process of how I worked through the process of product, documentation of process and

complementary writing, I have referred to Nelson’s (2013) summary of the praxis of research activities. The table below aligns his concepts of praxis (p. 29) with my research.

Nelson’s Practitioner-Research Praxis	Alignment with my research
Specify a research inquiry at the outset.	How improvising with technology and acoustic improvisation combine in performance and recording contexts for jazz trio
Set a timeline for the overall project including the various activities involved in a multi-mode inquiry.	Series of testing sessions, rehearsals, performances culminating with recording sessions
Build moments of critical reflection into the timeline,	Ongoing self-analysis of work created – performances and recording sessions
In documenting a process capture moments of insight.	Audiovisual recordings of rehearsal and performances reviewed by musicians
Locate your praxis in a lineage of similar practices.	Literature review and case studies highlight artists utilising similar creative practice concepts
Relate the specific inquiry to broader contemporary debate	Resulting work documented in rich multi-media for other contemporary artists to use as a resource and situate itself as connection between modern jazz acoustic improvisation and improvising with technology.

Table 2: Practitioner-Research praxis alignment

Nelson’s praxis is useful in clarifying how and why the project situates itself in a Practice as Research ontology. To further explain my process, the table below separates the research activities into his process breakdown.

Activity	Product with record / Documentation of process / complementary writing
1. Explore case studies of selected relevant artists improvising with technology in jazz contexts	Complementary writing
2. Test a range of electronics assessing viability for use in improvised trio ensemble	Documentation of process
3. Produce new music in written format for performance	Product with record
4. Rehearse new work with musicians that utilizes improvisation with technology	Documentation of process
5. Perform new work at a series of performances—with audiovisual recordings of performances	Product with record
6. Undertake recording session of works from performances— using multiple cameras, resulting in high quality audio-visual recording	Product with record
7. Interview participant musician using specific analysis method to create decision stream analysis alongside self-analysis of the recorded works	Complementary writings

Table 3: Research activity breakdown

2.2.1 Creation of new work

This phase of the project utilised aspects of action research, where the purpose is the improvement and a deeper understanding of my practice (Robson, 2011, p. 188). I set constraints on the work to be created before the composition process begun. These boundaries ensured that the outcomes are viable, achievable, and relevant to the ensembles performing the music. These constraints also helped give clear scope to the creative project and helped me define what elements I needed to engage with technologically.

The boundaries:

1. In the works performed every sound is to be created originally by the acoustic instruments, live at the moment of performance. No pre-recorded samples or extra musical samples will be used;
2. All performers are to improvise with technology in their music performance during each work;
3. There would be a set number of works created that would be performed repeatedly live, before being recorded in the studio.

I started thinking about how I should write music for these new augmented trios. Young (2015) recounts how Boulez suggests that a personal compositional language is defined through two types of behaviour—empirical and theoretical. Empirically through practice, the experience of writing and experimentation; and theoretically through speculation of concepts and analytical observation of materials and concepts (Young in Doğantan-Dack, 2015, p. 153). This concept resonates with me, for as both a composer and improviser I am often blending approaches of experimentation and practice alongside theoretical concepts and observing how things work. Young further clarifies Boulez’s thinking by stating that the composer “faces or at least seeks, a truth, a way of conceptualising the potentialities of sound, which will both facilitate and legitimise a method for working through artistic problems” (2015, p. 153). This is the challenge in my project—using an effective process as a composer and improviser in a way that allows the musicians to embrace the potentialities of their sound, and the sound of the group.

Another way to understand the artistic process is to think of it as a way of awareness. For all the empirical and theoretical concepts to be put into practice there needs to be an awareness of how the elements combine, an awareness of the decisions being made in the work's creation, both at the original conception time and in the moment of performance. The more I create, the more I get a sense of what my process is of understanding aesthetic and my relationship to the music. Donald S. Blumenfeld-Jones articulates some interesting thoughts on the phenomenology of the artistic process and how it connects to arts-based research. The ways of awareness he outlines are open and ongoing processes, not independent of each other, non-linear in their sequence. (2015, p. 326).

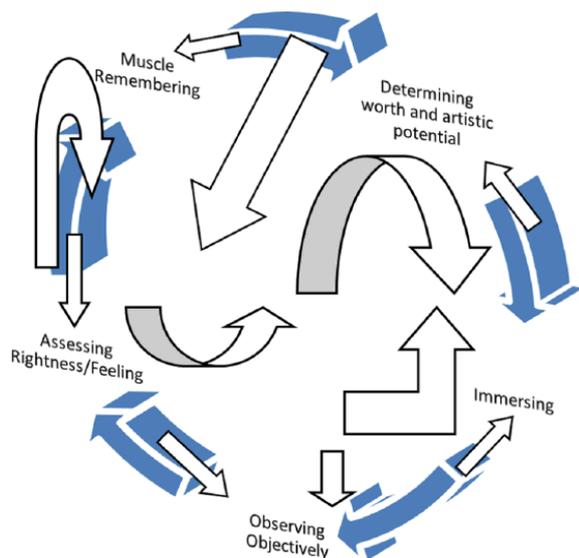


Figure 5: graphic representation of the recursive, reiterative character of this phenomenology (Blumenfeld-Jones, p. 326).

Although Blumenfeld-Jones is referring to dancing/choreography in this diagram, this articulation of artistic awareness in process can be adapted to my musical creation with the non-linear process moving through observing, assessing and immersing a key part of improvised music performances. Blumenfeld-Jones takes this graphic representation and expands upon how these elements occur, through immediacy and retrospection. Again, it is important to remember that the dichotomy of these is not linear, but a constant move between them as the work engages with varying aspects of awareness (p. 331).

Table 1. The Various Ways of Awareness Underlying a Feeling Way of Awareness.

Feeling grounded in: Immediacy (inside)	Feeling grounded in: Retrospection (outside)
<p>Determining (bracketing out what you think you know)</p> <ul style="list-style-type: none"> • <i>Worth</i> (what is of interest here?) • <i>Witnessing</i> (what is going on vs. what I think is going on?) • <i>Artistic</i> (what is of artistic interest to me here?) <ul style="list-style-type: none"> ○ Pleasingness ○ opening up possibilities ○ fruitfulness • Seeking what is “of essence” in the scene (What moment or action or images offered seem to “capture” the scene?) • Releasing from the scene leads to 	<p>Objectively observing</p> <ul style="list-style-type: none"> • <i>Stand at a distance</i> to assess whether or not the unfolding art is connected to what I am seeking to know/understand/ be. • <i>Stop and ask what I have done</i> and if what I have done is fitting the essences I have identified. • <i>Essence</i> is bodily/emotional/sensory intuitions of the “situation” that is the prompt for the work.
<p>Immersing (bracketing out the scene in question, focused on the making of the art)</p> <p><i>Immersion as an artist</i></p> <ul style="list-style-type: none"> • Seeing the “scene” for its art potentials, regardless of the content of the scene 	<p>Muscle remembering</p> <p><i>Remembering in my body</i></p> <ul style="list-style-type: none"> • <i>Motion</i> that is emerging, • Organization of the <i>emotion</i> that is emerging, and • Sense of the “art” I am making, the feeling states connected with the “thing” about which the art is being made. <p>Assessing rightness</p> <ul style="list-style-type: none"> • <i>Intuitive assessment</i>—Is what I want it to do steeped in the originating <i>flavor/feeling/state</i>? • <i>Choreographic/artistic assessment</i>—Is this dance “adding up” to something that resonates with my aesthetic sensibilities and understanding?

Figure 6: The Various Ways of Awareness Underlying a Feeling Way of Awareness (Blumenfeld-Jones, p. 331).

In implementing these concepts for the musicians in my research, we could align these ways of awareness within a musical performance framework. Musicians are constantly working on both immediate and retrospective observations of practice, and in re-creating Blumenfeld-Jones' table with my work I can see the balance between immediacy and retrospection. In performing music with elements of improvisation as is created in this project, the immediacy of awareness is critical. Bailey (1992) and Haywood (2014) remind us of this state of awareness in jazz musicians, but also MacDonald and Wilson (2016) and Borgo (2011) connect with the importance of outside reflection, of assessment and choice, of negotiation of sound, and physical understanding.

2.2.2 Composition and improvisation

Through crafting the music for of this project I have been acutely aware of the fine balance between composition and improvisation, and the ensemble direction that is needed in utilising new performance tools for performers. The success of the project will stem in part from using and extending the participants established performance skills. Stylistically, the improvisation will be drawn from both the cultural and historical context of the players, but also from their analysis of this new information.

John Young refers to Simon Emmerson's action research model for composition using electroacoustic sounds where he situates composition as a process with an action repertoire built up "within the creative process as the result of experientially validated actions" (Young in Crispin, 2015, p. 158). In Emmerson's process the actions that are successful are retained, the ones that are not, are rejected. In this approach, the composer is attempting to find a set of sounds that connect and make sense together. The criteria for selection are personal, and in my case, they would come into effect from my perspective as composer, but also from the perspective of the improvising musicians. The initial concept and process for a musical creation is abstract. As a composer, I am often drawing ideas for new work from varying perspectives. New work may manifest itself from a technical perspective, that being the composition is written so it can articulate a technical concept—from a specific instrumental perspective or general musical elemental consideration. Other compositional starting points may be a mood, melodic idea, title, rhythmic figure or with some works in this project, an electronic sound.

By using various frameworks for improvisation and composition, the ensembles create a wide range of music that facilitates the collaborative interactivity and blend between

acoustic improvising and improvising with technology. The musicians construct and deconstruct musical materials, relate to each other imaginatively and use their style and technique to create music specific to these groups and this moment in time.

I base these creative methods in part on a process that Dylan Van Der Schyff calls “Modular Composition” (2019). Van Der Schyff’s process is inspired by the improvising work of groups such as the Art Ensemble of Chicago, where the works “that emerge from such environments reflect these processes of improvising culture and identity—they are largely determined by the unique improvising abilities of the individuals who constitute and perform them”, (p. 336), and the work of the downtown scene in New York City during the 1980s. Musicians such as John Zorn would use game pieces involving a series of prompts that create a framework for improvising. Van Der Schyff’s Modular Composition involves

getting participants to research and bring to the ensemble (among other things) forms, melodies, chord structures, rhythms, field recordings, new and old technologies, other media, sound making and new instrumental techniques, and concepts derived from their listening and reading. The material is then developed and given forms by the ensemble through an improvisational, exploratory process where it is integrated, juxtaposed and adapted in various ways (bricolage). This can result in fixed forms, where the musicians eventually improvise within and against an overarching form that they have developed collectively; or it can involve a mobile form, where the various materials and ideas are cued and structured by the ensemble members in real time and in accordance with the flow of the music (2019, p. 336).

This is a fascinating music development strategy, and while I am not following this process completely, I have drawn some elements from it including:

1. Bringing things to the ensemble—sketches I create, ideas from the testing sessions, new sounds from listening to the work of others
2. The improvisational and exploratory process with the material to create fixed or mobile forms

From embedding these elements in my process I created a range of compositional types of work to be performed and recorded by the ensembles. These works are structured in the following manner:

1. New work with composed musical concepts developed through an exploratory process (fixed form).
2. New work with composed musical concepts developed through an exploratory process (mobile form).
3. New work that is purely improvised—with direction and non-direction of musical elements.

I have devised the music using these three categories to enable the musicians the opportunity to interact with technology through three varied musical stimuli. By creating music from these varied starting points the musicians have three opportunities to engage their acoustic improvising and technology based improvising and can use the musical stimuli in distinct ways. These compositional frameworks also mirror the style of music often performed by these groups, so closely follow the naturalistic design of how each group operates. These works include significant amounts of improvising as a core part of the musical content, and thus the works themselves are fluid in the performance of the content. I am taking an approach that also mirrors the research of Sarah Nicolls (2011), where she notes the importance of allowing the pieces to grow out of the technology. The technology chosen will be used by the musicians in multiple performances and then in the studio recording session, facilitating the performers ability to gather specific performance techniques with the selected devices across the works in the repertoire.

2.3 Notation

In this research both groups are professional working ensembles, with an extensive history of performing together. All the musicians are comfortable working in scored environments, semi-improvised works, or completely improvised pieces. As a creator, often when I bring music to both groups there is a scored element which may include a basic lead sheet. A lead sheet is an abbreviated notation style where only the essential information is presented. This would commonly include elements such as the time and key signature, main melody, rhythms, chord progression and form of the work. They are efficient, as they do not overwhelm the player with information, giving them scope to interpret, but enabling everyone in the band to be aware of critical musical details (Feist, N. D). Brevity is the key here, the

melody and harmony will remain, but otherwise, there is scope for a personal approach to performing the work.

However, if an additional layer of improvisation and sound creation is added—the improvised technology—this becomes an additional consideration for performers. Traditionally, jazz improvisers have been well schooled in improvising techniques such as playing over chord changes, but not in how to improvise with, and create improvisation as a group with these additional elements. Performing with technology requires a degree of flexibility. While improvising musicians are highly flexible in their ability to modify sound, style and performance attitude, flexibly in interacting with technology is another thing entirely (McNutt, 2003, p. 297). In contemporary classical music, the score is of central importance to bridge the gap between composer and performer. For electroacoustic music though, a score becomes more of a barrier, as McNutt elaborates;

performers need to have a reasonable idea of what sounds they will hear and how to work with them, yet explanations of the technology involved seldom accomplish this goal. Scores of electronic music are often vague about the sounds and relationships they represent, or else explain them in terms most useful to engineers. Composers' comments and explanations in rehearsal are often similarly opaque to performers (2003, p. 298).

Nicolls (2011) comments on the lack of this information in experimental music styles, noting that an improvement of notational practices would facilitate greater sharing of the music. Successful notational practices, according to Nicolls, fall into either entirely notated, or a mixture of words and music.

2.3.1 Moving away from the lead sheet

Cat Hope's paper 'Wording New Paths: Text-Based Notation in New Solo Percussion Works' by Natasha Anderson, Erik Griswold, and Vanessa Tomlinson (2017) gives a useful perspective on using text based notation in contemporary works that utilise electronic parts and percussion. When reflecting on the music created for my ensembles I find that the work created for these groups often straddles styles and sounds located between jazz and

contemporary art music worlds, so thus the concepts raised here are useful. The blend between clear musical elements such as rhythm, pitch and harmony is easily defined in traditional notation, but as Hope (2017) notes, “other elements such as descriptions of texture, timbre, or electronic sounds may not be served particularly well by traditional, common practice music notations. Compositions that feature some or all of these traits are often best represented by other types of notation, which can include graphic and text scores” (p. 37).

Hope (2017) also highlights the excellent text ‘Sound and score essays on sound, score and notation’ and refers to the chapter by Virginia Anderson. Anderson’s writing on graphic and text notation outlines some clear analytical approaches to this kind of notation, which for composers gives a powerful starting point for conceptualising work for performing musicians. Anderson (2013) specifies approaches including:

1. Physical Properties
 - A) Type of Score?—written, graphic, text, common notation, or combination
 - B) How is it read?—Syntactically, pictorially, metaphorically
2. How the idea is transmitted from composer to performer to listener
 - A) Duty of each participant
 - B) What does each participant make up and take in?
3. Indeterminacy
 - A) What are the limits?
 - B) What is possible and impossible?

These three approaches are useful concepts to refer to when developing how I present the notated information for my works to the participant musicians

The field of notational options is large, and somewhat infinite in the variations that could be injected into each score, or groups of scores. Sandeep Bhagwati (2013) reminds us that musicians since the 1950s have engaged in a variety of attempts to re-introduce the unwritten and the unforeseen into Eurological music-making, thereby creating a “new type of hybrid music ecology: a dispersed, heterogeneous practice situated somewhere between the poles of improvisation and composition—or, better, orality/aurality on one side and musical literacy on the other” (p. 168). He reminds us that between notation and improvisation the terrain is slippery. Improvisation never completely ‘relinquishes repeatable structures, no composition (notated music) can be said to be completely contingency-free’ (p. 170).

I agree with Bhagwati when he also refers to *Comprovisation*, a term I introduced earlier in this thesis through the work of Michael Hannan. In this case, Bhagwati places musical practices on a continuum of notational perspectives, “between the extremes of “[fixed]

composition” and “[free] Improvisation” (p. 171). He defines Comprovisation as “musical creation predicated on an aesthetically relevant interlocking of context-independent and contingent performance elements” (p. 171). This definition is well rounded as it places an importance on the context of the participants involved, and the importance of the elements co-existing and relating.

Sarah Nicolls (2010) includes some information on her approach to scoring Live Electronics for the acoustic piano in her PhD thesis. The material she covers utilises a range of scoring techniques, combining graphic, text and traditional elements.

Mixing graphic and traditional notation, the timeline and emotively named structural parts (e.g. TURBULENCE, BLISS) enabled us to create fixed sections on the score that we then completed with the most useful but minimal pictorial or notational elements... Some motifs are written out precisely and exactly, but beyond this and with these, there is much improvised development. It is, however, notated precisely enough so that I am able to play it with the same motivic and harmonic material every time (p. 38).

2.3.2 My approach to notation

In thinking about the wide variety of notational styles from traditional notation to more abstract graphics and text, it is easy to be overwhelmed by the myriad of choices. For the music in this project I have kept in mind the musical outcomes of an improvised musical experience using acoustic instruments and technology—and have approached notation in a way that facilitated both of these improvisational parameters. Bhagwati (2013) clarifies that although the scope is wide, written music does fall into four broad types.

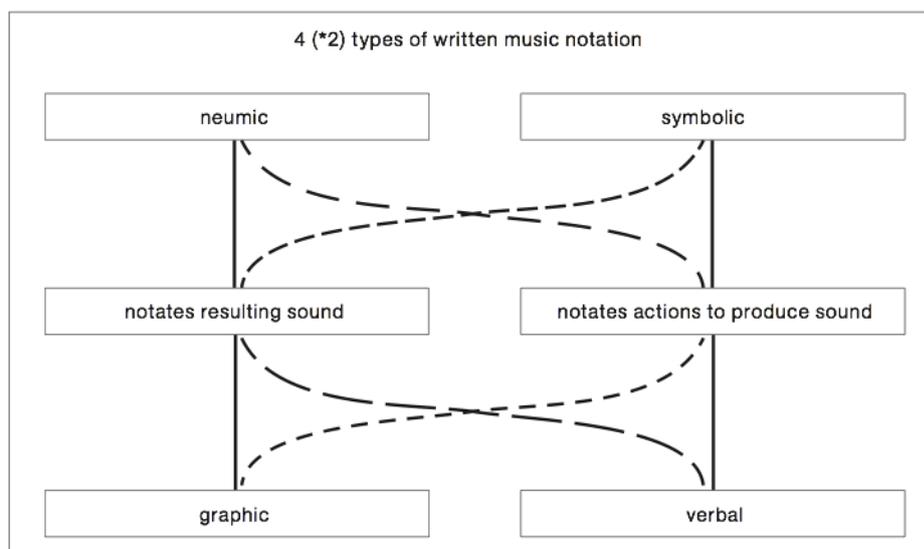


Figure 7: 4x2 Types of written music notation (Bhagwati, 2013, p. 172).

As Bhagwati's (2013) diagram indicates, the four styles of notations can be split into two delineations, categorised by the intention of a resulting sound or by the action used to produce the resulting sound. He highlights how in any musical situation, we could use any of these of types in parallel, with graphic, verbal, neumatic and symbolic notation systems interacting with each other in a score. What Bhagwati articulates, is that the composers choice of notational system is an important part of their compositional craft and deeply linked to the creative process (p. 173).

Thus it is important to consider what Bhagwati calls the *notational perspective*. The mix of notational styles chosen by the composer, is determined by the relationship of these styles, their functions, the level of freedom for the musicians performing the work and the impact on the overall aesthetic experience.

While conceptualising material for this project I came to realise that to create a suite of work that gave the performers the widest opportunity for creative music making the initial stimuli needed to be varied. The music became less about notating how and when performers would improvise with the technology, and instead was created to develop varied notational starting points for the performers to engage with composed and improvised material. Delivering a folder full of jazz style leads sheets with extra notational elements that communicated when to use technology, and instructing the ensemble to improvise—both acoustically and with technology—would not yield results that allowed significant performer freedom, and a fluid musical group experience. This would also be too radical a departure from the performers developed performance practice. On the other hand, performing a suite

of entirely improvised works would not allow the communication of specific musical content, removing the specificity of my compositional intention. Giving the performers aesthetic control I believe is an important part of how I design the notational system for the works. The music performance must consist of context-independent and contingent elements (Bhagwati, 2013, p. 176), and allow for multiple contexts to co-exist, but also notate in a way that communicates my intent clearly to the players.

The suite of music created for the musicians to work from in this project ranges from traditional jazz lead sheet notation, to more text and graphic works that move between instructional and allusive notational styles. Pedro Rebelo (2010) clarifies some categories for the roles and functions of notations in his paper 'Notating the Unpredictable', highlighting how the nature of notation changes in collaborative musical practices such as improvisation. Rebelo (2010) places notation into the categories to document, to communicate, and to reflect (p. 19).

In 'Notation as Production' Rebelo outlines how the notation invites engagement from the composers and performers, where "the score functions as a catalyst for musical collaboration, in which decision-making is distributed between composer, conductor and performer" (p. 20). This pathway is useful in creating graphic and text based scores that utilise both clear musical elements and other more abstract musical elements. Hope (2017) stresses that, "as composers continue to search for new sonic combinations, unpredictable rhythmic patterns that do not relate to metre or pulse, new ways of relating acoustic instrumental performance to electronics, and a stronger conceptual basis for musical works, they will seek out ways to notate them" (p. 46).

Overall, the notation used in this project utilises a variety of techniques, and is used to create works that emphasise a distinct style of music making that includes improvisation. I am using traditional notation, text notation and graphics to invite engagement from the performers and give them creative input into how they combine the technology with their acoustic music performance. There has been a deliberate decision to avoid specificity in how and when the musicians will engage which type of technological devices in their performance, instead these performance decisions are left to the performers. It is my intention that they wrap these decisions into their improvised decision making as part of their performance on their acoustic instrument. Notating directions for how and when to improvise with technology would reduce the performer input and reduce the true interaction between the acoustic improvising and improvising with technology in this music.

Types of work	Notation style
New work with composed musical concepts developed through an exploratory process (fixed form)	Lead Sheet
New work with composed musical concepts developed through an exploratory process (mobile form)	Graphic notation—symbols and text
New work that is purely improvised—with direction and non-direction of musical elements	No notated elements—some verbal direction and discussion

Table 4: Notational styles

2.4 Reflective practice

In thinking about the reflection and analysis of the music in this project I wanted to analyse my complete musical experience—from the initial selection of electronic devices, developmental testing, rehearsing and live performance through to the final studio recordings. I wanted to include some analyses created by the participant musicians and to clearly communicate this analysis to the wider musical community.

Overall, the work in this project can be viewed in two categories;

1. The development - Writings surrounding the case studies, literature review, technical setups, test recordings and live performance recordings.
2. Final works - Final studio audio/visual recordings of the music.

By referring to these two categories of musical development and analysis I intend to create a co-construction of meaning when relating to the works. The actual musical performance—in this case the final studio recordings— contain a significant amount of information, and the use of an audio/video recording for a performer to make a detailed analysis is highly beneficial. But importantly, the prior activities - the rehearsals, testing, and discussions with musicians provide an essential context to finding the motivations and intentions of the performers in the performed situation (Boutard, 2016, p. 362).

2.4.1 Development

The analysis is an ongoing and iterative process, utilising reflection on, in and for

action. This reflective practice uses information gathered throughout the project assisting in understanding the effectiveness of performer improvisation with acoustic instrumentation and technology, within the performances, testing and rehearsal sessions. This reflection in and for action is essential in forming a part of the development process for the works within this project.

1. Literature review and case studies

The review and cases studies presented gives context to my work in relation to other significant artists creating music using improvisation with acoustic instruments and technology. While I do not design this review to be a benchmark, it serves as a straightforward way to situate the quality of the work created in this project and give some stylistic comparisons to known artists practicing in the field.

2. Choice of technology

The technology selection process was an important part of the project development. Specific pieces of hardware and software were selected, with the writing in this section outlining how these pieces work and why they were chosen for each musician.

3. Testing sessions and rehearsals

Individual testing sessions with video documentation were completed with each musician. These individual sessions enabled the musicians to learn and test the electronic devices in and out of the context of the musical works for performance.

4. Live performances

I completed the live performances over a three-year time period, with the material in this project performed multiple times. I include some short performer reflections of selected performances, along with video documentation of the performances. The musicians viewed the video recordings of these performances as part of the ensemble development process, with the musicians reflecting on their performance for future performance strategies.

2.4.2 Final Works

The final works presented in this research were recorded as an audio-visual production and connected with a multi-part reflection and analysis drawing on musical analysis concepts and performer reflective writings. As Emerson and Landy (2016) note, “one does not normally analyse a piece of music from every conceivable angle; the analyst has specific intentions” (p. 11). My full analysis of the final works needs to take into account

the written elements, but also the performance of the works. Some of the works are purely improvised, or have mobile forms with some set composed elements.

The written analysis is useful—it allows me to clarify musical elements that are heard in the recordings and draw conclusions regarding how the performers are interpreting the notation information. But for a large part of the music created, there is no notation, so this notation based analysis is only one element of the complete understanding.

The intention in the presentation of these final works in written and audio-visual form is to connect an understanding of the musical concepts created, the pathway to how the performers created the resulting sounds, and the group performance style that connects improvising with technology with acoustic improvising. The presence of the audio-visual material, the reflective writing and performer analysis of the recordings is critical in producing a robust analysis that tackles this situation.

2.4.3 Audio Visual Analysis

In researching a method for presenting an analysis of the audio-visual material, I considered a several options. I wanted to create a visual analysis of the performance using a performance reflection by the musicians that included elements of musical concepts and ensemble interaction. I also wanted to communicate information about how the sounds were created, how the musicians interacted and how this related to the stimuli material (the notated music). The visual communication between the performers and the engagement with their instruments is only possible to examine through visual means, so any analysis that focuses on only the audio is unsuitable, any non-aural moments are lost. Electroacoustic music is difficult to analyse using traditional music analysis language and methods and as Michael Clarke (2013) notes in his research on Electroacoustic music analysis, the musical development involves aspects that cannot be notated traditionally. This understanding led me to engage with the video-based analysis of the final recordings that facilitates a more complete examination of the resultant music.

In the final audio-visual recordings of the studio session, each work has been recorded by multiple cameras, with a camera focused on each musician. The reasoning for this is to enable a visual connection to sound, and the ability for the viewer, listener and reader to use the video to understand how the performer is making the sound. Often the complexity of sound production using technology makes it difficult to determine where each sound is coming from. Thus, the video focused on each musician enables the musicians to deliver an

accurate self-reflection, and for the viewer to gather a clearer understanding of sonic source and the interaction between each musician and the ensemble sound.

The final audio-visual recordings are presented in a multi-frame video for each recorded work.

2.4.4 Graphic Representation of the final works

Pierre Couprie has been researching the analysis of electroacoustic music since 1998 and has developed a system to graphically represent the music. He asserts that graphic representation can not only be a useful pedagogical tool, but a valuable analytical tool for electroacoustic music where there is a lack of visual representation—a score. This is also paralleled in improvised music where there is the absence of a score, and in my work where improvising with acoustic sources and technology combine. Couprie’s analysis system, a program he developed called *E-Analysis*, combines graphic and/textural elements alongside a spectromorphological visualisation. Each object presented in the representational view—most commonly viewed as an XY graph, with the horizontal Y being time—represent certain sound criteria or structures. Their size, shape, colour, and positioning are all related to criteria within such as intensity, length, density. (Couprie, 2004, p. 109). This representation of the music is useful, the small variances and difficult kinds of sounds produced can be identified and aligned in relation to each other.

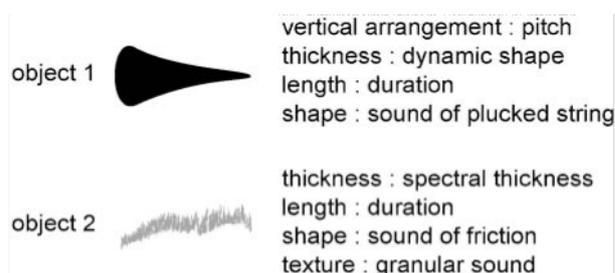


Figure 8: Example of Couprie’s visual-sound graphics (Couprie, 2004, p.111).

This kind of graphic analysis is thorough, but for the work in my project, it does not thoroughly account for what the musicians were thinking when they made their choices using acoustic improvisation and improvisation with technology during musical performance. Throughout this research it was important to understand the performance styles of each individual and each ensemble, and create an effective analysis for each musician’s part. I

needed a text and visual analysis that links to the performance video and audio.

In my initial analysis of works in progress I started categorising what was happening in the music and then adding some subtitles to the video recording so it would be possible to view and listen to the music with the text analysis on screen. This was satisfactory with low levels of analysis, but difficult when there are multiple events to analyse at the one time, and also it did not give enough fine detail in terms of timecode.

In light of the above, the work of Rodrigo Constanzo (n.d) has been exceedingly helpful. His research into improvisation analysis has led him to create a method of visual interactive representation which has been utilised in my analysis. Constanzo uses video-cued recall, enabling the analysis to focus not only on the audio but the physical, non-verbal and the auditory decisions surround the resultant music. During the video-cued recall, the video is played, paused, re-winded, replayed, writing down as much information is possible about decisions made during the performance of the music. These notes are time coded and from the information provided each entry is connected to a category. The writing needs to be honest, detailed and focus on the thinking rather than just the doing. Constanzo (n.d) defines categories including:

1. Material—Decisions dealing with manipulations of local sonic materials. These can come in the form of instrumental behaviors or general development and are open to context and interpretation.
2. Formal—Decisions dealing with form and transitions.
3. Interface—Decisions dealing with instrument, ergonomics, technology, and performance modalities.
4. Interaction—Decisions dealing with how materials interact, primarily with simultaneous materials (as opposed to Formal decisions), but not exclusively so.

This resultant written analysis Constanzo calls the decision stream. Importantly Constanzo (n.d) notes that the video-cued recall and formalising of the data into the decision stream needs to occur quickly after the performance—most ideally one or two days after the performance. After this time the representation of the memory can be distorted and the performer cannot really recall the thought process, but only infer it.

Constanzo's analysis focuses on an improvised solo performance, and for my research I have created a performer decision analysis stream for each performer with each piece of music. The benefit of this is the ability to then correlate patterns of thought across multiple pieces of music and across multiple performers for a single piece of music. From the resultant cross

referencing of the decision streams I can find personal and ensemble performance styles using improvisation with technology and acoustic instruments. The data can also be cross referenced across the two ensembles to compare ensemble performance styles with similar music content.

2.5 Summary - Methodological Relationships

The artistic methodology that has driven this research and the multimodal aspects of this can be visualised in Figure nine. The structure for this image was drawn from a similar concept developed by Australian drummer Grant Collins in his thesis, ‘Solo Drumset: Reverting the drum set as a solo instrument with expansion for the instrument, notation, physical expression and compositional works’ (2013). Collin’s research investigated extensions of solo drum kit performance and draws some parallels to this research in terms of expanding on the physical and stylistic capacities of the personal music through a multimedia research project. Even though the process is often non-linear, the model below outlines the connection between parts of this process and the intended outcome of new music that is drawn from specific elements of practice-based research. In the final part of this project the new work created can be seen from multiple perspectives—the studio recordings and live concert performances. Both of these are created through the existence of new extended instrumental technique in all the musician participants.

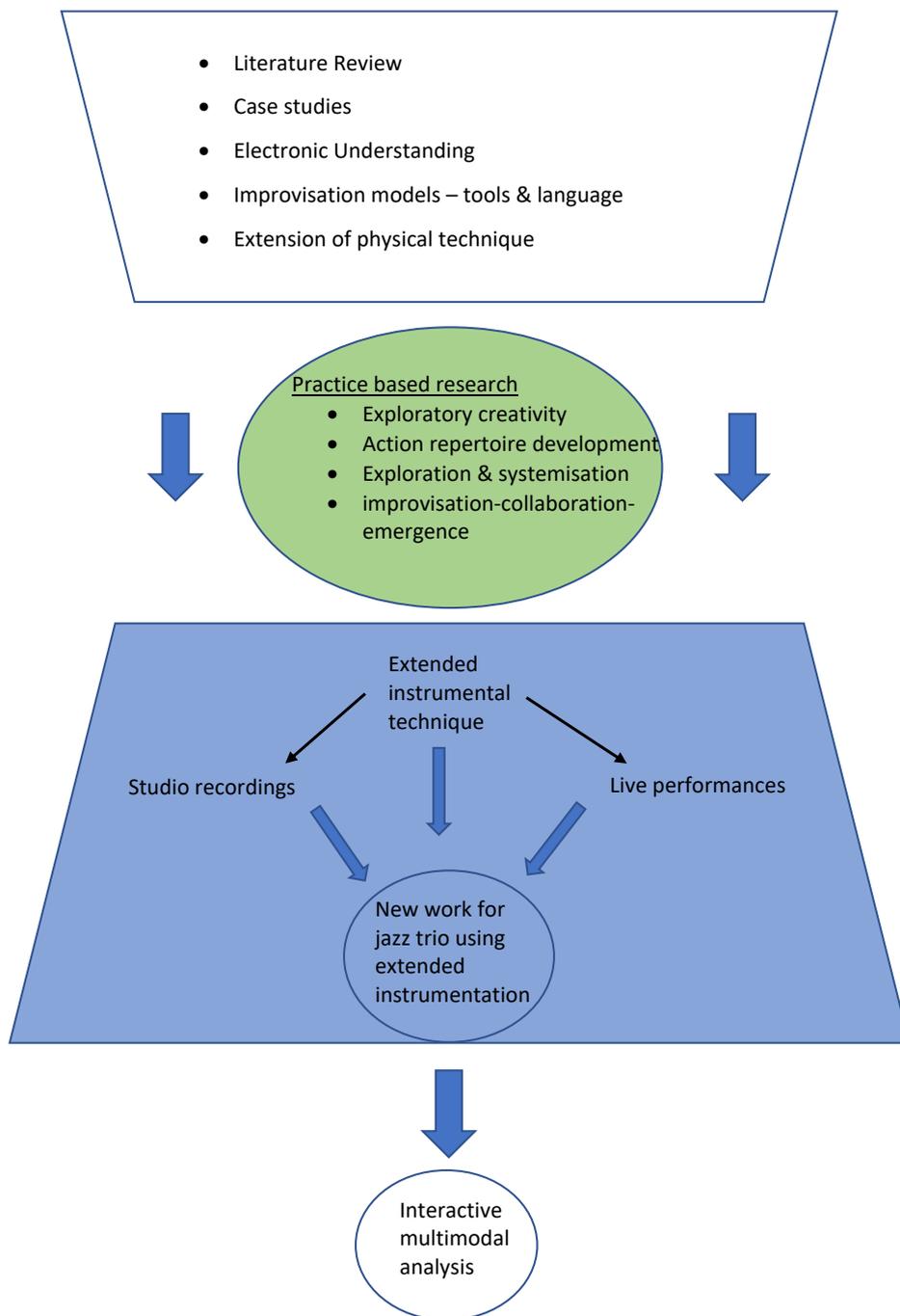


Figure 9: Methodological relationships

CHAPTER THREE: LITERATURE REVIEW

3.1 Introduction to the review

This literature review aims to give context to how I position my research when I refer to the concept of improvising with technology. The intention is to align my technology focused improvising around the definition of *Live Electronics*. Although the technological elements and musical outcome is different in this research to that of one using Live Electronics, there is a similarity in process and musical intention. This chapter also articulates how jazz and electronic music have intersected historically.

3.2 Live Electronics

Performing on acoustic instruments alongside electronic elements can take a variety of forms and there is a substantial amount of literature and works composed for instruments and fixed media. This may also be referred to as instruments and tape, where the fixed part is played via computer file, hardware sample player, compact disc player or similar.

Interactive Electronics refers to what Robert Rowe (1993) describes as a computer system that modifies their behaviour based on the varying input from musicians. Julienne Klein (2008) clarifies this further noting that *Interactive Electronics* refers to a kind of collaborative relationship with the computer, where “the computer’s ability to respond to performer input in an interactive system implies a level of intelligence on the part of the computer not present in Live Electronics or music for fixed medium” (Para 30).

Unfortunately, the terms live and interactive are used interchangeably in the literature, without a clear differentiation between them. Words such as real-time electronics, or interactive performance are often used to describe various kinds of computer-based electronic interaction in performance (Klein, 2008).

Live Electronics falls with the field of Electroacoustic Music and Simon Emmerson (2000) breaks this into:

1. Mixed Electroacoustic Music— instruments and tape
2. Live Electronics Music—using processing of sounds produced by a performer
3. Real-time computer music—performer and machine responses, also known as interactive performance.

Emmerson (2000) discusses the problematic merging of real-time and Live Electronics. The danger here is that real-time can refer to any kind of on-stage electroacoustic performance,

whereas Live Electronics involves transforming the performers acoustic sound, and maintains “the human performer firmly in the centre of focus—most usually performing an acoustic instrument (or voice) for modification” (p. 205).

Early Live Electronics involved composers such as Pierre Schaffer and Karlheinz Stockhausen manipulating electronic sounds during performance. Alongside this was the development of the electric guitar and the processing possibilities involved with it—reverberation, echo, delay, tremolo, phasing, flanging, and distortion. The first commercially produced single guitar effects unit, the Trem Trol 800 Tremelo, was released in 1948. Used by Bo Diddly in 1955 ‘it passed the guitar signal through a water-based electrolytic fluid to augment the original tone’ (Davies, 2018). Subsequently, the Gibson Maestro Fuzz-Tone, was released in 1962 with the distorted guitar tone created by the unit designed to ‘emulate the sound of different types of instruments, such as brass’ (mixdownmag, n.d). After Jimi Hendrix was introduced to the sound of Wah Pedal (first utilised by Del Casher in Frank Zappas band), the 1966 Dunlop Cry Baby Wah Pedal became a signature part of the funk and disco sound in the 1970s (mixdownmag, n.d). Continuing through the 1970s companies such as BOSS (a Roland subsidiary) and Electro-Harmonix began to release compact effect pedals. These devices gave new sonic control possibilities to players, enabling them to “recreate what had previously only been possible in the studio by manipulating tape” (mixdownmag, n.d).

Julienne Klein (2008) clarifies the process of Live Electronics by noting that “the poetics of Live Electronics reflect a desire to extend human musical capability by transforming the performer’s sound with technology” (para.30). In this research I am connecting with the concept of Live Electronics with live performers. Klein again identifies this as,

composition where the instrumental sounds and/or electronics are processed in real-time (the term real-time delineates the computational speed by which computers receive and process data; a real-time operating system responds to input immediately, with minimal latency, or delay in processing). Live electronics normally involve real-time control of signal processing parameters and/or changes in signal routing (para. 31).

In the context of improvising musicians, Live Electronics present an additional way

for improvising musicians to interact with musical parameters. Using them in creative and musical ways requires an understanding of multiple technical and musical elements. Sebastian Lexar in his thesis 'Live Electronics in Live Performance' (2012) states, "technology used in performance extends the listening experience by introducing new sounds or unheard combinations of sounds through an exploration of the sonic potential and characteristics of the employed devices" (p. 11).

However, this is a complex task. Lexar reminds us that combining electronic and acoustic sounds complicates the role of the performer in negotiating these varied sounds worlds. John Croft (2007) presents some paradigms of the how electronic sounds can interact in live performance, most specifically his *instrumental* paradigm, with the acoustic and electronic merging is used to "attempt to create a composite instrument" (p. 62). Croft stipulates that the performer should play the instrument-plus-electronics in a way somehow analogous to the way in which she would normally play the instrument alone (p.62).

Miranda and Wanderley in Lähdeoja et al. (2010) note how instrument augmentation is a process. Technology is used to expand the acoustic sound, but without jeopardising ergonomics, or expressive possibilities. Their research focuses on the electric guitar where the use of various hardware and software effect units have contributed to substantial history of instrument augmentation, where "the electric guitar's various sound shaping and amplification modules form a set of augmentations concatenated to the initial acoustic sound source" (p. 42).

Lähdeoja et al also raise the issue of control when discussing instrument augmentation. They highlight how the increase in sonic possibilities and control interfaces can complexify the instrument beyond the ability of the musician. The electric guitar often avoids this scenario by utilising clear augmented interfaces (the pedals), and effective ergonomic positioning (p.43).

There is a significant body of existing research into the use of Live Electronics in improvised music, with researchers such as Simon Emmerson, Tone Åse and David Borgo discussing the range of interaction between Live Electronics and performers. In this section of my literature review, I aim to draw out an understanding of the relationship between improvisation, Live Electronics and performers, and concepts of how the sound source can be adapted and transformed. This knowledge will be a critical step in defining my own artistic process and approach to incorporating improvisation with technology within the compositions and acoustic improvisations.

Derek Bailey's text *Improvisation* (1993) considers some valuable concepts and

includes a chapter titled 'The Music Improvisation Company'. This refers to a group involving Bailey on Guitar, Evan Parker–saxophones, Hugh Davies–Live Electronics and Jamie Muir–percussion. Bailey notes how the group was looking for sounds that were not associated with traditional instrumental improvisation, and the electronics served to “extend the music forwards and backwards” (p. 94). Bailey also quotes Evan Parker throughout the book, most notably where Parker comments on the value of free or open form improvisation against composed form improvisation. Ideal improvising scenarios are formed when players can improvise freely in relation to “the precise emotional, acoustic, psychological and other less tangible atmospheric conditions in effect at the time the music is being played” (Parker in Bailey, 1993, p. 81). The electro-acoustic composer/improviser John Wall notes the inclusion of surprise as a crucial part of his work, “because I can’t bring myself to spend countless hours learning how everything works... I’m often surprised by what happens, and I respond well to accidents” (Wall as cited in Borgo, 2011, p. 5). Evan Parker further elaborates on the notion of creativity and interaction between musicians and the electronics, noting that the “relationship between technological affordances and creative intentions can become even more involved in the context of a group performance ... there's a kind of uncertainty about whether that was the first time that sound happened, or, “did I miss it the first time and that's a replay of a sample of the first time?”(Parker as cited in Borgo, 2011, p. 6).

3.2.1 Language and Influence

British pianist, composer and educator Sarah Nicolls has been exploring the interaction of piano performance and Live Electronics since 2007. Improvisation has been a critical part of her experimentation, with improvisation often utilised as a compositional tool and method of discovery with technology. Similar to Norwegian pianist/composer Morten Qvenild, Nicolls uses a range of technology including the MIDI interface piano Bar, spacial sensors, looping patches in Max/MSP and DSP effects through Ableton Live. Her research space, The Piano Lab, has allowed her to engage in real-time, collaborative, evolutionary research, with the piano at the heart of the musical situations, and a variety of computer-based electronic stations around it (Nicolls, 2010). Nicolls explores questions of physicality, noting that when composing works with interactive setups, “to have the performer improvise with the technology means to unlock an inner physical language. To find both what is possible and natural and also what is unnatural, or outside of the natural body language: the spaces between pianism” (p. 48). The intention of this study is to create conditions where the

electronics are a critical part of the compositional, improvising and performance process. This process will require each musician to unlock their own new physical language, borne from their personal acoustic performance style, and engagement with their new electronic tools.

In my research, one of the focal points of the musical creation will be the ways in which the musicians alter their natural acoustic sound. As this is unfamiliar territory for many of the players in this research, drawing on a variety of musical influences will be integral to creating work that authentically bridges acoustic and electronic worlds. Norwegian vocalist Tone Åse (2012) brings together acoustic and electronic sounds through her research and music, noting the use of sound as the central piece of musical material. In relating to the work of colleagues in the Norwegian improvisational scene, she lists techniques for using sound including:

- Free jazz: improvising with open structures;
- Utilising influences from western Avant-Garde and experimental music;
- Influences from popular music (p. 38).

Further to this, Åse (2012) also gives a clear definition of the experience of electronic processing, noting how it can create *distance from* and *transformation of* the natural vocal sound (p. 70). This concept is a useful compositional and improvisational marker for the work in this project. How can I use technology to create transformations and distances from the original sounds of piano, percussion, saxophone, double bass and vocals?

Åse (2012) uses technology to expand or redefine the role of the vocalist in the ensemble, creating distance, or abstraction from the natural voice sound created. From these new sounds the voice is then able to interact in new ways with other instruments and also take on completely new roles within the musical interplay (p. 13). She reflects on the level of complexity with the electronics and how finding a level of intuitive operating skill is critical. Alongside this, surprises and experimentation are a natural part of improvised music. In her interactive experience with technology, Åse experiences “a basic preference for instrumental control and intuitive flexibility rather than technical complexity and unpredictability” (p. 66).

In my interview with her, she spoke about the importance of shifting and blending sound in controlled ways.

But if you think about what you need to practice, what skills, for me it has been the ability to do quick changes, you know like technically to be able to do quick changes and to work with controllable or partly controllable transformations you know; to be

able to if you started something; to be able to gradually change it or... You don't just turn on the effect, you know? Just work with ways of transforming and changing and varying whatever you find of that (Åse, personal communication January 26, 2017).

The subtlety of this music involves much more than just turning an effect on and off. Finding how to negotiate this in an improvised scenario is challenging, and involves not only the technical understanding of the device, but the skill to implement these sounds within the musical environment in real-time



Figure 10: Tone Åse & Thomas Strønen performing at the Jazz Festival Umea (All About Jazz. <https://www.allaboutjazz.com/2012-umea-jazz-festival-umea-sweden-october-24-28-2012-by-john-kelman.php>)

Trombonist Nic Collins' paper *The Evolution of Trombone-Propelled Electronics* (2009), is a fascinating exploration into his process of developing a physical way of controlling electronic sounds through the slide and breath used when playing trombone. His unique instrument first developed in 1986 was both a controller device and acoustic sound generator, where the electronics and electronic sounds combined in a symbiotic way. Originally connecting to rack mount digital reverb units the instrument developed over time to feature signal processing using Max/MSP. Within the physicality of the instrument action, such as the trombone slide, the electronics and acoustics co-exist in the sound creation.

3.2.2 Pre-Imagining Sound

The vast array of tools for technology-based manipulation of acoustic sound

facilitates a high degree of artistic expression. This is one challenge present for the composer and improviser, as with this wide variety of sonic outcomes possible, the difficulty in pre-imagining the musical outcomes is increased. Previous to this research I have been working with the musicians in my project for a number of years, with hundreds of performances around the world. Each musician in the ensemble has a clear sense of what their acoustic sound is, and what the sound of the ensemble can be. John Young (2015) notes that ‘our capacity to pre-imagine the kinds of complexity encountered during the electroacoustic production and processing of sound is far more limited than that for materials founded on traditional pitch and duration’ (p. 150). This is one of the challenges for the work presented in my ensemble—each improviser will be challenged by their ability to ‘pre-imagine’ sounds created by themselves and each other. A critical part of the ensemble development through testing sessions and performance is for the players to develop a sense of understanding in how the sounds they create will respond to the varying types of signal processing they choose (Young, 2015, p. 150). They may develop a preference for certain processing pathways and sound selections within the technology available to them. This type of learned development is ideal, where performers can create a personal approach to sound creation using electroacoustic performance.

Young also notes how in electroacoustic performance the role of “aural imagination and creativity in compositional practice enters a new dimension” (p. 150). This concept is a clear marker for participant musicians and I, surrounding the method of composition, and improvisation as composition. Through integrating technology with our acoustic improvising, the methods and structures that I use to develop new work has needed to shift. We are all hearing new sounds, and the way that our creative musical concepts are expressed in the ensemble have been significantly altered.

3.3.3 Performance models for improvisation with acoustic instrumentation and technology

In my work the cohesive blend of composition, alongside improvisation using acoustic instrumentation and technology, is paramount in creating work that communicates the objective of the composer and improvisers. In this situation, the performance model that the musicians will use in this music is significantly changed from the traditional approach to acoustic performance on their instruments.

As Xenia Pestova (2009) demonstrates in her article ‘Models of interaction: performance strategies in works for piano and live electronics’, traditional performance

models feature sound transference directly to the audience, with the performers only needing to control their acoustic instrumental sound.

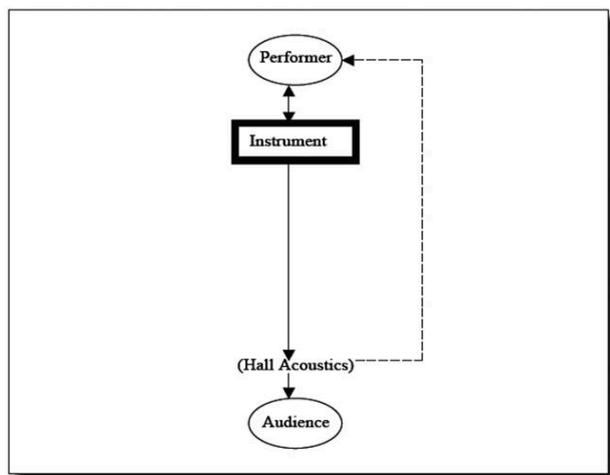


Figure 11: Pestova's model for performer to audience connection (2009)

In performance situations using Live Electronics, this performance model is modified to include the control of the electronic sounds and the audio feedback to the performers of the electronically manipulated sound.

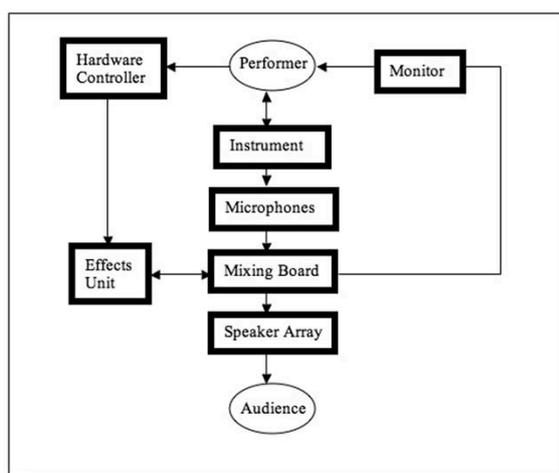


Figure 12: Pestova's model for performer to audience connection including Live Electronics (2009)

Further to this, the effects units and hardware controllers may be a single device or multiple devices, and the mixing board may not be needed as each effect unit can have its own dynamic level control. The options for variance on this performance model are extensive. The critical element to note is that before the sound reaches the audience there are

multiple sonic elements –such as microphones, hardware controllers and mixers, that will affect the sound. In this research design the performers are in control of all of these conditions, and thus the complexity of the setup has significantly increased from their acoustic performance. As outlined in Chapter Five, the device selection and technical setup for each performer is a crucial part to a successful performance or recording environment.

3.2.4 Effects

We could refer to Live Electronics as *live processing*, or *live effects*, or even just *effects*. For all of this terminology we are concerned with the manipulation of the sound in real time. As mentioned, Norwegian vocalist and researcher Tone Åse considers how Live Electronics enable the creation of *distance from* and *transformation* of her vocal sound. But what parameters can this contain? It is difficult to place effects into clear categories, but some common delineations as outlined by Elsa (2013) are time/modulation, frequency/dynamic, and spacial placement. Table 5 gives further explanation of possible effect types within these parameters.

ELECTRONIC PARAMETER	EFFECT TYPE	SOUNDING RESULT
Time/Modulation	Delay/Echo	The sound is heard as a repeat, with control over the time between repeats, and the amount of material encompassed by the delay.
	Flanging	A short delay, sounds are almost on top of each other to create a fluttering sound
	Chorus	A short delay where parts of the frequency spectrum are manipulated creating clashes in harmonics and interesting spacial sounds.
	Phasing	The incoming signal is split, where part is moved out of phase with the dry signal. The moving in and out of phase creates a ‘whooshing’ sound.

Time /Modulation	Looping/Sampling	A selection of the incoming sound is repeated continuously. This loop can then be manipulated independently of other acoustic or electronic sounds. This closed loop can be of varied length, and can be played back at varied speeds, pitches and directions (reverse). A sample is often the description given to a short loop played once.
	Ring Modulator	The mixing of an incoming audio signal with existing signal – like a sine wave. Bell-like overtones created.
	Tremolo	A change in pitch created by a variation of the volume of the signal.
	Vibrato	Pitch change at a regular rate, usually by a small amount but able to control the rate.
Frequency/dynamic	Filters	Lo and High pass filters modify the equalisation of the audio spectrum. Signals above or below the specified frequency are reduced by a specified audible dynamic range.
	Wah-Wah	An effect that boosts parts of the audio signal allowing the user to sweep the frequency centre.
	Harmoniser	Adding another pitch to the existing pitch, by a predetermined interval.
	Pitch Shifter	Modifying the pitch by a set amount.
	Distortion, Overdrive	A breaking apart of the sound wave by increasing the gain and manipulating parts of the frequency.
Spacial placement	Reverb	The addition of a sense of space, by continuing the sound past it's natural conclusion.

Table 5: Categories of effects (Elsa, 2013, p. 95)

All of these effects produce unique sounds that will interact with the acoustic instrument sounds in varying ways. As part of the testing, rehearsal and performance process each musician will find the effects that respond in a way that they can engage with on their instrument during their performance.

3.3 Electronic Jazz

Thom Holmes' paper, *The Roots of Electronic Jazz, 1950-1970* (2018) highlights that in the 1950s jazz music had already developed a long and vibrant tradition of performance and improvisation. Contrasting this, electronic music during this time did not share the same levels of spontaneity. Electronic music at this time could be more described as tape music consisting a multiple layers of pre-recorded tape sounds. These fragments of tape could be cut up and edited together, looped, sped up and slowed down to create a variety of interesting sonic effects. Further to this, Electronic music of the 1960s did not really contain a spontaneous improvised style. Most of the music was painstakingly constructed using tape, and any live performance element merely involved the playing of pre-recorded sound (p. 1).

Experimental approaches to jazz in the 1960s led to musicians seeking alternative ways of expression, and some turned to using electronics. It is important to remember that at this time "early experimenters in electronic jazz mostly followed the individual rather than institutional paths of discovery, taking advantage of whatever resources were available" (Holmes, T and Pender T. M, 2012, p. 401).

We can place early electronic jazz into two categories:

1. Jazz incorporating pre-recorded electronic music on tape;
2. Jazz using electronic instruments and/or the sound modification of jazz instruments in performance (Holmes, T and Pender T. M, 2012, p. 401).

There were some elements of electronic music that attracted jazz musicians during the 1960s, as the use of tape techniques, electronic instruments and synthesis facilitated new types of control for jazz musicians. In the table below Holmes and Pender (2018) outlines these techniques.

Technology	Technique
Tape	Speed adjustment, tape reverse, echo, reverb, splicing sound envelopes, sound processing, editing form, and filtering.

Instrument modification	Distortion (fuzz), echo, reverb, ring modulation, sustain, low and high pass filtering (wah- wah), octave shifting, chorus, phasing, tone control.
Synthesizer	Note sustain, pitch bending, sliding, microtonal scales, arpeggio, portamento, pitch range manipulation, envelope manipulation, signal modulation, dynamic timbre shifting, sequencing, filtering, pitch timbre, noise, voice selection.

Table 6: Electronic music techniques used in jazz (Holmes & Pender, 2018, p. 7).

In the mid 1960s, the American saxophonist Eddie Harris experimented with ways to modify sounds from the saxophone. He pioneered the use of a device called the Veritone. This amplified and changed the sound of the saxophone. The device “included a small microphone located on the neck of the saxophone and a set of controls mounted on the side of the instrument. The saxophone was then attached to an amplifier. Using the device, the player could harmonize with him, or herself, by producing a secondary tone, change the tone of the instrument, and use special effects such as tremolo and echo” (Holmes, T & Pender T. M., 2012, p. 409).

Following this, in the late 1960s and early 1970s, the British group *The Music Improvisation Company* featuring Hugh Davies and Derek Bailey, paired free improvisation alongside electronic manipulations, found sound and sonic abstractions. With astonishing varieties of sound, their free improvised explorations conjured fascinating sounds and structures with a sense of surprise around every corner of the music.

In the twentieth century music technology developed through amplification, sound effects and processing, synthesisers, the move from analogue to digital technology, and the development of small computers for sound recording processing and sound library creation and curation (Cerchiari, L., Cugny, L., & Kerschbaumer, F. Eds. 2012, p. 346). American technologies range from the electric guitar pickup to the Rhodes electric piano, but European imagination invented sounds and methods to create sounds that had never previously heard. Instruments such as Lev Termen’s Theremin, or Maurice Martenot’s Ondes Martinot, or Friedrich Trautwein’s Rhythmicon—the prototype to the electric drum—all represent the European new technological approach to music making and sound creation. (Cerchiari, L., Cugny, L., & Kerschbaumer, F. Eds. 2012, p. 346)

European artists continued to draw from these new technologies into the 1970s and 1980s. Players such as the British guitarist John McLaughlin who wanted to create sustained sounds on his guitar similar to a saxophone or sitar, turned to extended performance

techniques and guitar pedal effects to create a shimmering, virtually infinite sustain. Other guitarists like the Norwegian Terje Rypdal use a volume pedal to remove the attack from the guitar sound, creating ethereal soundscapes. In Rypdal's music, "an elastic tension prevails, which aims at sound scape and vision. In "Rainbow," as in many of the Norwegian guitarist's following works, a texture of sounds is created—sounds that are similar enough, yet different enough, to successfully interweave into a multi-colored tapestry. Electronic effects on all three instruments stimulate a wealth of overtones, which symbolize optical refractions and reflections, as if sounds are teasing and playing with light" (Cerchiari, L., Cugny, L., & Kerschbaumer, F. Eds. 2012, p. 353).

British saxophonist John Surman utilised multi-tracking in a way that extended the way he improvised, on his 1972 album *Westering Home*, and he also used delay effects with stunning control.

By regulating the digital delay and linking it up between the amplification system and the microphone, he obtains a cyclical repetition of notes performed on the saxophone (using all or just some notes selected with a pedal), thus creating an accompaniment by himself for his own solitary melodic lines. This mechanical process may appear banal in itself, but it is the way Surman uses it within a very precise poetic style that makes the difference. (Cerchiari, L., Cugny, L., and Kerschbaumer, F. Eds. 2012, p. 360)

Surman is creative with his use of technology, and uses delay rhythmically. He develops improvisation by altering the repetitions and frequency in the delay. He creates bass lines and harmonised passages. "But most of all, in overlapping new or repeated phrases with the help of technology, he also creates pure swing, that most typical element of jazz. Surman swings on himself, or rather on his own echo. He single-handedly combines the stylization of an archetype originating from a myth, the polyphonic technique born out of European history, and a typically jazz sensibility" (Cerchiari, L., Cugny, L., & Kerschbaumer, F. Eds. 2012, p. 363).

Austrian pianist/keyboardist Joseph Zawinal's obsession with sound has led him to approach playing the keyboard instrument in a textural way, often playing with a sequencer, drum machines, and effect processors. Tone colour possibilities often inspired his

compositions. He recounts the sound created by the acoustic piano on the opening track from the Weather Report album of the same name where “the introduction was based on chordal resonance obtained by holding down the piano keys and the pedal, while Wayne Shorter played a note on the soprano sax above the tailpiece, making it vibrate in sympathy. Then I cut out all the attacks of the notes from the tape. It wasn’t possible to do such things with synthesizers at the time, but I did it all the same, with acoustic tools” (Zawinal in Cerchiari, L., Cugny, L., and Kerschbaumer, F. Eds. 2012, p. 354).

Guitarists including Fred Frith, Eivind Aarset, Christian Fennesz and Nels Cline have also stretched the sonic possibilities of the electric guitar using combinations of effect pedals and extended performance techniques. Austrian guitarist Christian Fennesz, although inspired by jazz artists such as Wes Montgomery and Miles Davis, uses the guitar more as a sound generator rather than traditional melodic or harmonic creator. When performing live, Fennesz improvises complex soundscapes that blends swirling guitar based melodies with dense skittering electronic glitching sounds. His multilayered setup uses the electric guitar, a laptop with Max MSP, various single guitar effect pedals, all fed into a mixer. Fennesz uses a custom Max patch called ‘ppool’, allowing him to loop, sample and add effects to his guitar sounds (Cycling 74, 2019). Norwegian Eivind Aarset’s work also demonstrates how the guitar can be used to create ambient soundscapes similar to that of Rypdal. On the Nils Petter Molvær album *Khmer* (1997), Aarset matches the electronic processing of Molvær’s trumpet, with his guitar textures often featuring ‘raw edges and, at times, an altered tone that, played with an EBow, sounded more like the Middle Eastern, double-reeded Ney than anything resembling a guitar’ (Prepared Guitar, 2018). Aarset also explains how he uses guitar effects to expand his palette of sounds, deviating from what is expected as a guitar sound. He notes, ‘I found that I could use some of them—very simple guitar pedals—in a way that did something else; a textural thing that wasn't solo, wasn't rhythm. I found things that made sense to me and built from there’ (Aarset in Prepared Guitar, 2013). Fred Frith and Nels Cline are both known for their adventurous approaches to guitar performance, using unconventional performance techniques and effect pedals to create surprising sounds out of the instrument. When performing as a duo for the Alternative Guitar Festival in New York City in January 2014 they ‘scraped and drummed on their guitars, wedged sticks between the strings to be slid and thumped, and played their guitars with a bow (Mr. Frith) and a windup music-box mechanism (Mr. Cline). Of course, they also ran the sounds through looping devices and effects pedals’ (Pareles, 2014).

Musicians performing in fields of jazz and Live Electronic music have an affinity

though, each sharing the commonality of the use of improvising as a core part of the musical process. While jazz musicians often form the basis of their improvising on structural elements of melodies, harmonies and rhythms, electronic music improvising is more based on the spontaneous modification of non-pitched aspects of sound: the shape of the envelope, timbre, rhythm, layers or filtering, effects such as echo, delay, ring modulation, amplitude, and duration. A seasoned improviser learns how to listen to many layers of sound activity as part of a performance (Homes & Pender, 2012, p. 416).

3.4 Literature Review - Chapter Conclusion

This chapter has presented information clarifying definitions of Live Electronics and how I refer to it in this research as a reference point for how the performers are approaching improvisation with technology. Even though I find a synergy with definitions of Live Electronics that involve modifications of performers sound through technology I believe that Live Electronics is more closely aligned to electronic music, experimental sound-based composition, computer music and modified electronic instruments. I acknowledge the importance of improvisation in music that includes Live Electronics, but the music in this research connects more with the jazz performance canon, and uses extended improvisational techniques through technology to create new music. Thus, I am referring to the engagement with technology in this research not as Live Electronics, but as improvisation with technology.

CHAPTER FOUR: IMPROVISATION AND CASE STUDIES

4.1 Overview

Much of the music created in this project involves improvisation as a core musical element. A critical part of the creative process in this music requires the musicians to improvise with their acoustic instruments, and the electronic devices that create modifications of their acoustic sounds. Thus, an understanding of improvisational strategies from a group perspective is presented in this section.

Subsequently, this chapter presents an exploration of selected artists who are using acoustic instruments and technology in improvised music. Many of these artists are based in the genre of modern jazz, and have informed my understanding of how acoustic instrumentation and technology can co-exist in an improvisational context, allowing each to feature in the music.

4.2 Improvisation: tools, concepts and flow

There is a significant depth of research into the field of musical improvisation, and the intention of this chapter is to consider some of these facets within improvising in group contexts. This research involves the participant musicians and I creating music that requires high levels of improvisatory control, where the performers are working to adapt into new music making techniques, while holding onto their already developed tools and language. Musical improvising in a group setting is a fluid experience and for an individual musician to contribute creatively to an improvised experience there are many elements that they need to have a clear and thorough understanding of. Jerry Coker (1987) identifies materials of music making that jazz musicians use, including instrumental technique, understanding of theory in practice, harmony, rhythm and aural languages, techniques for improvising, historical developments and compositional frameworks. Coker refers to these as the 'improvisers basic tools' (p. 3-11). Jeff Pressing's (1988) research into jazz improvisation highlights the pathway for improvising, where improvisers generate ideas, and then use motor skills to create a musical output. Alongside this, sensory feedback from aural, visual or touch sources can help the performer in their real time processing of these ideas. Derek Bailey (1992) considers a broad spectrum of practice of improvising and connects with this concept of 'tools' through outlining the improvisers use of a 'vocabulary'. Successful improvising groups use 'styles, techniques and habits of the musicians involved. This vocabulary will then be developed by the musicians individually in work and research away from the group, and collectively in

performance' (p. 106). Bailey also refers to the instrumental impulse; the physical experience of playing the instrument, harnessing and reacting to the moment (p. 97). Bailey's concepts are worth considering more deeply when relating to the work created in this research, as the instrumental impulse has been placed into new contexts, with the performers tools and vocabulary altered. Adding improvisation with technology extends the parameters for playing the acoustic instrument and the performers physical experience is significantly changed. The performers styles and techniques need to adapt to create new performance habits.

Improvisation can often be viewed as both the intent—where the musical events are driven by the improvising, and the performers are constantly striving for new interactive moments, and as the tool—where it can craft the elements of music, or explore possibilities on the instrument (Belgrad, 1998, p. 2). This fluid movement between artistic intention and musical technique creates a depth of content and spontaneous engagement for performers and audiences in live performance. Australian composer and researcher Michael Hannan (2006) also tackles this subject using the term 'comprovisation' to articulate his process. Hannan recorded improvised piano sounds and passages and then used them to create textural or structural concepts (p. 5). This process uses improvisation and technology to facilitate composition in a way where improvisation is the critical intent based and tool based process in the compositional development.

In addition to the control of musical materials in performance and composition, jazz performers require highly developed verbal and non-verbal communication. To lead or be led, or as Barry Harris says, to be "calm but alert, ready to go with any possibility" (Harris in Berliner, 2009, p. 219). Paul Berliner (2009) further considers the ensemble interactions and subtle sense of communication and discusses the importance of control and letting go of it. The blend of the passive performance posture and moments of precise artistic control give the collective improvised music its sense of creative tension and exhilaration (p. 219). In true moments of peak improvised performance musicians often talk of being in the groove, the moment where the technical fluidity, musical elements and communication all connects. Australian researcher and bassist Nick Haywood (2014) outlines for an ensemble to collectively improvise, they need to develop control over the 'key concepts'. Throughout two years of focused study with professional improvising musicians, Haywood poses that four key concepts emerge:

- Knowledge of materials,
- Aural and Visual Awareness,
- Trust and respect,

- Intuition (p.71).

Haywood notes that the interdependence of knowledge and intuition is critical, with each constantly informing the other. Aural and visual awareness and trust are the key components in this interaction between knowledge and intuition (p. 72-73). Indeed, the elements of awareness and trust form critical parts of ensemble interaction in the improvised space, informing the elements of knowledge and intuition. Haywood's concepts are also aligned to the work of Seddon (2005) who connects sympathetic attunement (the sharing of musical knowledge) and empathetic attunement (the existence of trust for creative risk taking), acknowledging that the production of this peak improvisation may be regarded as empathetic creativity (p. 58). Within this environment, improvising musicians can thrive, creating engaging music for all participants.

Often this intuitive creative environment is described as flow, most notably by Csikszentmihalyi (1990) who emphasised the individual peak experience. Sawyer (2014) and Berliner (1994) engage in a more complete perspective for jazz musicians, referring to group flow, where the musicians are engaged in "interactional synchrony" (Sawyer, 2003a). Sawyer further identifies the elements in group creativity as improvisation, collaboration and emergence, and when these factors combine a situation of peak group flow is created. In forming this synchrony, the musicians are often drawing on what Lewis (1996) describes as Afrological or Eurological foundations, where the improvised musicality refers to social and cultural locations, emerging historically. Often the development of an improviser's individual voice encompasses an alignment to these systems, drawing on influences from the Afrological tradition—that of the self-identification and symbolic communication of the performer, and Eurological—connecting with European notions of form and experimental musical concepts. However, Lewis reminds us that the emergence of artists without American or European roots further serves to "to identify improvised music's transcultural nature" (1996), and that the action of improvising relates closely to the improvisers cultural understanding and personal identification. Borgo's (2005) outline of the Lewis model is succinct, the "Afrological perspective implies and emphasis on personal narrative and the harmonisation of one's musical personality with social environments" (p. 22), whereas Eurological "implies either absolute freedom from personal narrative" or the "need for a controlling or structuring force in the person and voice of a composer" (p. 22).

4.3 Adapting the groups – uncertain sounds

In developing a model for integrating technology into an already functioning acoustic improvising group, it has been worthwhile to reflect on the role of each musician within group improvising. Raymond MacDonald and Graeme Wilson's (2016) research into musical identities in an improvising ensemble, reflects on a critical element that relates to my music creation—an individual improviser may make a contribution to the music with a particular intent; but both musical content and intent will be shaped by the identities which that individual can construct for themselves and others within the social and temporal context of performance (p. 569). The group shapes the sounds created by the individual, and further to this, “that musical contribution may be interpreted, and responded to, in idiosyncratic and unpredictable ways by the other improvisers” (p. 569). This is more evident when considering the effect that the technology has on the music being created by each performer. The unpredictability present in acoustic improvised music is extended through the use of technology that manipulates these acoustic sounds. Sounds are much more unpredictable, and abstracted from their original source which can create new musical objectives for the musicians and a transformed group identity. Roles can shift with each performer capable of creating new and changed musical elements.

MacDonald and Wilson's (2016) work on choices in free improvisation, also reveal some useful comments that can be applied in the improvising scenarios investigate in this research. Touching on sonic properties of the music, structural concepts, and ideas of the overall group feel, MacDonald and Wilson identified reasons improvisers made choices during free improvisation. They are: texture, rate of innovation, novelty, diversity, structural concerns, practicality, and enjoyment.

These evaluative dimensions that emerged from MacDonald and Wilson's analysis of improvised music point to significant variance in the justifications for why improvisers made the choices they did during improvising. In my work, I believe that the performer's improvisation with technology further deepen the impact these choices have on the music, and the depth to which each choice can be enacted. Improvising with technology may also increase the rate of choice for particular reasons, making considerable contributions to textural change and diversity of sound. MacDonald and Wilson also posit a model for the process of individual choice during group musical improvisation. Improvisers evaluate sounds heard and make choices to either maintain the current trajectory of the music or play something to change that. The change could be an initiation where the performer plays

something completely new, aimed at starting a contrasting section of the work, or ending the current moment, or the change could be a response to existing material. Further distinctions in response include adopting the current musical content, augmenting the musical content, or contrasting the musical content.

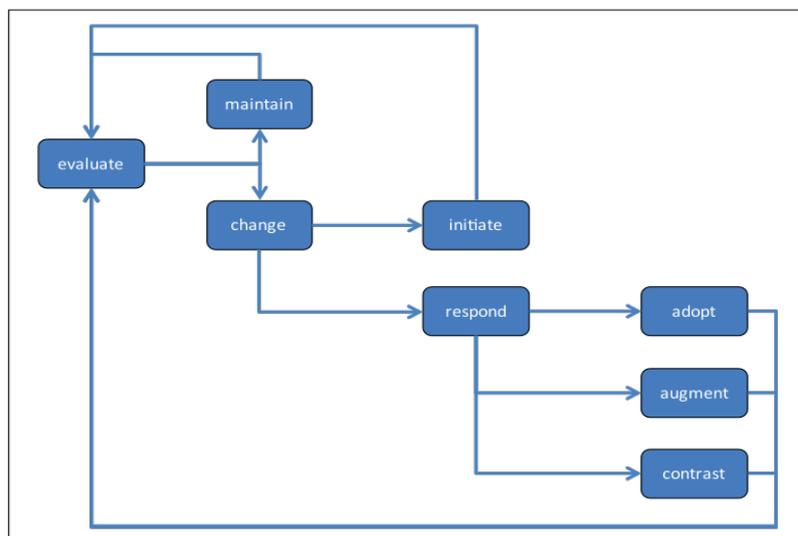


Figure 13: Choices in improvisation (MacDonald & Wilson, 2016, p. 1035).

In a practical sense though, what becomes more critical in the music during this research project is an understanding of balance. This required an understanding of the role of the modified instruments in the ensemble and the sonic space that the acoustic-electronic instrumentation occupies. For these ensembles to fluidly co-create electronic and acoustically improvised material, a musical understanding of sound, and technical understanding of the technology must be achieved. But, as David Rothenberg and Ben Neill (2010) note, the challenge is to use these effects in a way that is musical and spontaneous, familiar and ambiguous at the same time. Performers need to not be too wrapped in what the machine is doing and lose the musicality of the moment (p. 19). The performers also need to have a strong awareness of the behaviours that Denis Smalley (1986) identifies as dominance/subordination and conflict/co-existence (p. 61). These causal relationships in the music are constantly at play between the acoustic and electronic sound worlds, and for an effective interaction, the coherent flow between these poles is integral. As improvising musicians, we are regularly encountering uncertainty in our music making. In every performance, we approach each piece of music with a sense of the new, a sense of unknown, and hopefully a sense of risk, where performers try things to spark that magical group flow

that is so special in an ensemble improvisation.

As David Borgo (2005) writes, “improvisers not only welcome but they worship the sound of surprise” (p. 14). In this project, the musicians are negotiating new levels of uncertainty, as now there is a greater sense of exploration in each performers sound, and my aim is that the performers “revere the process of exploring and negotiating uncertainties together” (Borgo, 2005, p. 14).

Borgo (2011) also reminds us of how the “complex relationship between technological affordances and creative intentions can become even more involved in the context of a group performance” (p. 6). The sense of dissociation between the player and resultant sound in the audience, and the physical processes and resultant sound, can also weigh heavily on the outcome. I have been careful to also take on board Borgo’s (2010) thoughts of moving away from the distraction of the technology. Research, change, new sounds and technologies are useful, but we need to be careful to not spend too much time negotiating new interface environments, as opposed to developing knowledge, connection, and intuition within a more familiar one (p. 5). I think that often the musicians in my ensembles are not thinking completely as jazz musicians, but more as sonic improvisers, not stylistically bound, but responding to their experience, the music, and that of the ensemble.

4.4 Four case studies

The artists presented here improvise with technology in a way that creates clear personal identities in the music, identities that are captivating and inspiring. They continue the European cultural process of metamorphosis - Instruments imitate other instruments; sound imitates light; melodies, harmonies and rhythms become capable of visual, poetic, narrative, and dramatic expression. In all these cases, European cultural identity is expressed through a continuous reworking of its objects’ and instruments’ identity in a constant dialectic between tradition and innovation (Cerchiari, L., Cugny, L., & Kerschbaumer, F. Eds. 2012, p. 359). The use of technology in these jazz-based music examples presented range from electronics creating and driving core rhythm, harmony and melodic elements, to more textural, and dynamic parts. They are also a good indication of a clear stylistic benchmark for my approach to music creation—the artists have been specifically chosen for their close relation to my musical style. It is my intention to take inspiration from these artists, and create my own cultural identity as a creator, using the assimilation of my experience in devising and developing this body of new work.

4.4.1 The Norwegian Scene

In my conceptualising and crafting my work I have looked to selected artists from Norway who have and continue to use technology as a core part of their live improvising and recording processes. The Norwegian improvised music scene, with musicians emerging from places including Oslo and Trondheim, has established itself as a fertile place to create modern jazz inspired music that utilises technology alongside acoustic improvisation. While the musicians in this location are not uniquely combining improvisation with technology and acoustic instrumentation, an array of artists, both acoustic musicians and laptop musicians use electronic sound modification and creation to sculpt improvised sound in a variety of surprising and dynamic ways. The musicians share an approach that combines elements from jazz, rock, electronic music and Scandinavian folk songs. Rune Kristofferson, director of the influential Norwegian label Rune Grammofon, notes that “it’s about people from jazz and more hard-core improvisational music, and from electronic music and rock, playing with musicians from other fields and trying to create something that’s not very identifiable. The academies in Trondheim and Oslo have been important in that respect, encouraging musicians to step outside their own fields and experiment in ways that help them find their own voices” (Kristofferson in Williams, 2005). Unpredictable sounds emerge, from soft and delicate, to dense rhythmic propulsions. Helge Sten, electronic musician with the group Supersilent, regards the electronics as an “extra instrument” (Nicholson, 2003, p. 414). Sten notes the importance of giving musicians ‘rules’, to “make it a great musical experience for yourself and the people who listen to it” (Nicholson, 2003). The inclusion of the electronics is an integral part of the music and the depth of the improvisation.

a) Bugge Wesseltoft



Figure 14: Bugge Wesseltoft performing live (<https://friendrock.wordpress.com/2011/10/10/patterns-the-louche-f-c-bugge-wesseltoft-greg-wilson/>)

Norwegian pianist and producer Bugge Wesseltoft embeds technology throughout his music continuously. His solo piano albums *IM* (2007) and *Playing* (2009) both feature Wesseltoft deftly and seamlessly integrating technology; in the form of real time sound processing and looping of the piano in his acoustic piano improvisations. The blend is highly engaging, with the electronic components of the music as integral as the acoustic. Proceeding these albums Wesseltoft started working with laptop musician Henrik Schwarz and in trio format with the addition of double bassist Daniel Berglund. Their album *Triologue* (2014) takes concepts Wesseltoft explores in a solo setting further. Schwarz can sample the live improvisations from Wesseltoft and Berglund, firing it back at them for them to further improvise with. In the online documentary *Bugge Wesseltoft, Henrik Schwarz, Dan Berglund Trio—Album Documentary* (2014), Schwarz notes that this kind of manipulation creates new melodies that often sound unhuman, and that helps to make the sound interesting. These three musicians are of the belief that the combination of the acoustic sound and the digital manipulations of it, make the original sound more beautiful, interesting and engaging.

In a solo piano performance at the Kansi Auki Piano Jazz Festival in 2012, Wesseltoft gently blends the electronics with acoustic piano. He uses a laptop running Ableton Live, and a MIDI controller keyboard, both situated on a table behind his piano stool. Inside the piano resting on the frame is an iPad linked to Ableton, allowing Wesseltoft to control the effects and live processing wirelessly. This close proximity works well, with Wesseltoft often reaching in with one hand to manipulate delay and distortion, while playing piano with the other. He also uses a foot switch to engage looping and record samples. His hands are on the

piano for most of the performance, although there are times where he sets up loops and samples, then manipulates them with both hands. After the sounds are transformed and solidified, he moves back to the piano to play over them. The music is often highly rhythmic, with sampled and looped material working in time-based system, creating rhythmic structures and patterns for improvising with. In an interview with Wesseltoft he mentions how he wants his setup to "have maximum flexibility for starting out from zero, and going anywhere I want as easy and direct as possible" (Wesseltoft, personal communication, July 27, 2017). His setup allows him to stay away from the computer and be free to move around, manipulating parameters with one hand, playing with the other, and then setting up layered parts to play over. His ease of manipulation of the electronics creates a complete merge of the acoustic and electronic sounds, developed through years of testing a range of setups and devices. In referring to the understanding needed for it to be an effective performance Wesseltoft says, "there has to be a deep understanding, interest, and respect to make acoustic/electronic ensembles work. I really see electronics or laptops as a full instrument today, needing as much knowledge as playing a violin on a certain level" (Wesseltoft, personal communication, July 27, 2017).

c) Morten Qvenild

Pianist and Composer Morten Qvenild is known for his music in various Norwegian groups, with his most active being the piano trio *In the Country* and piano/drum duo *Space Monkey*. However, his solo work is of particular note in reference to my research, with his complex augmented piano the focus of the music creation. Qvenild has taken the concept of improvisation with acoustic improvisation and technology further, creating what he calls a *Hyper(sonal) piano*. Based on the concept of the Hyperinstrument, developed in 1986 at MIT, the goal of any Hyperinstrument is to expand an instrument using technology to give extra power and fitness. (Hyperinstruments, n.d). Morton's Hyper(sonal) piano project involves Qvenild creating an electronically extended piano that gives him the flexibility to create music that connects to his personal aesthetic and performance practice. His setup is complex involving a grand piano with multiple microphones and pickups to capture sound, a laptop running Ableton Live and Max MSP, standalone hardware samplers and loopers, an extensive array of guitar stomp boxes, and a variety of MIDI controllers. This setup is shown in Figure 15.



Figure 15: Morten Qvenild performing on the Hypersonal piano (<http://www.mortyq.com/>)

The instrument is highly expressive, and the focus is on the sound. As Morten says, sound arrives first, “then tones, chords, structures, melodies, texture, ambience. Sound is always first. Searching for sound was also my starting point” (Qvenild, 2016, p. 96). Qvenild’s (2016) focus on sound and his process in extending the possibilities of the acoustic instrument involves some fascinating perspectives on the poetics of the instrument sound, the interplay and the complexity in the live performance. He is interested in denaturalising or destabilising the sound of the piano, introducing instability and fragility to even the simplest of passages (p. 81). This creates alternative ways to generate interest in improvised material, where the electronics are key co-creators of emotional content. As an acoustic musician there is a well-developed style of interplay with your instrument, but in Qvenild’s Hyper-instrument interplay is approached in various ways.

1. To get unpredictable responses from the instrument;
2. To get direct responses, yet more or less abstracted, establishing the sound-output as a merge between my output and the device's response;
3. Making the output difficult to control, using devices or processes that are going bananas (p.66).

His performance process moves between safe and insecure and he has created a “complex and layered instrument that is difficult to control” (p.65). The complexity in his setup creates a sense of alertness in the performance environment, there’s a significant

amount of hardware and software to control, but importantly, “there is a balance between losing control to generate energy and losing control period” (p. 65). I like this sense of being on the edge where the sound can change at any moment in surprising and unpredictable ways.

Like Wesseltoft, Qvenild focuses on “rehearsing the instrument and setting up the different interfaces allowing my movements in and actions on the instrument to be natural and without stuttering. I am trying to move like one of those trained sushi chefs. Not a single hesitation, getting the work done in a wave of actions” (p. 65). The interaction between the technology, the acoustic instrument and the improvisation is used to create the resultant music that extends the piano in ways that are completely unexpected. However, Qvenild raises the concept of *flow friction* noting how the processing of the acoustic sound creates a friction against the natural sound of the instrument. For Morten this friction concept is extended further incorporating rhythm, the performance and the instrument setup. His complex instrument creates this friction, a resistance in his performance. This is a resistance that he seeks, with Qvenild noting “the ability to create friction is a main reason for me to use electronics the way I do” (pg. 34). In his recording “*Personal piano*” (2015) there is an impressive sense of depth, with the piano sounding very close and clear, then distant, broken, and crumbling. Flanging processed piano sounds loop, with Morton playing unprocessed piano over the top. Fleeting sounds drop in and out, often heavily modified so that only fragments of the real piano sound remain. Alongside this there is a clear melody, the music does not suffer from being too abstract and retains a connection to melody throughout. This balance is effective. The melodic content gives context to the array of sounds being produced, and also frames them in the space of the natural piano sound. Natural and un-natural piano sounds co-exist, with each complementing the other.

c) Thomas Strønen

Figure 16: Thomas Strønen recording (<https://www.bbc.co.uk/programmes/p03blpgk/p03bln90>)

Norwegian drummer Thomas Strønen utilises electronics as part of his inventive approach to drum kit performance. He features in a range of ensembles including *Humcrush*—a duo with keyboardist Stale Størlokken, an un-named duo with vocalist Tone Åse, and the group *Food*—a duo featuring Iain Ballamy (saxophones), and sometimes members Arve Henriksen (trumpet and electronics) and Christian Fennesz (guitar and electronics). In a *Food* live performance at Oslo's Nasjonal Jazzscene (Nasjonal jazzscene, 2015), Strønen and Ballamy give considerable focus to the electronic sounds in the music. Strønen seems to move through roles in the music seamlessly, functioning as a time maker, textural creator, melody creator, and also one of sonic sound shaping. His physicality is smooth, with the electronic devices—all hardware based and not computer controlled—situated to the left side of his drum kit. He often operates the kit with one hand, the other on the various devices, shaping the sounds created. Later in the performance he uses live sampling and looping to create dense percussive textures and strong rhythmic parts for Ballamy to interact with. The sheer range of sounds created from the kit is highly engaging and consistently surprising. Strønen seems to be approaching the playing of the acoustic and electronic sounds with a delicate care that enables significant subtlety. Ballamy's role falls mainly in the melody maker area, but again, the subtlety of the saxophone sonic manipulations allows you to be

drawn into the sound, with Bellamy also using spacial manipulations consistently. He often plays phrases, manipulates, plays another, manipulates. Both of the musicians are confident to take their hands off the instruments to access the hardware, and to allow the music the space to give room to both acoustic and electronic sounds. The music is lyrical with constant textural changes and continual shifts of mood. It captures the kind of textural intensity and surprise I wish to achieve in my work when using saxophone and drum kit.

In discussion with Strønen on his process and ability to improvise fluidly on the drum kit and electronic equipment, he mentions the development of multifaceted skill as a player. “I need a certain technique, coordination, I need ideas, I need to know what's possible to do, and it's just the same with the samplers; I need to know how it could help me out, so that's when I get this idea just that second, I don't want to use one second to think about what I have to press in order to do this process, it just has to be internalized in my hands and mind and in my music. (Strønen, personal communication, July 1st 2017). Strønen clearly articulates the importance of a seamless extended control over the acoustic instrument and electronic devices. His improvising process cannot be restricted or slowed by the electronic devices, his awareness of their use within the music must match the acoustic instrument at all times.

Strønen also features in duo format with vocalist Tone Åse. The concert recording *Live at Dokkhuset 09* (2009) is another example of how he alters the acoustic sound of the drum kit during an improvised performance. Åse also utilises a complex electronic device setup comprising various hardware devices, laptops and pedals and notes in her research that she is interested in the sounding result of different types of sound processing more than the technology. They are a means to achieve the music. To effectively plan for these improvised scenarios, she sets up experiential categories, comprising of:

1. Broadening: adding something to the voice;
2. Narrowing: filtering the frequencies of the voice;
3. Placing: putting the voice in different rooms/spaces and distances;
4. Reconstructing: changing the voice sound substantially (Åse, 2012, p. 83).

This experiential categorization is a useful way of segmenting technological experience and creating improvised scenarios for the musicians taking part in my project. Although we are not using these categories as formal methods or structures, conceptually they are broad indicators that can act as stimulus points, markers that can assist in framing decision making when using technology in performance.

d) *Supersilent and Nils Petter Molvær*

Norwegian trio Supersilent perform entirely improvised music, featuring trumpet, keyboards, drums and electronics. Their music is heavily defined by the electronics, with Helge Sten manipulating and processing sounds live. The sounds are highly varied, a mix of state-of-the-art and *Lo-Fi*, with colour, texture and emotional intensity the focus (Dahlen, 2003). Sten notes the role of electronics within the ensemble, stating, “I think the meeting [between electronics and jazz] has to be the result of a genuine musical expression and has to be a genuine musical adventure” (Nicholson, 2003).

Nils Petter Molvær creates a highly engaging blend of manipulated trumpet, piano, percussion, vocals and guitar on his 2005 album *Er* where the electronics are deeply married to the acoustic sounds. It is dreamy, textural, groove laden, and highly rhythmic with shimmery layers from all instruments fading in and out, and while it’s melodically strong, the melodies often feel sparse. They take a subsidiary role to the rhythmic layers and are often melodically simple, rhythmically open. There is a focus on sound. Molvær often uses thick reverbs and harmonisers to create spacious and harmonically rich versions of his trumpet. The music is lush, and it draws me in.

4.4.2 Outside Norway

Even though I have presented a selection of Norwegian artists as the focus for my case studies, there are other musicians using acoustic improvising and improvisation with technology that have informed my practice. While these artists have not formed a critical part of my listening, I feel that they are worth noting as musicians using this mode of music creation in contemporary music contexts.

a) *Evan Parker Electro-Acoustic Ensemble*

This group is significant in the way they have placed electronic elements at the forefront of music creation. The ensemble featured on the *Drawn Inward* (1999) album is essentially of two groups existing alongside one another. One is acoustic, comprising saxophones, violin/viola, double bass and percussion, while the other is a trio of musicians who contribute electronic sounds and live manipulation of the acoustic sounds. Additionally, multiple members of the acoustic instrumentation engage in live sound processing, with anywhere up to five musicians playing electronics throughout the music. Steve Lake, producer of the Evan Parker Electro-Acoustic Ensemble’s releases on the ECM label

comments that the challenge in performing and recording this kind of music is complex. Musicians have their sounds fed back to them, with “many more unknowables than in normal improvising” (Lake, 2004). Importantly, a deeper kind of listening is evident in this music, the more traditional quicker interaction present in many jazz-based ensembles takes a lesser role, and the importance of giving space to the electro-acoustic sounds is a priority (Lake, 2004). This group is completely different to the ensembles in my project, where the performing musicians are controlling their own electronics, but the blend between acoustic and electronics in this ensemble, and the density of sound is effective. I’m also intrigued by the concept of the musicians having processed sounds fed to them. What would happen if I fed processed sounds of themselves to the musicians in my ensembles? This concept is one to explore in a future research project.

b) Hauschka

The music of Volker Bertelmann (aka Hauschka) is another example of a soloist using the sound of the acoustic instrument—piano—and merging it with a range of electronics in a live improvised setting. What is most notable in Bertelmann’s work is the prominence in the use of prepared piano, drawing on minimalist music concepts more than jazz based ideas. He often uses a variety of prepared piano techniques—adding ping pong balls, clips, tape, cardboard, drums, shakers, and other objects that will create interesting vibrations and sounds when paired with the acoustic piano sound. Electronically, he draws sounds from non-computer based sources with Hauschka’s setup using single guitar pedals, such as the Boss RC-300 loop pedal, various delays and reverb units—including the Roland Space Echo—as a relatively simple way to enhance and manipulate the prepared piano. He also incorporates the EBow into his performances. This simple device can generate infinite sustain using an oscillating magnetic field directed at the string causing it to vibrate. Often used on guitar, violin or other string instrument, the result on piano is almost synthesizer like. In his live performance for BoilerRoom, (Boiler Room, 2014) he fluidly blends the prepared piano and guitar pedal sounds, with one hand often off the keyboard manipulating his mixer or other controls on pedals. His extended piano technique is impressive, and it informs the creation and performance of the music. I enjoy the combination of prepared piano and electronics in Hauschka’s setup. His laptop free performance environment is another reminder that through extended performance techniques and careful selection of hardware, the musical results can be engaging. Figure 17 shows the placement of Hauschka’s hardware with the acoustic piano.



Figure 17: Hauschka's piano performance setup (<http://eemagazine.net/entrevistas/an-interview-with-hauschka-at-the-arsfutura>)

c) Franziska Baumann

Baumann's vocal repertoire is fascinating. Specialising in non-idiomatic improvisation, she uses her voice to expand upon traditional sounds created with the instrument using extended techniques and technological means. Her development of the Sensorglove, an analogue to MIDI gestural interface device, allows Baumann to use gesture in performance and translate this to parameter control via MIDI. This gives Baumann the ability to curate sound without using a standard controller device with buttons, knobs or faders, manipulating manipulate "sound and spatial articulations through gesture in real time, while keeping any devices and/or controllers close to the body" (Klein, 2010). By connecting the control of the electronic devices to the body, Baumann's performance is unencumbered by the devices, leaving her more connected to the moment in the music.

4.4.3 An Australian focus

The artists mentioned so far are all based in Europe. This focus has been a conscious

choice for my research, as I am aligning my work with a modern European jazz sensibility. However as I am a practicing artist in Australia, my colleagues are Australian, and many of my performances and recordings are completed here, I feel it is important to also acknowledge some Australian artists who are contributing to this review.

a) *Tangents*

Sydney ensemble *Tangents* occupy an interesting space within contemporary improvised music. The ensemble features Ollie Brown (laptop); Adrian Lim-Klumpes (piano/Rhodes/vibraphone/marimba; Peter Hollo (cello); Evan Dorrian (drums) and Shoeb Ahmad (guitar). The background and listening base of the musicians in the band has led the group to create music that settles on the fringes of sounds from contemporary jazz, electronic music, minimalist classical music and modern post-rock. Acoustic piano, drums and cello are prominent in the music, but alongside this, cellist Peter Hollo is continually manipulating his sound with loops and live processing; and pianist Adrian Lim-Klumpes is sending the piano (or Fender Rhodes) sound through a series of guitar stomp boxes, which dramatically alter the output. The laptop musician Ollie Brown is integrated within the sounds of the acoustic instrumentation in creative way. Brown places a microphone on the drum kit, and live samples, loops, and processes the sounds performed by Evan Dorrian. Dorrian then plays along with these manipulated versions of his own performance, creating a pseudo, double-drummer sound.

b) *Peter Knight*

Trumpeter Peter Knight has presented practice based research involving improvisation with technology in his dissertation 'The Intersection of Improvisation and Composition: A Music Practice in Flux' (2011). Similar to my research, Knight uses the addition of electronic elements in his music to create new approaches to composition, performance and recording. Knight's work features in solo and ensemble contexts, with his solo performances of particular interest. His multifaceted setup includes live trumpet running through a variety of plugins in Ableton Live, and various pieces of hardware including guitar pedals, and reel to reel tape recorders. The setup is multilayered, but not overly complex with Knight using the technology to create inventive reimagining's of the sound of his trumpet. Blending musical concepts from both jazz and electroacoustic music traditions, his output demonstrates a focused understanding of effective blending between acoustic and electronic sounds.

4.5 Chapter Conclusion

I have presented some viewpoints on improvisation in this chapter, focusing on tools, concepts, choice, and communication methods. For my research this is relevant as the group connection within the improvising space will be of increased importance when new sonic considerations are presented, through the inclusion of improvisation with technology alongside acoustic improvisation. Secondly, this chapter presented selected case studies of artists performing music utilising improvisation with acoustic instruments and technology as a part of the performance process. I have mainly focused on a selection of musicians in Norway, because of a personal emotional connection to the music made by these artists.

I believe these musicians are using technology and acoustic instrumentation in a way that blends the two sounds in a symbiotic way. This creates music that integrates both sounds to produce a personal performance practice using improvisation as a core part of the music creation and performance. It is my intention to create music inspired by these artists, not attempting to replicate their sounds and styles, but rather, be spurred to create new music that contributes robust work to the already existent material in the canon.

CHAPTER FIVE: CHOICE OF TECHNOLOGY

5.1 Overview

Throughout this chapter I will outline the various pieces of technology that the musicians use alongside their acoustic instruments and clarify how the technical setup is constructed for each ensemble. The musicians used the chosen technology in the rehearsal testing phases through to the various performances and finally in the studio recordings. One of my critical concerns in this project is the ability for all the improvising musicians to implement technology alongside their acoustic performance with a high level of spontaneity, control and immediacy. As Norwegian vocalist Marja Ratkje explains, more mental capacity is consumed by the operation of technical aspects of the instruments when using electronics. It is also difficult to control multiple layers at once. Controlling the electronics takes practice to learn the setup, to learn how to immediately trigger the ideas that come. (Ratkje in Thelle, 2020). When referring to computer music controllers, Perry Cook (2020) reminds us that “some players have spare bandwidth, some do not” (p. 3). The bandwidth Cook refers to here can be either the mental capacity to use the controller, or the physical availability to use it. He uses violin as an example, where “players generally have their hands completely occupied, so a successful interface must exploit interesting remappings of existing gestures” (p. 3). This project is about new music creation where technology is used to achieve new sounds, change the acoustic sounds and create new sonic interactive possibilities for the ensembles. The focus was on how the technology can serve these improvising musicians, and I created music that was intended to give them scope to extend their improvising process by including technology. I was aware of balance, as I felt a danger that the use of these electronic sounds could become dominant in the music, or conversely play a minor accompanying role to the acoustic sounds. As Elsa explains, “in the worst case the technology can fail, leaving a gaping hole in the music if not stopping the show entirely” (Elsa, 2013, p. 447).

I wanted the technology to be used in a way that facilitated a smooth blend between acoustic and electronic sounds with each featuring extensively throughout the music. The design of the musical content is integral to the success of this, but the choice of technology is also a key component in how the improvisation with technology can contribute to the musical elements and improvising processes.

Ferguson (2013) draws attention to the work of Bowers who discusses the relationship between the performer, the instrument and the environment, calling it the performance

ecology. In the performance situations presented here the acoustic instruments are at the centre of the performance ecology for each musician, but as Waters (2007) notes, the mutability of this performance ecosystem is enhanced when adding computers, software or other kinds of digital sounds. The distinctions between performer, instrument and environment blur, and the assembly of this music in real-time further accentuates these shifting distinctions. This unpredictability and destabilised setup is similar to the work of Ferguson (2013), where he looks at the notion of technologically mediated performance practices using real-time improvised scenarios. Ferguson (2013) picks up a similar performance ecology to what I present in the music here, noting, “these performance ecologies are less about being in control of a situation than about ways to find lifelike resonances with which to interact, foregrounding the relationship between imagination, expectation, and material” (p.133).

5.2 The nature of the trio

“When you find a group that is rhythmically attuned to one another it’s the most beautiful thing that you would even want to hear in your life” - *Barry Harris in Paul F. Berliner’s Thinking in Jazz (1994)*

I love performing in the trio format and I have been working with this type of ensemble since 1999. I think what fascinates me most about this kind of ensemble in jazz based music is the degree of freedom possible between the three musicians. I feel that the music can have a significant amount of depth and variety— harmonically, melodically, dynamically, rhythmically and texturally, but all of these elements can shift quickly, and dramatically. I enjoy the closeness with the musicians, the sense of intimacy between the parts and the aural space that is present. For this project I have chosen two trio ensembles, with the acoustic piano, my instrument, being common in both groups.

5.2.1 The piano trio

The piano trio in jazz based music comprises acoustic piano, double bass and drum kit, and has been an integral part of the modernisation of jazz into the 21st century. With contemporary groups such as Brad Mehldau Trio, E.S.T., The Bad Plus, and Vijay Iyer Trio all embedding a variety of musical practices wider than a traditional jazz approach into their music, the piano trio has become a fluid and constantly changing ensemble shape in modern

jazz.

a) *Trichotomy*

Sean Foran - piano

John Parker - drums and percussion

Samuel Vincent - double bass

Trichotomy have been performing together since 1999, and have toured extensively throughout Australia and internationally with performances at high level events including Jazzahead Festival Germany, Tokyo, Takatsuki, and Kutchan Jazz Festivals Japan, Calgary Jazz Festival, Melbourne Jazz Festival, Brisbane Jazz Festival, Darling Harbour Jazz Festival, Woodford Folk Festival, Canberra Jazz Festival, and MIDEM Music Conference France. They have released seven albums internationally and collaborated with symphony orchestras, chamber ensembles, solo jazz artists, video artists and dance companies. In 2013 the group was a finalist in the APRA Art Music Award for Excellence in Jazz (Australia) and have been previous winners of the QLD Music Award for Jazz and finalists for the Australian AIR and BELL awards for contemporary jazz album of the year. The music of this group draws on concepts from the Afrological jazz tradition and contemporary art rock, but also engages with concepts from Eurological western art music practices incorporating sounds of minimalist modernism. Even though the group uses jazz based structures and roles within the ensemble, it avoids a heavy use of swing and harmonic practices found in jazz. The music is highly improvised, and avoids a predominate use of atonality and clashing melodic-harmonic structures, instead connecting more with singable melodic phrases, repetition and structures that audiences can follow. A more extensive biography on the group and each musician can be found in Appendix eight.

5.2.2 Piano/tenor saxophone/vocal trio

This trio is a little more unusual in jazz contexts than the piano trio, and does not share the same extensive historical dominance in the style. The unusual instrumentation is a challenge, as the lineup presents two single line melodic instruments—the vocals and saxophone, and one harmonic instrument which also can present melody—the piano. British vocalist Norma Winstone is an example of a well-known jazz artist that favours this kind of

instrumentation in much of her output, having recorded extensively for the ECM label with the group *Azimuth* and in her trio with pianist Glauco Venier and Clarinetist Klaus Gesing. I spent a significant amount of time in the United Kingdom, completing my master's degree at the Leeds College of Music and engaging in a mentorship with the British pianist John Taylor, who played with Winstone in the Azimuth trio. It was John introduced me to the possibilities with the piano, reed instrument and vocal trio, and after I listened to the Azimuth album 'Somewhere called Home' it set me on putting a band together that featured this kind of instrumentation.

a) Berardi/Foran/Karlen

Sean Foran - piano

Kristin Berardi - vocals

Rafael Karlen - tenor saxophone

Berardi/Foran/Karlen (BFK) formed in 2014 and has also toured extensively through Australia and New Zealand, performing at major jazz festivals and clubs. The debut album from the group "Hope in My Pocket" released in 2015 featured a range of material developed to explore the experiences and emotions contained in the correspondence of men and women involved in the military past of Australia and New Zealand. This album was the winner of the QLD Music Award for Jazz in 2016 and the APRA/Australian Music Centre QLD State Award for Excellence in Jazz at the Art Music Awards. The sense of space in this group is invigorating, as the lack of a rhythmic instrument such as a drum kit opens up the music, leaving silences that are not filled with notes. The song forms used by this group are often varied with through composed pieces, openly improvised works and more formally notated compositions featuring along with pieces in a jazz styled format of melody, solo, melody. A more extensive biography on the group and each musician can be found in Appendix eight.

5.3 My principles

In considering the above thoughts surrounding balance, blend and the performance ecology for the musicians, I developed a set of basic principles at the outset of this research. These principles aimed to provide a framework for how the technology would be chosen and implemented by the players in the two trios. They included:

1. To construct a performance setup using technology that is practical, streamlined, and implementable in a variety of venue styles;
2. To select technology that catered to the skills of the musicians: Most of the musicians in these groups had minimal experience using laptops on stage and preferred to use hardware devices in their electronic setup.
3. Limit the amount of technology: While each musician could have many pieces of technology on stage, I kept to a maximum of three or four per player. By limiting the technology, it would give the musicians a chance to develop reliable operational control skill with each.
4. To construct a piano technology setup comprising of software and hardware: I am a trained jazz musician, but also quite fluent with Ableton Live. This enabled me to devise a technological setup that included Ableton Live with MaxMSP and a range of hardware devices.
5. To select commercially available technology that suits the practical considerations of each instrument: I chose technology that was appropriate to the physical constraints of the players. This consideration would sometimes limit which device could be used by the performer, but also forced the musicians to develop robust physical skills of operation.

Selecting the specific setup was a process that took time. I wanted the performers in the ensembles to be able to access and control multiple parameters—such as effect depth, mix, speed, intensity or others. In my initial research into commercially available technology, I found that there are many options suitable for use with acoustic instruments. However, this project was not designed to test a wide range of software, hardware or to explore bespoke technology development. This research was designed to explore the potential of technology as a means to amplify and extend musicality, allowing musicians creative opportunities to use software in a way that enables consistency, and connection to their acoustic sound sources.

Additionally, it is worth noting here that I chose to include more devices in my piano setup

than I did in the setups for the other musicians. I made this decision primarily as I have had some more experience working with technology than the other musicians in the groups. I wanted to push myself further, and challenge what was possible for me as an improviser. However, in the Berardi/Foran/Karlen recording session I did simplify my setup slightly, removing the gestural controller. After using it extensively I found that it was restricting my playing on the keyboard too much, and was a distraction.

5.4 Monitoring

Monitoring refers to the ability for musicians to hear themselves and the sounds of other musicians while performing. In a live concert environment musicians commonly use fold-back monitors—floor positioned speakers close to their instrument, or in-ear monitors—small headphones that fit snugly in the ear, reducing outside noise—to have a personal mix of their sound and the sounds of the other musicians played back to them during the performance. In a studio setting given there is no audience and thus no need for an amplified sound in the room, so musicians often wear in-ear monitors, or open/closed back headphones. In both live and studio settings, the use of fold-back monitors, in-ear or headphone monitoring enables the musicians to hear a combination of the amplified acoustic sound mixed with the electronic sounds. The musicians would also hear the acoustic sounds from the band naturally. Most venues would supply some kind of fold-back monitoring system, and musicians would need to provide their own in-ear or headphone monitoring system if they were choosing this method of monitoring.

The delicate balance between acoustic and electronic sound was an immediate concern of all the musicians in the project as it is a challenge to have clear control over these sounds in varying performance and recording situations. Xenia Pestova (2009) writes about these issues, noting how the performers do not really have an accurate representation of the music in the audience while performing. Before embarking on this research, both groups *Trichotomy* and *Berardi/Foran/Karlen* operated in purely acoustic performance situations, where amplification is used primarily to fill out the sound in the room, making it louder and more balanced. With the inclusion of technology, the speakers are the only sound source, thus the balance of the electronic sounds with the acoustics is of high importance for the audience and musician engagement with the music. This includes the sound that is fed to the audience, but also the fold back sound—the sound coming to the musicians from speakers on the stage. As an example, if John (drums) has developed a loop using one of the electronic devices,

both myself (piano) and Sam (bass) will need to clearly hear that through the monitoring on stage so we can musically respond to it. Without clear and balanced monitoring, John's live electronic sounds are ineffective, preventing us from improvising with him cohesively. For the live performances in this project, all monitoring was produced via fold-back monitors on stage for the musicians as this was the method that most musicians felt the most comfortable using on stage. The variety of venues that the groups performed at was wide and using fold-back monitors provided by the venue was also the most practical solution given the variety of technical possibilities across these venues.

In the studio recordings monitoring was produced via headphone monitors for each musician, with the only live sound in the room being the acoustic instruments. This enabled the musicians to hear the electronic sounds through their headphones and the acoustic sounds of their instruments naturally in the room, plus some additional amplification of the acoustic sound through the headphones.

5.5 Technical Setups

To begin to improvise with technology alongside the acoustic instruments in concert settings and then in the studio, I needed to solidify the technical setup for each musician. As explained earlier in this chapter, the focus for most musicians became hardware, with a combination of single floor controlled effect pedals, and tabletop positioned multi-effect units. The piano setup featured a range of hardware plus a laptop, with software controlled by a variety of MIDI controller devices. The setup for each musician developed throughout the performances, with sometimes the musicians using a selection of their chosen technology in their performance. In the final studio recordings, the musicians used a setup comprising of all the technology, and in Appendix three a selection of tables can be found that give further clarity for the technology used by each musician, in their live performance and studio setup. Figures 18 and 19 show an overall perspective of each groups stage and studio setup incorporating technology.

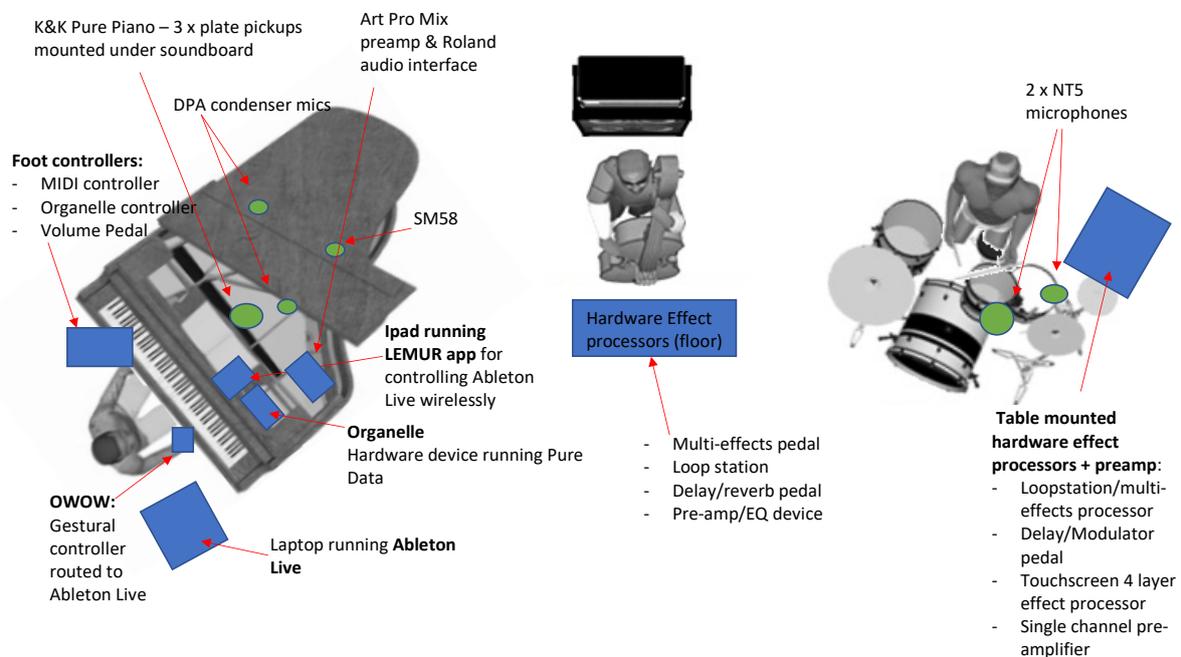


Figure 18: Trichotomy electronic setup

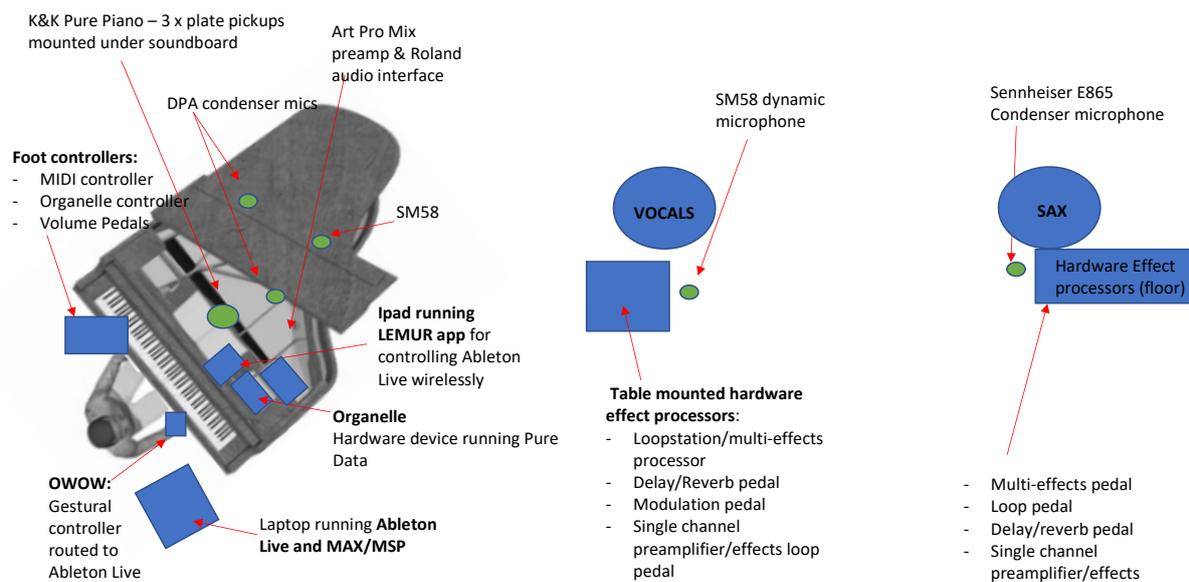


Figure 19: Berardi/Foran/Karlen electronic setup

5.6 Piano

The device setup for the acoustic piano was the most complex out of the instrumentation for each ensemble. The piano is my instrument, and is featured in each ensemble, so this prompted me to develop a more detailed setup than with the other instruments. I specifically wanted to utilise a range of technology incorporating a laptop computer running Ableton Live, and various hardware devices. Creating varied methods of interacting with the technology was an important part of the setup, and I also wanted to find technology that I could easily and quickly move between while improvising.

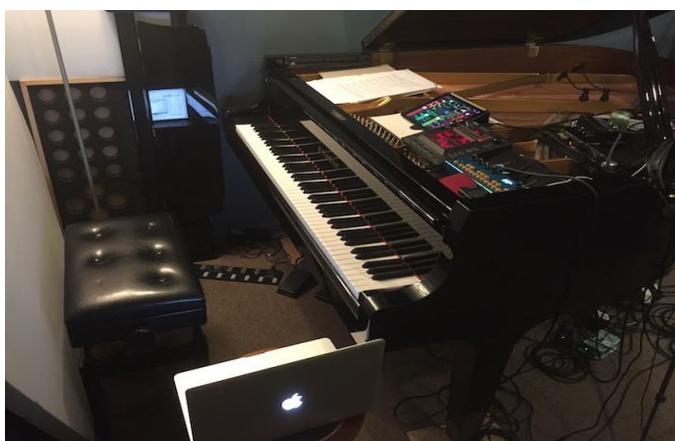


Figure 20: piano electronic device setup during the recording session

5.6.1 Critter & Guitari - Organelle



Figure 21: Critter & Guitari Organelle

This device has been quite revolutionary for me. I was looking for something tactile to complement the setup I had developed using Ableton Live. Having an alternative setup to Ableton would be advantageous as I could run contrasting electronic sounds, and blend them with the Ableton effects in a completely separate audio channel. The Organelle is a hardware device that comprises of physical controllers—knobs, buttons, foot switch input—and a modern microcomputer. The interface is simple, but the sonic output is complex and varied. On the top of the control surface it features a series of buttons laid out in a piano keyboard style design, plus four knobs for controlling parameters. Additionally, there is a foot switch which is often controlling patch on/off, loop engage, hold/freeze, or similar facets of the selected patch. I enjoy the tactile nature of the device, this is an effective balance against the touch-screen focussed iPad interface, and the sonic output of the device is of high quality. I often find the Organelle sounds surprisingly hard to predict in how they will transform my live piano playing. This is exactly the kind of result I am aiming to achieve as I wanted to improvise with the electronics alongside my acoustic playing, creating musical ideas that stimulate myself and the other musicians. Ergonomically it is also effective given that I can fit it inside the lid of the piano, within reaching distance of the piano keyboard. The ability to situate the device here is of importance, as it facilitates ease of interaction when improvising and quick changes of patch parameters and the patches themselves.

There is an extensive range of patch options on the Organelle, and throughout the various testing sessions and performances I came to find a selection of patches that I felt responded well to the acoustic piano sound and gave a variety of sonic modifications of the

piano. You will hear these sounds coming through in the live performances and final studio recording. Appendix six contains some audio tests of these patches in a solo piano setting and further explanations of the patches are found in Appendix three.

5.6.2 Korg–Kaoss Pad KP3



Figure 22: Korg Kaoss Pad - KP3

Korg first brought out the Kaoss Pad in 1999. Original pitched as a device for DJs the simplicity of its interface gave it significant popularity across a variety of musicians, not just electronic artists. (The Guardian, 2011). At the time of its release it was a unique device, and still presents a different effect generation and manipulation solution to many other devices, mainly due to the touch pad control surface that is the focal point of the unit. For the acoustic piano electronic setup, the Kaoss Pad 3 is a useful addition. It processes incoming audio with a large number of effects on board (64), although in practice I only use a handful. In Appendix three, a table outlines the patches saved to the preset buttons 3-8 (which enables fast access between the various effects). The XY touchpad is used to control the effects in various ways with the touchpad controlling elements such as effect depth (X) and volume (Y).

5.6.3 Ableton Live



Figure 23: Screenshot of Ableton Live

Ableton Live is a program that combines a traditional digital audio workstation layout with what Ableton call *session view*. Session view is ideal for triggering and manipulating audio and MIDI in a live performance scenario. Through this workspace musicians can easily improvise with ideas, both through live sounds and computer created sample instruments. Ableton also contains a variety of audio effects and the flexibility to be controlled by a range of external devices such as MIDI keyboards, MIDI foot controllers and OSC devices such as iPads (Ableton, 2014). In this project I have mapped selected audio effects to a variety of physical controllers—hand, foot and gestural controller—and worked to develop skill in utilising them throughout the material performed. I find Ableton to be intuitive in its operation, easy to navigate, layer and control the range of audio effects that I have pre-selected. In Appendix three, further information is provided on the audio effects selected during this research.

5.6.4 Max for Live

Max is a visual programming language designed to allow experimentation in a variety of media environments such as audio, video and lighting. Based around a graphical ‘patching’ principle, you connect virtual boxes connect together containing actions that then create sounds, effects and processes. It also interacts with a range of hardware devices and can be integrated with Ableton Live through the Max for Live version (Cycling 74, 2014). Max for Live is a useful addition to my Ableton setup, mostly because of the interesting range of audio effects it contains. I find the electronic processing surprising with the most useful part

of this program in my setup being the *Device Randomizer*. This plugin enables me to randomise parameters for any audio effect in Ableton Live, thus reducing my need to physically adjust controllers. I have chained the *Device Randomiser* to multiple effects in Max for Live, enabling me to have changing parameters occurring in real time for multiple effects without the need for me to physically control them. Appendix three contains further detail on the audio effects controlled by the Max for Live Randomizer.

5.6.5 MIDI Control devices

To control Ableton Live while improvising on the acoustic piano, I wanted various control devices. There are a significant range of MIDI controllers available, but many have the same challenge—how can I position these controllers in close proximity to the piano keyboard, in a way that facilitates a smooth transition back and forth from the controller to the acoustic piano? Size is also an issue, as I needed a controller that would have a reasonable amount of control settings (i.e. sliders, knobs), but also be small and portable, ideally of a size that I could fit inside the piano.

Pianist and researcher Xenia Pestova comments on the difficulty of using various controllers for pianists, for a number of reasons. Keyboard controllers—modelled on the piano keyboard—although similar, are completely different in terms of action response, sensitivity and control. Even MIDI foot controllers are completely different to standard piano pedals, often featuring an on/off response without a graduated action (Pestova, 2009, p. 118). Ultimately to control the technology in a way that gave me a significant depth of control, I opted for multiple MIDI controllers that utilised varied physical control techniques. This was a conscious choice, enabling me to broaden the ways I could manipulate the technology while playing the acoustic piano, allowing me the ability to react in the moment using various physical processes. The physical control and co-ordination needed to use these devices in a seamless way within improvisation is very high—I need to use them to make a variety of accurate modifications to effect parameters, and I need to engage with the devices quickly, in the musical moment, while playing the acoustic piano.

a) Lemur Application on Apple iPad

After looking at a variety of MIDI control devices decided that I needed something that I could freely move around the piano and that had a variety of control parameters—such as faders, buttons, wheels or similar. I had noticed Bugge Wesseltoft using an iPad to control

his technology on stage. The iPad size and wireless capability gives Wesseltoft the ability to position it in close proximity to the piano keyboard.

Lemur is a MIDI and Open Sound Control (OSC) application for iPad and Android that communicates with any program that receives MIDI or OSC (Liine, n.d). What I like about Lemur is the ability to customise the interface to suit the needs of the user. You can start with a template featuring a range of control types—buttons, sliders, wheels—and edit it to suit the way you want to control your program of choice. Additionally, because it is able to run on iPad, it connects to the host program (in this case Ableton Live) via WIFI (through the creation of a private network). To use Lemur, I initially tried a variety of templates on the Line Lemur user community. The Line Lemur community page features a range of templates for users to download that you can use in their downloaded state, or use as a starting template for your own controller creation. I was looking for a template that had predesigned controls for loopers, and a few audio effects in a clear and easy to interact with interface. I found a template called *Rheynelooper*, which suited well. (Liine Community, n.d). The *Rheynelooper* is a multipage control template featuring multiple loop controllers, sliders, wheels, and XY controls. I started using it in the preset state before modifying to suit my session and desired controls. I reduced the number of wheels and sliders, and started labelling everything to reduce the memory load of having to remember multiple controls on the iPad. I also made some notes regarding what the gestural controller was mapped to (labelled as WIGGLE), and set the sliders to volume control of the standard Ableton effects and Max effects as shown in Figure 24. I left some controls unused at this point, allowing for ease of the addition of other audio effects in future. I then added a second page, containing a looper for the Max channel and additional effects, as shown in Figure 25.



Figure 24: Screenshot of Lemur template – page 1 on iPad



Figure 25: Screenshot of Lemur template on iPad - Page 2

b) MIDI controller— foot operated

Using a multi-button MIDI footswitch has become an essential part of the control devices for the Ableton Live program. I found early on in the development process of this music that I needed some hands free control of the electronic devices, and a foot operated device was an ideal option. I have two feet, one is usually occupied with using the sustain pedal, but the left foot I can use for electronic controls. Initially I was using a Logidy three button footswitch as shown in Figure 26, with the pedal mapped to a looper audio effect within Ableton Live on the piano *FX* channel. The buttons control parameters of record, loop, stop/clear.



Figure 26: Logidy 3 button MIDI controller

This worked well at the beginning of the process, as it gave me limited chance of error and was easy to operate. However, some difficulties emerged. The pedal was black and with no lighting options, seeing it under the piano on stage was sometimes difficult. The three button design which started off as being useful quickly became a limitation when I wanted to

control more than just the looper with my feet.



Figure 27: Logidy positioned under the piano with other foot controllers-volume and Organelle footswitch

I began investigating other multi-button foot controllers such as the Behringer FCB1010, or the Keith McMillen Softstep/12 Step, which feature more buttons, and other MIDI control parameters such as pressure sensitivity, or tilt. The piano setup then shifted to include the Keith McMillen 12 Step.



Figure 28: Keith McMillen 12 step MIDI controller

The 12 Step was a useful discovery. It has 12 programmable buttons, with additional MIDI control capability via pad pressure and tilt direction. The pads are able to have the sensitivity adjusted, so I do not have to slam my foot down on them while playing something soft and subtle. Plus, as is indicated in Figure 28, the buttons are illuminated, and the front row is at a varied height to the back. All of these options enable an ease of use, something this is important in a controller with so many buttons on the surface. There is a virtuosity of control needed with the operation of a pedal such as this, accuracy of timing when recording and triggering loops or samples is critical. The benefit however is significant. Loop controls— or any other audio effect in Ableton— can be controlled in a hands free manner, enabling me to play the piano with both hands, and in keeping with my most effective performance mode as a pianist.



Figure 29: Recording setup indicating position of 12 Step under piano

c) Gestural Control

The concept of being able to manipulate the technology without taking your hands off the instrument is quite appealing for me as a pianist. This led me to investigate gestural controllers. Gestural controllers use human movement to send data to an electronic instrument, computer or sound producing device. They are a more specialized piece of equipment as they will commonly control multiple parameters and require more precise control and training from a performer. Once the gestures are known, the interaction between performer and controller can send information in the following categories:

1. Direct acquisition— where one or various sensors are used to monitor performer's actions. The signals from these sensors present isolated basic physical features of a gesture: pressure, linear or angular displacement, speed, or acceleration. Each physical variable of the gesture to be captured will normally require a different sensor.
2. Indirect acquisition— where gestures are extracted from the structural properties of the sound produced by the instrument. Signal processing techniques can then be used in order to derive performer's actions by the analysis of the fundamental frequency of the sound, its spectral envelope, and its temporal envelope.
3. Physiological signal acquisition— the analysis of physiological signals, such as muscle tension (Mirando, E. R., and Wanderley, M. M. 2006, p.14).

Similar to the design of the other pieces of equipment in the technological setup I did not want a solution that required me to spend a large amount of time programming, or learning a new piece of software, or with levels of complexity that required more splitting of thought processes during improvising. This led me to using the OWOW Wiggle device.

Shown in Figure 30, the OWOW Wiggle device allows me to control any mappable parameter in Ableton live through three-dimensional control across an X, Y, Z axis. The device uses direct acquisition to send information. Using this device has enabled me to:

1. Turn electronic effects on or off without needing to touch physical controllers
2. Use exaggerated physical gestures to control effect depth.



Figure 30: OWOW Wiggle gestural controller

This wireless gestural controller allow me to control effect parameters with movement. These movements could be integrated into my piano performance and thus allow me to modify effects while keeping both hands on the piano. The OWOW Wiggle is a small device about the size of a matchbox and I have been able to attach a velcro strap to the device allowing me to wear it on my wrist during performance. To use it all I need to do it activate the parameter by touching one of the buttons, which I can do prior to the commencement of the track.



Figure 31: OWOW Wiggle during rehearsal

The use of this gesture control device has been quite successful, although has had its challenges. I have certainly felt that I cannot play in my normal fashion while improvising

and engaging the gestural controller. It is not completely hands-off in terms of device control and some movements need exaggeration that forces you to pull away from my standard piano technique. I do not use the device for all songs in a performance, but rather use it for selected tracks when I feel that there is scope in the work to embed this type of movement in my playing.

5.6.6 Volume pedal - Boss FV-50



Figure 32: Boss FV-50 Volume Pedal

Once I started blending the live electronic sounds from Ableton Live and the Organelle I found that I wanted to have dynamic control in a hands free way. I was cautious about this as I already had multiple foot controlled pedals—the standard piano pedals, the MIDI foot controller, and the Organelle footswitch controller. Using a volume pedal to control the Organelle sound did require me to start to think in a new way, I was fading in the processing of the acoustic piano, uneven control of this would destabilise the music and take away from the sense of balance between electronic and acoustic sounds that I was looking for. Ultimately though, the foot controlled ability to shape the dynamic curve of some of the electronic sounds is invaluable. I am able to have two hands on the keyboard and bring electronics in and out without the need to stop playing. Controllers such as this facilitate my ability to play in my natural way, helping keep the improvising fluid and with complexity. Additionally by using this on the Organelle I can fade in and out Organelle sounds while other effects (such as Ableton Live) are still present.

5.7 Double Bass



Figure 33: Samuel Vincent during a live performance at the QLD Conservatorium

There is an extensive range of effect pedals that allow live manipulation of the sound of a guitar or bass guitar instrument. Most of these are designed for electric guitar and electric bass, not double bass, so Sam and I spent time investigating ways to curate the effects generated from his pedals in a way that responded to the tone of the double bass. In designing the setup with Samuel we focused on some clear goals:

1. To include a stand-alone looper to enable looping of the natural bass sound and versatility with layering loops and live samples of bass sounds with other effects.
2. To include some kind of multi-effect processor with layering possibilities to give a wider variety of layered output sounds within one unit.
3. To include a stand-alone delay and/or reverb unit as these sounds can be effectively paired with other effects.
4. To use a pre-amplifier/effects loop device that gave adequate levels of tone control, thus ensuring the dry and wet signals were of a high quality and suitable for studio recording.



Figure 34: Sam's electronic devices during a performance at the QLD Conservatorium

5.7.1 Zoom–B3 multi-effect unit



Figure 35: Zoom B3 multi-effect unit

The Zoom B3 unit is designed for electric bass guitars, which is a better starting point than using a guitar orientated pedal with the double bass. It features an extensive range of audio effects (99), with three effect patches able to run simultaneously, in any chained order. Each patch includes one or multiple 'pages' of parameter controls, modified by the physical knob controls on the top of the unit. Effect on and off switches are foot switch style controls, with one button for each patch. Similar to the piano setup, Sam often chose a handful of favourite effect settings, and saved them for easy access during performances and recordings. These are detailed in Appendix three.

5.7.2 Boss/Roland–Space Echo RE-20



Figure 36: Boss/Roland Space Echo RE-20

The Boss Space Echo RE-20 is a digital pedal that models the original Roland RE-201. The RE-20 is a tape delay modelling pedal and it uses the various knobs to allow the user to control delay and reverb in various ways. As with many delay and reverb units there are controls for reverb and echo volume as well as the delay time and intensity. Sam often used the second footswitch to tap tempo—by tapping in the tempo of the music the delay would be matched to the live tempo. Additionally one of the unique features of the RE-20 is the twist feature, an effect enabled when the second footswitch is held down. This creates a cascading sound, where delay level and feedback gets louder, resulting in an intense wash of sound, emulating the tape coming off the spool. Sam also utilised this sound during performances and the recording session

5.7.3 TC Electronic–Ditto X4 looper



Figure 37: TC Electronic Ditto X4 Looper

The ability for Sam to easily record and layer loops was one of the clear goals in the technology setup for double bass. There are numerous effect pedal loopers available, but for

Sam I wanted a looper with an easy to navigate interface, and two independent loop layers. The Ditto X4 works well in this setup. It has two independent loop layers, each with volume control, and a dedicated stop button. Additionally, loop effects such as reverse, half time, double time or hold can be added to the loops through *FX* switch. Throughout the performances and recordings Sam can be heard recording loops and playing them back at varying tempos using the effect settings on the Ditto X4. This became a useful way of engaging effects independently on the loop, while using other live effects through the Zoom B3.

5.8 Drum Kit

The technology setup alongside John's drum kit is designed to be accessed via his hands. In a similar way to the setup of Norwegian drummer Thomas Strønen, John wanted a variety of technology that he could utilise with his hands, situated on the left side of his drum kit, in close proximity to his snare and hi-hat as shown in Figures 38 and 39. Often the live drum part is heavily layered, with a variety of rhythms played simultaneously across the kit. For John, extending that through the use of extensive looping and sampling formed the core of the technology selection.



Figure 38: John Parker during a live performance at the QLD Conservatorium

The goals in the electronic setup for drum kit included:

1. The inclusion of a hand operated multi-track looper
2. The inclusion of multiple other effect processors— using various buttons, wheels or pads. These needed to be hand controlled.

3. A setup that was hardware only— not using Ableton live, as John did not want the complexity of dealing with a laptop on stage.



Figure 39: Placement of drum electronic devices during rehearsal.

5.8.1 Boss–RC-505 Loop Station



Figure 40: Boss RC-505 Loop station

The Boss RC-505 is a tabletop looper, with a visually responsive interface and wide range of looping and effect possibilities. It includes five separate looping channels, that can be operated independently of each other, and set to ‘one shot’ play or continuous loop. It also includes an effect section with editable effect parameters such as effect depth, filtering or cutoff, possible on both the live input sound, or the loop track independently. Three channels of effects can be layered on input sound or loop tracks. (Boss, n.d). The immediacy of access to the loop and effect options is excellent, as John can create and trigger loops with one hand while playing the kit, or quickly hit the loop record with high levels of accuracy. John uses

the loops in a way that obscures what part of the music is live drums and what part is looped, creating a more complex and dense drum part. He can then bring effects in and out over the looped parts, giving a constant shift to the sound, and taking away too much of the fixed loop emphasis.

5.8.2 Korg–Kaoss Pad Quad



Figure 41: Korg Kaoss Pad Quad

Similar to the Kaoss Pad 3 as explained in the piano technology section, the Kaoss Pad Quad is touchscreen device with multiple effects. As with the RC-505, this is designed for hand control, with the key feature being that it can layer 4 effects simultaneously. The interaction is fluid with John able to quickly turn effects on and off, and ‘freeze’ them, Korg’s version of leaving the effect on in its current state. John also uses the touchscreen to manipulate the effects, utilising it with live drumming and loops being fed to the Quad from the RC-505.

5.8.3 Hungry Robot–The Karman Line



Figure 42: The Karman Line pedal

The Karman Line is an effect pedal, designed differently to the usual footswitch pedals. It is a guitar style single effect unit but curiously though, it has a joystick, thus is more designed to be used with hand control. The pedal is a delay and oscillation device, with

lo-fi delays and pitch modulations. The joystick gives creative hands on control of the unit, moving it completely away from the footswitch nature of the pedal. This is ideal for John, as he can situate it on a table beside the other effects units. When feeding the drums through the Karman Line John is able to craft intensely transformed drum sounds that extend duration and change timbre in unpredictable ways.

5.9 Vocal

Similar to the setup with the drum kit, Kristin and I wanted to use technology that could be controlled by hand, operated in close proximity and with independent control over various effects and loops. An example of her setup is shown in Figures 43 and 44. I wanted to lean away from the various vocal effect units such as the TC Helicon Voice Live, as I feel that so many of these are focused on preset effects, and things like adding harmony parts to the vocal line, in a way that did not focus on modifying sounds in the moment. I wanted Kristin to approach the technology in a creative sound manipulation way, and many of the devices used were effect pedals, the kind used by guitarists, but carefully selected to complement the multi-effect looper. The only drawback with these effect units is the actual pedal click - the pedals require firm depression to work and create an audible click when used.



Figure 43: Live performance at Orange Studios Christchurch indicating positioning of vocal effect devices

The goals of the electronic setup for vocals included:

1. The inclusion of a hand operated multi-track looper.
2. The inclusion of multiple other effect units—using various buttons, wheels or pads, but avoiding the same devices as used on the drum kit—to ensure variety in sound across the two ensembles.

3. A setup that was hardware only—Kristin wanted simplicity in the setup, something compact, and that could have an intuitive sense of operation with tactile and visual feedback during operation.



Figure 44: Kristin Berardi performing at The Jazz Lab in Melbourne utilising technology

5.9.1 Boss–RC-505 Loop station

As explained in the drum technology, this tabletop looper combines live looping with input and track effects. Kristin is using it with hand control, layering looped vocal parts and bringing in effects over the live loops. Importantly, Kristin places it last in the chain of effect pedals so she can feed the other effects into it. This gives greater options of effect variety with the created loops.

5.9.2 Hungry Robot–The Stargazer



Figure 45: Hungry Robot - The Stargazer, reverb effect unit

I had been so impressed with the sound quality of *The Karman Line*; the modulating delay oscillator used in the drum setup that I went to the Hungry Robot pedal company to find a reverb unit. Kristin’s vocal tone is quite warm, so I wanted a reverb unit that would capture that and not thin the sound too much or create strange digital reverbs that felt false. The Stargazer is a hardware effect pedal, with two channels of reverb, each with mix and decay controls. It also features a ‘sparkle’ switch, which turns on a freeze type effect on the reverb giving an almost infinite reverb tail to the input captured. (Hungry Robot Pedals n.d). The design is simple, allowing Kristin to switch between two reverb channels easily during performance and fade in the reverb level and decay time smoothly.

5.9.3 Greenhouse Effects–Retro Sky



Figure 46: Greenhouse Effects Retro Sky delay pedal

The Retro Sky delay pedal is an analogue delay pedal, designed for guitar. I thought that giving Kristin control over a delay effect independent of her looping device would be

useful. Kristin would be able to control vocal delays cleanly and easily with a single unit, and send these delays to the looping device if desired. Similar to the Stargazer reverb unit, this stomp box style pedal has clear knobs to control the parameters delay mix, number of repeats and the reverb time. The ease of design is this pedal is important, and Kristin can easily alter the delay depth and repeats, without needing to use preset delay settings or a complex interface.

5.9.4 Radial–Voco-Loco



Figure 47: Radial Voco Loco Vocal Preamplifier and effects loop pedal

The Voco Loco is a critical part of the vocal technology setup. Even though the RC-505 contains XLR input with phantom power, overall gain control of the vocal input level and mix between the ‘dry’ unprocessed vocal sound and the ‘wet’ processed vocal sound is important. The Voco Loco facilitates this, taking the input of Kristin’s microphone, before running the effect devices through loop and back to the Voco Loco. This also gives Kristin the ability to fade in the effect chain, and also completely mute the effects if the sounds get uncontrollable. Without a device such as this, we were not able to send enough clean microphone signal through the electronic devices, and had no simple way to blend electronic and acoustic sounds. Kristin is singing into one microphone as the source of her unprocessed and processed sounds. Giving her control over the balance between these two sound worlds is integral to the success of her performance.

5.10 Saxophone



Figure 48: Rafael Karlen performing at The Jazz Lab Melbourne, with floor positioned pedals

Selecting devices for the saxophone presented a similar ergonomic situation as the double bass. Foot operation was preferred by Rafael as he often has two hands on the saxophone for playing, as shown in figures 48 and 49. In designing the setup for saxophone I aimed to:

1. Include a stand-alone looper to enable effect free looping.
2. Include some kind of multi-effect processor with easy foot controls.
3. Include a stand-alone delay and/or reverb unit as these sounds can be effectively paired with other effects and would be easy for Rafael to implement.



Figure 49: Rafael Karlen adjusting parameters during a performance.

5.10.1 Boss–ME-50 multi-effects Pedal



Figure 50: Boss ME-50 multiple effects unit

The Boss ME-50 is an effect pedal designed for use by an electric guitar, with a range of standard effects included on it. There are three channels for effects, with each one having a selection of preset options in the categories of overdrive/distortion, modulation or delay. In practice, Rafael focused on using the modulation, expression Pedal and overdrive patches, leaving the delay to the RE-20 unit. The ME-50 is similar to many other guitar style multi-effect pedals and is not a new unit, having been commercially available for nine years. Rafael felt the clarity of the interface with easy to use knobs, clear text information and large footswitches made the device easy to use on stage, especially when he found himself at a distance from it when playing saxophone.

5.10.2 Boss–RC-30 Loop Station



Figure 51: Boss RC-30 Loop Station

Similar to the loop pedal that Samuel is using for the double bass, the Boss RC-30 has two loop tracks, each with volume control. The pedal is clean in design with Rafael able to switch between the channels easily. The preset effects—pitch bends, phaser, filter sweep, delay and Lo-Fi filter—have no edibility though, so were avoided by Rafael for most of the performances and recording.

5.10.3 Boss/Roland–Space Echo RE-20



Figure 52: Boss/ Roland Space Echo RE-20

As outlined in the double bass technology section, this device is a delay and reverb unit, with excellent two pedal control and a range of knobs for smooth shifting of delay and reverb parameters. Similar to the Boss Loop pedal the foot controls are large and of softer design than the small click switches, and are easier to hit in the moment with less audible noise.

5.10.4 Radial–Voco Loco

For Rafael, the Voco Loco preamplifier is functioning in a similar way to the setup with the vocal technology. It is an essential part of Rafael’s electronic setup, allowing him to control gain level from his saxophone to the electronic devices and the ability to blend electronic and acoustic sound in a smooth manner.

5.11 Chapter Conclusion

Selecting specific pieces of technology for each musician was an important part of the development stage in this project and I used the technology to build a new sound world for the musicians to explore with their instruments. When starting the process of technology selection it became clear that the options were vast, and the process became focused on finding a range of varied technology that worked for each musician rather than finding the absolute best devices available. The outcomes from this chapter include:

1. The musicians are implementing a variety of technology —There was a careful effort to curate the technological setup for each musician, with the various pieces of technology focusing on different audio effects. Also, each musicians setup comprised

of a limited number of devices, mostly hardware, that have allowed the setup to be relatively compact and easy to setup on a variety of stages.

2. Usability matters—The sound created by the technology may be great, but it must be usable for the instrumentalist. What's critical here is that this usability may shift from musician to musician, depending on how they interact with their acoustic instrument and the technology. As Kim Bjorn (2017) outlines, the usability of an electronic device or instrument comprises many factors, and I have found for the musicians in this research, the principles of ergonomics, simplicity, tolerance and consistency are key.
3. Layering - There has been an effort in the technical setup to use multiple piece of technology, enabling the musicians to layer sounds. The intention here is to give the musicians choice while performing and create variety in the sound layers created during each performance.

PART B

CHAPTER SIX: DEVELOPMENT THROUGH LIVE PERFORMANCE

6.1 From practice to performance

from its very inception jazz has been about inventiveness, about the process of change (and) that sense of change and inventiveness is most powerfully registered in its cultural forms that accent dissonance and contingency, in music making that explores the sonic possibilities of traditionally outlawed models of practice (Heble in Borgo, 2005, p. 35).

As noted in Chapter Five the physical choice and placement of electronic hardware for each player needed to be suitable for the instrument they perform with and how they are comfortable in interacting with the device. I also outlined the electronic devices chosen to use in the stage setup for each musician for live performances and studio recording. After choosing the devices, the musicians needed to test their personal electronic setup in rehearsal and performance settings. All the musicians in this research project are highly skilled improvisers with years of professional experience playing together as touring ensembles, and to prepare each group for performances and recordings of music using improvisation with their acoustic instruments and technology I used a flexible design approach. The performers draw on their own understanding, skill, and interactivity in the ensemble to create increasingly engaging work in various performance settings. This chapter aims to expand upon the information presented in the previous chapters and outline the process through which the musicians acquired a sense of personal and group control over an extended instrumental technique involving improvisation with technology and acoustic instruments. There was a lengthy process of development, the musicians needed time to learn how the technology worked and also how they could physically embed them in their performance techniques and within the musical content of each piece of music. Figure 53 provides a visual representation of this process and this chapter refers to audio-visual recordings of individual testing sessions, rehearsals, and live concert performances. These recordings are located in Appendix Four and Six and selections of these recordings should be viewed before engaging with the final studio recordings and complementary analysis in Chapter Five.

PROJECT PROCESS DEVELOPING INDIVIDUAL & ENSEMBLE FLUIDITY

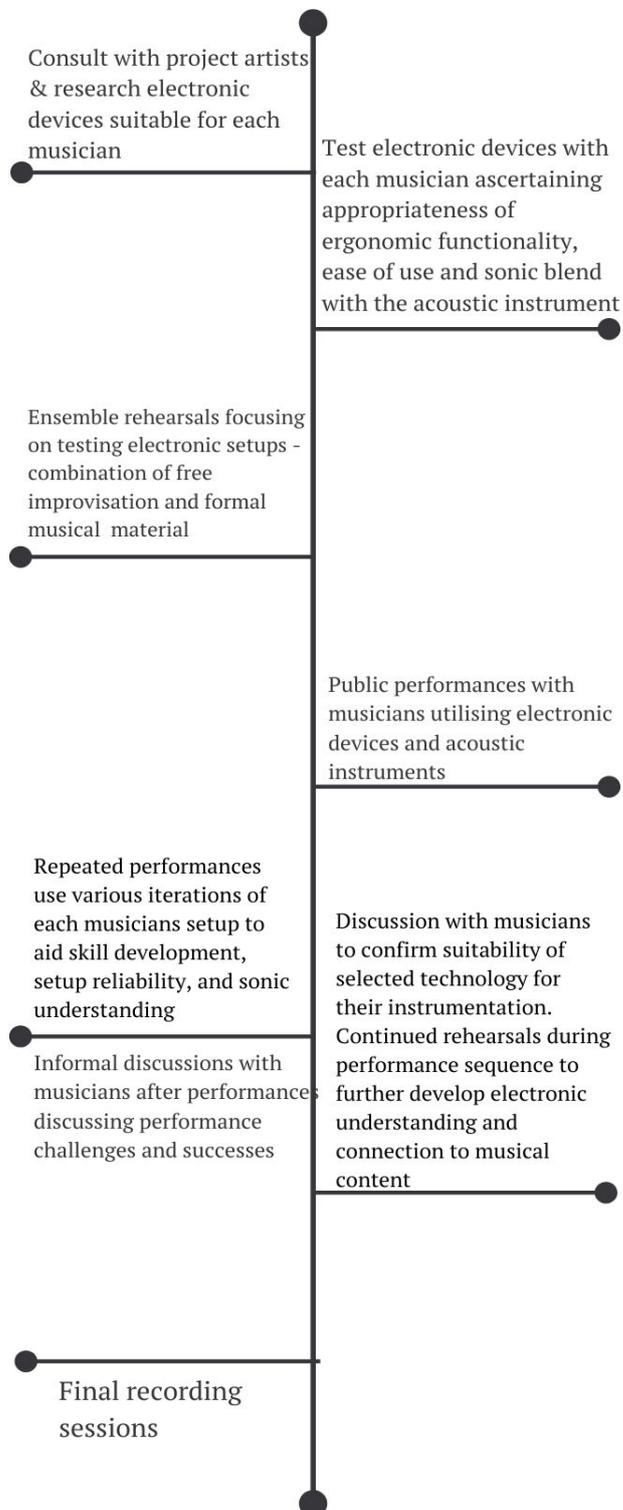


Figure 53: Project process for ensemble and individual fluidity

6.1.1 Developing control

Since technical fluidity has already been established on the acoustic instrument as an improviser, the addition of new controls—those used to create and manipulate the technology—presents significant physical consideration for improvising musicians. It is not so simple to merely use some microphones to capture the sound of the instruments and then add some electronic devices to manipulate this acoustic sound during the performance. In developing a skillset to confidently create new work as an ensemble, it is worth outlining the musical skills needed to be musically creative and confident in operating an instrument that has been augmented through the use of technology. In the text ‘The Digital Musician’ Andrew Hugill (2012) refers to the difficulty in acknowledging the breadth of skills and experience that digital musicians possess. Performative decisions are critical, and “in general, what is wanted from the equipment is responsiveness and controllability” (p. 122). Hugill emphasises that the interface is the critical part - the interfaces between the musician and the hardware, the musicians and the software, the musicians and each other, and with the audience. This level of performance control is what forms the success in the performance, where “the musician’s ability to handle the interface, or the controller, is a powerful indicator of the level of technological understanding” p.122).

Physical controllers utilised— whether hardware effects controllers or MIDI control devices— need to have an effective balance between the performance and operational activities, appropriate levels of sonic manipulation choice, and a physical layout that facilitates a smooth control in addition to standard acoustic performance on the instrument. Marco Stroppa (1999) presents a sobering perspective on the effectiveness and ease of Live Electronics, reminding us that sound recording is a delicate and fragile process, where microphone position, timbral qualities and dynamics significantly affect the final outcome of the processed sound (p. 48).

This is a serious consideration in my research, as the technical aspects directly and significantly impact on the musical content. He also mentions that the live processing of acoustic instrumental sounds is fraught with danger, since these sounds need to be played first to be then processed, the audience will probably hear them. This risks the piece becoming tedious and trite (p. 53). Further to this, the physicality of the interaction with the electronic hardware must be easily adapted into the performers acoustic improvising.

When using technology the regular techniques of playing one's instrument are augmented with both performative tasks of adjusting parameters in an audible effect (i.e. delay time), alongside the operational tasks. These operational tasks may involve selecting the effect and adjusting settings prior to enaction of the effect. To do this, the performer may need to take a hand off the instrument, look away, or stop playing (Lexar, 2012, p. 56) and this combination of performative and operational tasks can present a new improvising consideration for performers. To enact an electronically created sound a non-acoustic instrument based preparation may be needed, and potentially, specific time-based control of the electronic device is critical to implementation of this electronic effect in the music.

The process of understanding the acoustic and digital paradigms and how a performer can relate to the instrument is an important part of each musician developing control and interaction between acoustic and electronic sound. Owen Green (2011) draws on Magnusson's research on the relationship between acoustic and digital instruments, noting four clear reasons for the differences between the acoustic and digital paradigms.

1. A) Acoustic instruments—empirically driven, embodied engagement with materials
B) Digital instruments—top down—application of conceptual principles
2. A) Acoustic instrument design orientation—embodied
B) Digital instruments—symbolic mediation breaks this embodiment
3. A) Acoustic instrument skill formation —tacit knowledge through situated experience
B) Digital instruments —skill development tied to process of symbolic understanding
4. A) Acoustic instruments—inactive character — fixed design
B) Digital instruments —active character —understanding taken from the digital instruments designed affordances (p. 136).

To interpret this relationship into my practical context of improvising with technology and acoustic instruments, the performers needed to develop an interactive understanding when working with acoustic and electronic sources, an ability to switch modes of understanding, between instrumental embodiment and symbolic knowledge of the electronic devices. The design of the interaction between the acoustic and electronic is dynamic, evolving to fit new ideas and a personal developed understanding of spaces and musical ideas. Green also cites John Bowers comments on design of preferences, where Bowers notes that the “organisation of my playing environment makes things more effective for me, it gives clues to the legibility of my gestures, both for co-performers and audience. By moving from one side of the table to the other I can do different things and be seen [and heard] to be

doing different things” (Bowers in Green, 2011, p. 137).

What I have realised is the importance of developing a skilled practice at engaging in a seamless blend between the acoustic and electronic worlds. Green (2011) points to *agility* and *playfulness* as two potential ways to situate our understanding of this interaction, and uses them as potential points for reflective focus, and knowledge about the interaction in the performance ecosystem (p. 142). My interpretation of how these concepts can work for my musicians:

Agility	ability to adapt to the electronics not working as intended, or surprising sounds coming out, or technical inaccuracies occurring in the performance moment
Playfulness	responding to the surprising sounds of other musicians, using the electronics in unusual or creative ways, making sounds that are not expected from your instrument.

To prepare for the final stage of this research project—the recording—each musician needed to develop a level of usability and confidence for their new acoustic-electronic setup that facilitated fluid music making. The mental awareness of what the devices would do was needed, along with a visual and physical understanding of operation of the devices in the musical moment.

I wanted the devices that each performer interacted with to be relatively simple to control and not awash with a vast array of buttons or menus. The musicians need to focus on improvising, listening, making music and transforming sound, not trying to work out how to use the box in front of them. David Borgo (2010) envisions three paradigmatic ways in which a performer can engage with electro-acoustic improvised music:

1. Creating acoustic sounds
2. Creating electronic sounds
3. Manipulating acoustic and/or electronic sounds.

These roles can be performed separately or in combination, and in this project the music uses all of Borgo’s methods for electro-acoustic engagement. In this project the electronic and acoustic interaction is designed in the way that Bogo’s first way must occur initially. The acoustic sound is the source. Once this occurs there can be a fluid movement between ways one, two and three.

6.1.2 Balance

Developing the balance in each trio between the acoustic and technology based improvising required some thought about how the balance within each group already existed, and what the addition of the electronic sounds would do to this balance. In each of the ensembles, common roles of creating rhythmic, harmonic and melodic elements exist in the acoustic format, and fluidly shift, with each instrument using its aural properties to produce these musical elements.

Borgo (2005) reminds of some of key goals within an improvised music performance—“ensemble self-organization so that critical levels of complexity, responsiveness, and surprise can be reached and maintained over the course of an extended performance” (p. 81). The complexity in these groups is now increased, with each musician able to produce an extended sound palette, and the role of each musician and their instrument able to then shift in a more fluid way given the availability of these new sounds.

There is an inherent tension in the interaction between the acoustic and electronic. Borgo (2011) reminds us of how the “complex relationship between technological affordances and creative intentions can become even more involved in the context of a group performance” (p. 6). The sense of dissociation between the player and resultant sound in the audience, and the physical processes and resultant sound can also weigh heavily on the outcome. We have been careful to also take on board Borgo’s (2010) thoughts of moving away from the distraction of the technology. Research, change, new sounds and technologies are useful, but we need to be careful to not spend too much time negotiating new ‘interface’ environments, as opposed to developing knowledge, connection, and intuition within a more familiar one (p. 5). In Chapter Five, I outlined the devices chosen, and once again it is worth stressing that the project did not undertake an extensive testing process with many varied devices. We took Borgo’s approach in finding interface devices that worked and spent time developing individual and group coherency with them. Nicolls (2010) comments that when using gestural controllers, “what is disruptive or challenging is learning a new gestural language, whilst retaining pianistic control or freedom” (p. 52). This concept can actually apply to any device that requires a physical control, even a simple effect unit.

Individual control of both acoustic and electronic sounds must be high, or, as Simon Emmerson (2007) notes, the performer can lose the overall ability to control and judge the overall effect of the electronics (p.91). Emmerson also reiterates F. Richard Moore’s term of ‘control intimacy’, where the ability to control and articulate very small changes in

parameters, "demands a consistent and clearly perceivable 'cause-effect' relationship, in the 'right' proportion" (p. 94). This fine control over the resultant sound is critical, as without it the electronics cannot match the subtlety of the acoustic instrument. In a small group setting—in this case a trio—this is even more critical. Each sound is clearly audible, with each instrument carving out its own sonic space and contributing essential musical content to the resultant work.

Homes and Pender (2012) recall electronic music improvising as part of Paul Epstein's improvisation group in the 1970s, noting the importance of listening, and choosing the moment to make a contribution to the group sound. They identify their improvising process as:

1. Listening;
2. Reacting;
3. Augmenting (adding a sound to any fragment of what others were doing);
4. Creating new sounds, or fragments to explore (p.416).

I note a similarity here between their identification of process and McDonald and Wilsons (2016) research on individual choice during group improvisation. Even though McDonald and Wilson were working from a jazz background, as opposed to an electronic music background, similarities are clear. During the rehearsal development of the material I drew on Seddon's modes of communication during jazz improvisation—Instruction, Cooperation, and Collaboration. Verbal and non-verbal communication were used, with verbal communication during rehearsal phases giving way to non-verbal during performance. As Seddon (2005) notes, the collaborative verbal and non-verbal communication are key in facilitating the creative developments in the music's content. The level of empathy and attunement between the player is always important in improvised music, but with the addition of the electronic devices, I believe the group trust, and heightened listening is of increased importance.

6.1.3 Individual Testing

The testing process as outlined in Table 10 initially involved some individual sessions with each musician focusing on exploration of the electronic devices in freely improvised musical settings. The sessions focused on various pieces of each performers setup and occurred prior to the first rehearsals incorporating the electronic devices in each ensemble. I have presented a table outlining the process with vocalist Kristin Berardi. Similar tables

showing the individual learning process with the other musicians are located in Appendix six. Also contained in this appendix are selections of individual testing videos for each musician with annotations regarding the electronic sounds being utilised in the session. These can be viewed for an extra insight into each musician's individual sound development.

Kristin Berardi – vocals

Background

Kristin is a jazz singer, with very limited experience in using any type of electronic effects. In our early discussions Kristin mentioned being interested in developing skills for improvising with technology so she could use these concepts in solo performances in addition to the trio performances.

Setup reasoning

Initially Kristin talked about how the addition of technology would ideally enable her to considerably change her improvising processes. In the group Berardi/Foran/Karlen, Kristin's role is often one of melody maker, she sings melodies that are written, or improvises melodic parts. Often these melodies are harmonised with saxophone, supported harmonically by the piano, or sometimes, unaccompanied.

Kristin's first thoughts in using electronic effect devices was that it would enable her to create multiple layers, thus creating harmonic environments herself. This would immediately change her role in the group, and how the other musicians responded to her part. Up until this point Kristin has had no experience in using technology during performance, so this project is exciting for her.

For Kristin, we decided that a hand operated effect processor would be ideal. Being a singer, her hands are free, and we could place the effects unit on a table for ease of access. The RC-505 is a good choice as it combines multi part sampling and looping alongside multi-effect processing. It is also a fairly easy piece of hardware to manipulate, with clearly labelled soft pad buttons and wheels, so it is a good way for Kristin to immediately engage with the device. After selecting this device I chose complementary effect pedals that Kristin could use alongside it.

Learning process:

1. Explain and test functionality of the RC-505—focusing on difference between input and

track effects, and working through effect patches to find favourites, then saving these to the preset buttons for track and input effects.

2.Explain and test functionality for the Retro Sky Delay and Stargazer Reverb —focus on parameter control.

3.Explain and test overall signal flow through the pedals.

4.Explain the Voco Loco preamp—overall gain control, mute button and FX/dry microphone mix capability.

5.Free improvisation—using all pedals, experimenting with sound.

Table 7: Kristin Berardi – vocal electronic device learning process

6.1.4 Ensemble Rehearsals

Rehearsals with each ensemble occurred throughout the project, with various intervals of regularity, often occurring in the lead up to public performances.

Both groups are active professional ensembles, so rehearsing together is a common occurrence and in these sessions the newly created material for this project was workshopped alongside time spent freely improvising as a group, with the goal being establishing a greater sense of understanding regarding the kinds of sonic possibilities coming from each musician with their extended electronic-acoustic setup. Also, in moving the musicians from an individual testing session into a group environment, it forced all the players to consider their sounds in relation to the other musicians. These rehearsals assisted the groups moving confidently into each public performance at various venues in Australia and New Zealand.

6.2 Live concert performances



Figure 54: Berardi/Foran/Karlen performing at the QLD Conservatorium

Over the course of this research the ensembles Trichotomy and Berardi/Foran/Karlen completed a series of performances at various venues in Australia and New Zealand. The performances featured a range of material including:

1. Old songs reworked to include improvisation with technology. These were performed so the musicians could use songs they were very familiar with to gain more control over the electronics and try out a variety of ideas and sounds.
2. New material written specifically for this research—a selection of songs that I composed specifically for this project. The works created gave space to the electronic sounds, were composed through various structures as outlined in Chapter Two, and featured large improvised sections and open style forms to encourage exploration.
3. Freely improvised works—songs that are spontaneously improvised by the band at the performance.

Each performance featured material from every category noted above, with performances occurring at jazz club style venues such as JMI Live in Bowen Hills, Brisbane and The Jazz Lab in Melbourne; in studio concerts at Orange Studios Christchurch; through to concert style venues such as the Ian Hanger Recital Hall at the QLD Conservatorium, Griffith University. A table outlining the schedule of performances can be found in Appendix four.

These concerts were documented through audio and video recording, and a selection of material is presented here to give some context to the development of the sound of the music throughout this research. The recorded examples in this section are the same works presented in the final recording, and in this section, I present some short reflections by the musicians on several works.

It is intended that these recordings are viewed prior to viewing the final studio recordings and reading the final analysis, for they give perspective regarding how the groups have presented the music in live scenarios leading up to the studio recording. No situation is presented as the superior musical document, but rather the sequential nature of their enactment is of importance. The live experiences facilitated musician familiarity with the enhanced ensemble situation and the resulting analysis is completed of the studio recordings as this situation presents a higher level of sonic control in crafting performance of the music. Additionally the more detailed video capture of the studio recording session has enabled a closer inspection of the performer decisions and methods for sound creation. Links to the concert recordings are located in Appendix Four.

6.2.1 On the stage and in rehearsal

In creating this music the development of a personal and group style is critical to its success. The practice or rehearsal phase is best developed through repeated performance, “in context development and experience rather than isolated training” (Borgo, 2002 p. 174). The context development for these groups consisted of repeated rehearsals where each band would play through material repeatedly. This allowed us to test the electronics as a band, and repeatedly try improvised concepts in a group setting. Subsequently the performances enabled each group to implement the rehearsed concepts, ideas and sounds for an audience. For each group, these performances were the first time the ensembles had performed together publicly with each performer improvising with technology throughout the performance. Further to this, in these practical performance situations the relationship of the performer to the audience has been altered from the purely acoustic setting to one that includes a technologically modified acoustic instrument. These performance experiences are completely new for each musician, and are integral to confidence development prior to completing the recording session.

Schloss (2003) segments musical performance into three levels of control as articulated in the diagram below.

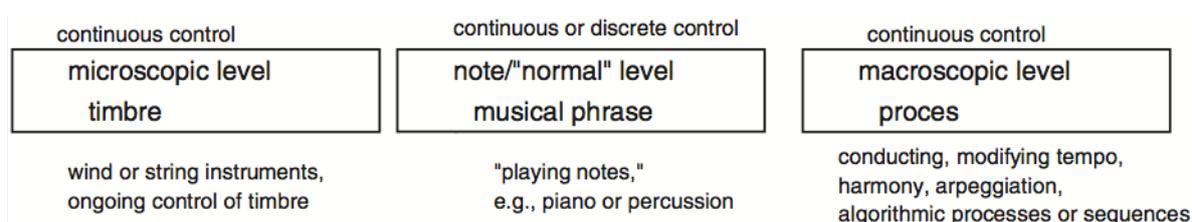


Figure 55: Levels of gestural control of music (Schloss, 2003, p. 241).

Further to the gestural control of the acoustic instruments in the music, there is the gestural control of the electronic devices on stage, which often involves micro, normal and macro level controls, and a continuous move between these levels. The interaction between the performers, their electronic devices and the music, and the interaction between the performers in the group all influence how smoothly and musically the technology-based sounds combine with the acoustic sounds. Through his research Schloss (2003) summarises some useful points in gestural control from the performance perspective:

1. Cause and Effect is important for the audience
2. Corollary - magic is good. Too much is boring!
3. A visual component is essential
4. Subtlety is important
5. Effort is important (performer)
6. Improvisation on stage is good, but 'baby-sitting' the apparatus on stage is not improvisation
7. People who perform should be performers, not programmers (p. 242).

During this project, there were no extended discussions on how to create engaging performances using technology for audiences. The focus was more on the music, and letting the electronics and the acoustic instruments serve the music. The above points however are worth considering, and in viewing the video recordings of the concert performances many of Schloss' elements are occurring naturally, a testament to the professional skill of the musicians and the inherent craft created in blending acoustic and electronic sounds. There is subtlety, effort and a little bit of group improvised magic.

6.2.2 Trichotomy live performances

The performances occurring over three years with the group Trichotomy allowed the band to develop a sense of a cohesive group sound and understanding of how to play with the

acoustic and electronic sounds on stage. For each performance the setup was similar, with each musician using the electronic gear as outlined in Chapter Five. For some performances a more streamlined setup was crafted, with selected electronic devices omitted, depending on the venue, setup time, and feel of the musician on the night. In this section I present reflections on a selection of the live performances, with the accompanying video recordings found in Appendix four.

a) Live recording #1: 'In Times Past and Present'



Figure 56: Sean Foran performing at the QLD Conservatorium

In this live performance of *In Times Past and Present* I find the piano introduction to be musically focused, and when I compare it to other recordings, including the studio session, I think the use of electronics created a cohesive and engaging start to the work. The looped piano introduction and bass delays create a beautiful sense of interplay with the acoustic playing. I notice that I accidentally trigger a pre-existing sample early at 01:26, but I disengage it quickly. These kinds of performance errors are the moments I am working to eliminate. The introduction section is lengthy, but it creates a powerful sense of atmosphere for the track, and it gives the musicians scope to explore sounds. Sam crafts some effective delays on the double bass, which seems to respond to the piano effects, and following this, John brings in some subtle delays on the snare to complement the delays occurring in the bass

and piano parts. His use of heavy reverb also creates a changed sense of space and distance in the work. Later on in the track each musician is working with loops creatively, with repeating fragments of material underpinning the music in the ‘piano solo’ section [06:35]. At times it is hard to discern which parts are live and which parts are recorded loops. This is ideal as the blend between the real and electronic is close. Of particular interest is at 07:33, where the bass looping delay part enacts a complete group change of rhythmic structure. Sometimes the loops distort the sense of group meter and harmonic stability, which is something that I think the group can continue to work on in future iterations of the track. However, the fractious nature of the acoustic and electronic worlds is challenging for the musicians—we are trying to maintain the unity of the sounds within the overall work, without one overpowering the other.

b) Live recording #2: ‘Reassemble’

In this performance of *Reassemble* the electroacoustic sound world moves from abstracted acoustic sounds to more strange, diffused and processed elements that challenge the listener to understand where and what each sound source is. The density and range of electronic sound fluctuates significantly through the track, with the performers constantly responding to the density of each other's creation of electronic elements alongside the composed musical content. The prominent electronic manipulations include spacial, time-based, frequency and textural changes. These changes create a wide palette of timbral colours, different to the acoustic instrument sounds, but complementary. Layered loops often enhance the timbre of the acoustic music, where the simultaneous performance of the electronic looped and natural sound creates additional harmonies and colours not present before.

The post-performance interviews with the bassist Samuel Vincent and drummer John Parker revealed some interesting comments regarding decisions made during the performance and thoughts on how they combine acoustic and electronic improvising. The interview sessions were conducted individually, with each performer watching a video of the filmed performance. I wanted the performers to comment on how they engaged their technology based improvising alongside their acoustic improvising and touch on the musical elements of the piece as needed. Bassist Sam Vincent notes the importance of listening to the ensemble balance—just as he would in a purely acoustic setting.

There's quite a lot going on in your (piano) playing and there's a lot going on in your effects, I don't want to trample on that because I want the audience to hear that the piano's doing something, not only is he doing something, but there's another dimension with this other stuff. I treat it as a piano centrepiece and I'm just going to add a background to that, a little atmosphere around the edges. So this is a thing where I'll use the loop station, and it's got two separate loops that you can do, so I set up two separate notes to create a chord, and then I bring the notes in and out.

As a trained double bassist and improvising musician drawing on a jazz and folk music backgrounds, the shift in a potential role in the music also plays a part in Vincent's response to the situation.

Sometimes I have in the back of my head this thought that if I'm not playing the bass part, then perhaps I'm neglecting my duty... but I think once I add these loops and other sounds, I get to be something else. I love that. It is so liberating, things like the reverb and crazy delays can really change the way I play.



Figure 57: Sean Foran and Samuel Vincent performing 'Reassemble'

Drummer John Parker mentions how the electronic devices allow him to significantly alter his acoustic drum sound while playing.

In the new section (B) I'm not sure what's going on here... ah hang on, yep I'm bringing some loops back, but I've brought the whole tempo down, so the sound is really changed, kinda gone into this granular sound. I've changed the pitch and tempo of everything... it's just a pulse type thing now. I'm not playing the drums anymore now, and I'm just feeding it back through the Kaoss pad again. It's cool... the sounds are nothing like the acoustic drums.

Parker also specifically mentions the importance of a free structure and the difficulty in accurately monitoring the sound, an ongoing challenge in performing this music across varied venues.

These sections are kinda open... you know, if you're locked into a form of a tune, um, yeah, it just doesn't feel like there's time to develop these ideas, just as it would be if I'm developing an improvisation on the drums normally... Also, there's the thing of

knowing how your instrument reacts to a certain acoustic. There are a lot of new variables with the electronics, as you're sampling the instrument, there's feedback, monitoring, all these things to think about. Some things work, some things don't. I think having these freely improvised and open sections gives you space to try these things out. When I listen back to this, I can hear how we are really able to augment how we play.



Figure 58: John Parker performing 'Reassemble' at the QLD Conservatorium

In reflecting on my performance I felt the challenge in continuously needing to take one hand off the piano keyboard to adjust parameters. I needed to change the way I improvise to allow the space and time to do this and also plan in advance the moments in the music where I can find the time to take my hands away from the keys. Using layered loops was effective in allowing me the freedom to move away from a repetitive pattern, facilitating my ability to play two handed chords over the loop, and respond to the electronic sounds coming from the bass and drums. Having two separate electronic layers—one with the hardware device *Organelle* and the other using *Ableton Live*—allowed me control options over the depth of the electronic sounds. I could bring effects in and out while others were playing, creating smooth textural transitions. Gesturally, the array of controllers was challenging, as I

am using various foot pedals—these are difficult to see under the piano—a gesture controller, iPad and hardware device. There are so many options in front of me, and it's important to not get side-tracked by choice. There is little time to be deliberating on what to use. In my performance I selected a few specific manipulations of the acoustic sound and engaged with them continuously. Much like an acoustic improvisation that develops, I feel there is musical worth in allowing the electronics time to develop with the music.

c) Live recording #4: 'Mercury'

There is a wide dynamic spectrum in this performance at Jazz Music Institute (JMI) late in 2017. I composed the track in mid 2017, so this performance represents one of the early live versions of the work. I have designed it to have an extensive amount of harmonic stasis, with scope for the trio to create significant abstractions of the harmony using the electronics. This is highly evident in the last three minutes of the track, with the electronic layers from each musician dominating the texture of the music. John moves away from the drums, lightly scraping some cymbals and drum skins, but significantly manipulating the sounds of the drums, creating layers of distorted, pitch bent sounds. Sam uses the Space Echo to create more distance in his sound, with re-pitched bowed layers sometimes sounding nothing like a bass. I find some piano samples and loops that have crept into the track, inventive in their melodic and rhythmic content. They connect with the playing of Sam and John in a complementary way and I also notice that I am spending a significant amount of time with one hand on the electronic controls. By having the confidence to take a hand off the piano, I am able to shift the electronic sounds more. I am also noticing my use of more foot control, as I record many of the piano samples via the foot switch into the Organelle or Ableton Live.

d) Live recording #5: 'Stream'

I am immediately struck by the sense of exploration in this performance. John's concepts at 02:00 are superb examples, where he is only working with the sound of the hi-hat, striking it, then using the Kaoss pad to manipulate pitch. This changes the role of the drums in the moment, creating another melodic part within the piece. Sam's confidence with the looped bass parts enables him to bring previous loops back in new sections of the song—evident at 03:36—where there is a seamless blend of live and recorded bass parts. I also work

with a similar idea and creating piano loops that I then improvise a piano solo over. My loops are more abstracted, featuring reverse and layered piano samples, with jarring filters and rhythmic stutters creating a shifting sound bed for me to play over. It sounds like the group overall is giving the electronics a significant amount of time and textural space in the music, giving them equal weight to the live sounds, and often taking time to develop the electronic sounds. There is a sense of confidence in the way the sounds are unfolding, or perhaps more of a confidence in how we can combine acoustic and electronic sounds without one dominating the other.

6.2.3 Berardi/Foran/Karlen live performances

Similar to the strategy used with the group Trichotomy, Berardi/Foran/Karlen engaged in live performances over three years, with multiple performances of the same material completed during this time. As with the Trichotomy performances, this section presents some performer reflections on selected performances.

a) Live recording #11: 'Double Take'

We had been on tour in New Zealand for a few days, with shows in Auckland and Wellington prior to arriving in Christchurch. The notable factor about this show was that it was at a recording studio in the main live room. There is enough space in there for an audience of around 30 people, but you get the benefit of it being a well-designed space for music, and the house engineer records the concert for you in both audio and video capacities. We had a suitable amount of time to set up and get a sound that everyone was happy with, plus the piano was in excellent condition and had a clear tone in the space.



Figure 59: Berardi/Foran/Karlen performing in Christchurch

In this recording of *Double Take* the introduction features a duet between piano and saxophone with the Organelle device sampling fragmented phrases from the piano and playing them back in reverse, (piano is using the *I Take Up* patch). There is no click track to play to, and the Organelle patch does not put the sample in any kind of tempo grid, so the phrases I have sampled were unpredictable. I am then attempting to play along with them and respond to both Rafael and the sampled piano. It is loose, and not rhythmically accurate at times, but the interplay feels creative. In the main introduction melodic riff Rafael uses an octave effect giving the saxophone more depth and dynamic impact, evident at 01:34. This works well here and suits the timbre of the instrument. In the saxophone solo, [03:36], I try more of the reverse samples which are more rhythmically unstable. This is not as successful in this section as the samples destabilise the phrases in a way that reduces the impact of the acoustic playing by both Rafael and myself. Also, in this section Rafael holds off incorporating electronics into his solo. In the vocal feature, [06:27] Kristin adds some reverb to her improvisation, but it is very subtle and barely noticeable. Overall, the work feels exploratory, but unstable from the perspective of the integrated electronic sounds. There are some powerful ideas, but they are not utilised or explored fully.

b) Live recording #12: 'Stretch'

At the same performance we performed the work "*Stretch*" which presents a more engaging blend of acoustic improvising and improvising with technology than what we hear in *Double Take*. By engaging, I'm referring to a more dynamic and textural use of the electronics that connect to the musical content through the work. It is a slower piece, so a little rhythmically and harmonically easier to get around for the musicians and has part of its structure utilising static harmonies, with limited chromatic chord movement, thus lending itself to ambiguous sounds and varied sonic directions in every performance.

The introduction (up until 03:22) of the work features the piano creating some layered loops embedding cascading delays. This creates an atmospheric pad for Kristin and Rafael to improvise with, and there's some interesting use of reverb and delay from both of them, creating a heightened sense of space and distance to the sound. It feels like they are moving further away from the audience, creating sound from an unfamiliar place altogether. Unfortunately, my control over the piano electronics was often messy. I was using the foot pedal to control the Organelle volume and changed the dynamics abruptly [01:07]. Further to this I was manipulating the delay time and repeat rate on the Organelle, and it overpowered the rest of the band [02:43]. At this moment I wanted the electronics to blend smoothly with the playing of Rafael and Kristin, not create a sudden jarring shift. In a post-performance interview discussing the work saxophonist Rafael Karlen comments on the textural blend;

There's some interesting interaction between us, and some engaging colours and textures. It got a bit tense in the beginning, which I liked. I'm not sure if it got a bit too busy, in hindsight, in the introduction. I like how we all went there, but I'm not sure if for an audience it may have sounded a bit indulgent. But I liked how we could get there.

Later in the track in the improvised section I used some modulating filters on the Organelle, [05:51] which sounding interesting, but really did not match the style of the work. I find it challenging to pre-conceive how the electronics will suit the musical moment—will the timbre of the electronic sounds complement the acoustic sounds of the band? For me, this performance was a lesson in choosing appropriate sounds for the track. Kristin continued to

embed heavy reverb, creating an effective distance to her voice [07:09]. In the last section I shifted to using a phrase delay with heavy repeats [08:30], which again, was interesting, but I'm not convinced that it enhances the music. Vocalist Kristin Berardi comments on the *flow* in the music, picking up on how the group had been performing together frequently, 'I don't remember it being as good as it sounds... it sounds like we are quite in the flow of it all. We're all being quite present and listening intently. We were playing a lot at that point, so when little things don't go the way you wanted, you're not thrown'.

This composition is designed to give space for the musicians to implement improvisation with their electronic devices, so there are sections of sparse harmonic material, as Berardi mentions, 'I guess I was feeling like there is a fair bit of electronics in there, but it doesn't sound like there's too much. That song is a good vehicle for it. There is part within the written form that lends itself to that (the electronics)'. Karlen adds to this touching on the ensemble control of the technology mentioning that

I don't think there were too many accidents. Everyone sounded comfortable and proficient with what they were doing. I guess the issue is always the same one of discretion. It's always a hard one. How much is too much, how much is not enough? That's always a shifting target from gig to gig and where things are in the set.

c) Live recording #13: 'Don't Fade Away'

In the first section of this work I am attempting to create some live piano looping, but the loops produced are just too soft to have any real musical impact. The acoustic piano overpowers them and there's not enough time to adjust them in a successful blend. Balancing the sound of the live piano with the sampled piano is challenging. However, once the piece develops into the improvised solo section, there is some collective improvising from all of us and a gradual growth of the textural density and dynamic intensity with the improvised electronics. Berardi uses reverb depth at 03:35 to create a thickness and emotional depth to her vocals that works well. This is mirrored by Karlen, whose long delay on the saxophone creates shimmering lines that blend with Berardi beautifully [04:22]. My piano part includes some live sampling via the Kaoss Pad that creeps in underneath my live playing. Additionally I am using some flanging style frequency shifts that pulse under the harmonies in subtle ways

[03:15]. Berardi pushes her sound further than usual in the melody after the groups solos engaging a modulating filter over her voice at 011:47. This creates an otherworldly sound to her vocals, it is surprising, but effective. The resultant sound is quite different from what I would usually hear from Kristin. There's a sense of confidence in the group during this performance, the electronics are not overused, but I'm hearing a more careful choice of sound from each musician. I would like to hear Karlen pushing more loops and samples as this would enhance the sense of interplay between his acoustic and electronic saxophone parts.

d) Live recording #15: 'Don't Fade Away'

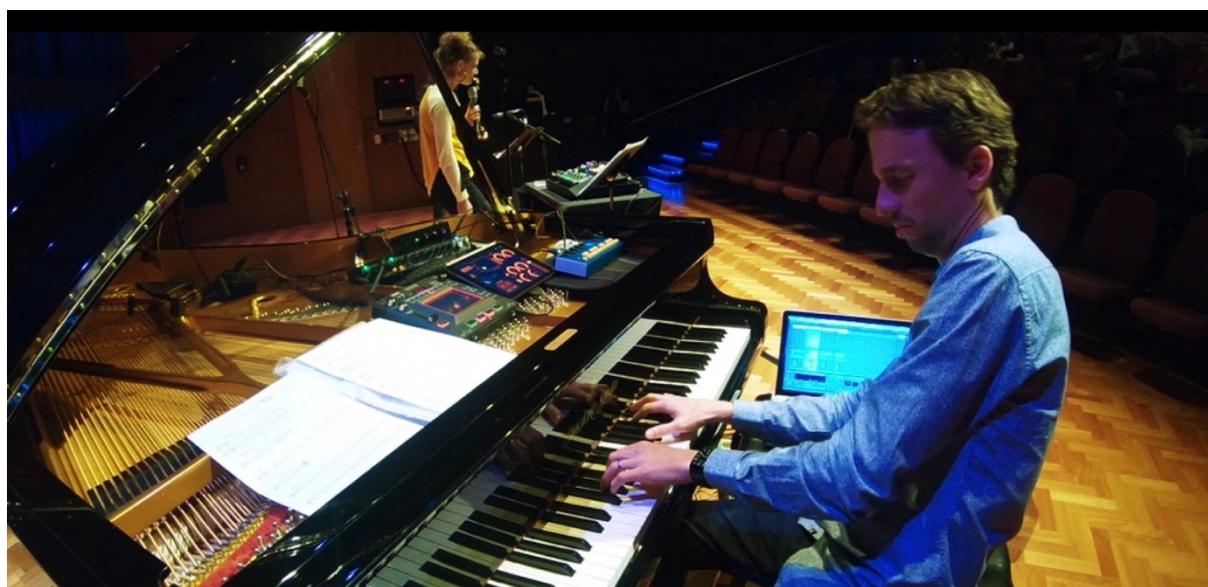


Figure 60: Berardi/Foran/Karlen performing at the QLD Conservatorium

In comparing this performance to an earlier recording from November 2018, there is evidence of more dynamic shifts and a smoother control of the entry and exits of the electronic sounds. In the introduction section I bring in some subtle piano loops that emerge from behind the acoustic piano and help to create thickness and a sense of depth. Rafael does something similar in the collective improvisation section [03:15] where he creates a sustained saxophone note underpinning the improvising. It is hard to hear at times, but helps create a new texture within the music not available in an acoustic setting. In this section Kristin uses gentle reverbs, that match the sustained sounds coming from the saxophone. Kristin also utilises some more varied electronic sounds, pushing the natural vocal sound to be something quite unnatural.

I remember using the wacky sound (7:08), and thinking... ohh, this is pretty out—is this cool or not cool? I could see my students looking at me and I could tell they were thinking—ohh, did you mean to do that Miss? It's interesting to notice that I wasn't sure things worked at the time, but now they sound like they did. Even the things that didn't work, well they actually do... but when you're in the moment you feel like it's such a big deal.

On the piano, the Organelle patch *Rhythmic Delay Distortion* is heard throughout the track, a consistent pulsing distorted sound that punctuates the music, creating a varied rhythmic framework. It doesn't match the rhythmic framework of the section, but creates a new polyrhythmic element which I think is interesting for the group. The main collective improvised section has a strong dynamic build, rising to a crescendo then falling away, with both Rafael and Kristin using their electronic sounds to add to the dynamic and textural change. I also notice that I'm able to make changes swiftly on the piano devices, evidence of some more developed physical control of them. Karlen picks up on the textural density, and raises concerns with the sounds becoming overpowering, noting;

sometimes the electronics enhance things. But in the solos, especially when we are soloing together, there's a danger of where the foreground is. It can all become a bit textural and not as focused, and that danger can become a bit exaggerated when the electronics are present. It can cloud that focus.

6.3 Chapter Conclusion

This chapter presented information on the process by which the two ensembles in this project moved beyond initial selection and testing of electronic devices, to using them on stage in series of live performances. The testing, rehearsing and performance process occurred over several years, with the music material created for this research performed multiple times for public audiences. This enabled the individual musicians and the ensembles to develop a greater sense of control over the technology, the musical material, and the combination of the acoustic and electronic improvising. Further to this, the performance

process facilitated the development of a group understanding of the electronic sounds, and how the group would improvise with these sounds in combination with the acoustic improvising. For Trichotomy this process allowed the group to create changing versions of the material at each performance, letting the set musical content—such as structure and harmony—shift in response to the use of the electronic effects. The performers found electronic effects that enhanced the improvised musical content, and utilised them in multiple performances in varied ways. In Berardi/Foran/Karlen, the performances gave the musicians scope to experiment with sound in surprising ways, creating varied emphasis on selected musical elements, composed and improvised. In this trio the performances forced the musicians to take chances with the technology, and adapt their usual performance style to include these new devices.

After developing the confidence on stage and reflecting on the success of the performances, the ensembles moved to the next part of the project—the studio recording sessions.

CHAPTER SEVEN: ANALYSIS THROUGH STUDIO RECORDING

7.1 Overview

After completing extensive performances with both groups, the next phase of the research was to complete a studio recording of the works that had been performed live. As outlined in Chapter Two, I developed a series of works in this research, with these compositions designed in various structures, using fixed and mobile forms, and standard lead sheet or graphic notation presentation. In addition to these structures, the groups performed freely improvised pieces of music at many of the performances during this research. This chapter presents an overview of the recording setup and process, explaining how each ensemble undertook their respective recording sessions. Subsequently, I present an extensive analysis of two selected works from each ensembles recorded folio. The analysis comprises a musical element analysis, a performer decision analysis for each musician, and an overall ensemble decision summary. I chose the tracks selected for analysis based on the density of electronic use and overall level of variety in the musical content created by each musician. The full decision stream analysis for each musician in the analysed tracks is extensive, often with the players making decisions on average every eight seconds during the pieces of music. The full transcribed analysis for each performer is in Appendix five and after reading the analysis in this chapter and viewing the recording, (located in Appendix one) the decision stream can be read to gain a complete understanding of the work analysed.

As explained in Chapter Three, I have captured the recording sessions in multi-camera video, as seen in Figure 61. This close multi-camera recording is critical in understanding where and how the acoustic and electronic sounds were generated, and should be viewed alongside the written analysis.



Figure 61: Still from multi-camera recording of Trichotomy studio session

This chapter presents an interrogation of the overall resulting decision analysis for each musician for the entire recording session, providing a more complete understanding of how they think about improvising with technology within the framework of their overall improvising process. Additionally, the ensembles are compared, enabling a synthesis of the similarities and differences between the performance decisions and styles of each group, giving greater context to how the ensembles have enabled acoustic improvising, and improvising with technology to coexist in their performing.

7.2 Jazz studio recordings

Jazz performances often feature spontaneous interactions between musicians, interplay with the audience, the venue, and the creation of an ephemeral social and musical experience. The improvised nature of the music suits a live setting, where both the musicians and audience members can feel the music more intimately than on a recording. In these performance settings, musicians engage with the space and work with their performance materials to create an engaging dialogic event (Jackson 2012). It may be easy to perceive that a jazz recording is inferior to the live experience; in that, a recording does not accurately capture or represent the true nature of the performance. It only represents one moment, or ‘take’ of the music, a partial representation of the music (Reynolds 2017; Schulling 2019). However, this does not present a complete understanding of the function of the recording for

musicians and audiences. Alongside this perceived inadequacy, jazz musicians use recordings to create highly detailed fixed representations of their work, or even an enhanced version of the live experience; these recordings serve as another mode of performance expression and form a critical part of their improvised music-making skill-set.

Reynolds (2017) cites pianist Vijay Iyer on the importance of recording, with Iyer saying how he can create layers and subtlety in the music that can be heard upon repeated listening, where listeners can find things they did not hear initially. This kind of close listening, and re-listening is rewarding, with the music designed to be experienced in this way. In this research project, the musicians are already using technological devices to create additional layers and sonic subtlety in the music, and a studio recording is an excellent medium to communicate this careful balance between acoustic and electronic elements.

Processes that musicians undertake in studio recordings of jazz vary, and techniques for recording jazz have changed significantly since the classic Rudy Van Gelder Blue Note recordings of the 1950s. Van Gelder modified the famed Neumann U47 microphone so he could place the microphone closer to the performers conveying more performance detail in the recording—developing a new standard practice (Crooks, 2012, p. 2). For many jazz styled recordings, the ideal can be to create an accurate sonic representation of the performance, while configuring the studio space to capture the musicians playing in a natural “live” way. Zagorski-Thomas (2007) recalls how in recording jazz musicians in studio settings they wanted to ‘play in an environment that afforded as much interaction as possible’; the listener should hear the music as real as it could be, free from technological intervention of the studio (p. 202). However, by its very nature, the recording process filters the performance and can only recount the performance to the listener (Crooks, 2012, p. 2). This paradigm is changing, as technological mediation in the recording process can enable jazz musicians to try new ways of performing, improvising and recording music.

Reynolds (2017) undertakes a thorough analysis of the process for jazz recording, production and release of the music, using extensive case studies of practicing musicians in New York. He outlines how many contemporary artists ‘use recording technologies as instruments of music-making unto themselves, which can, and do allow them to make music distinct from that which is or can be performed live’ (p. 129). These techniques are ubiquitous through contemporary music genres such as rock, pop, hip-hop and other commercial forms of music. Reynolds interviews Saxophonist Ben Wendel among others, with Wendel noting that recording allows you to produce ‘the music in a way that you couldn’t actually recreate live, whether it be with different effects through plug-ins, whether

it be through overdubbing and layering or manipulating the sounds of the instruments' (Wendel cited in Reynolds, 2017, p. 131). Kaveh Rastegar, bassist with the quintet Kneebody mentions production involving techniques such as sampling, splicing and effects processing added to material already recorded (Reynolds, 2017, p. 139).

These studio techniques, although they may appear contrary to traditional jazz recording ideals, are not new. Lennie Tristano's self-titled album "Lennie Tristano" released in 1956 involves the pianist recording multiple layers of piano parts, recording new piano tracks over existing rhythm section material, and added effects such as tremolo and echo (Jago, 2013, p. 3). Pianist Bill Evans' 1963 album, *Conversations with Myself*, also employs multi-tracking of improvised parts, with Evans recording layer upon layer of himself improvising; over himself.

In this research, the aim of these recording sessions were to generate a controlled environment where the bands could play the material in the same live manner in which they had at public performances. The recordings captured a live studio performance by each group, no post production studio techniques are utilised, with all the studio recordings capturing the live sound of the band as accurately as possible. All the musicians are playing their parts live, together and simultaneously. Many Trichotomy and Berardi/Foran/Karlen recordings are completed in a short amount of time, often setting up equipment on one day, and then recording over the next one, two or three days, depending on the amount of material to be recorded. I structured the recording sessions for this research similarly.

7.2.1 Trichotomy studio recording

After performing extensively with the group Trichotomy over the period from 2016 to 2019, we had amassed a level of familiarity with the chosen electronic devices that gave the musicians the confidence to move into the final practical stage of this research; the studio recording. The group Trichotomy have significant recording experience, having recorded 8 studio albums in the last 15 years, in various locations around Australia, and for this project we had recorded in our regular rehearsal studio at the home of our drummer John Parker in Brisbane. This space has been the regular Trichotomy rehearsal space for many years, and we have gradually gathered a range of recording equipment to enable high quality recordings to occur in this studio. When entering a recording studio the primary concern for this group is often the piano, but we are fortunate to have a Kawai GL-40 in the Trichotomy studio. The

sound of this piano is excellent, and there is adequate space in the room for the band to set up comfortably, as shown in Figure 62.



Figure 62: The Kawai GL-40 in the Trichotomy studio

Having played the piano extensively, I am familiar with its sound in the room, the piano action, and dynamic level. Similarly, John and Sam both know how their instruments sound in the space, giving a sense of comfort to playing together in this environment, and enabling a faster setup.



Figure 63: Lachlan Goold & John Parker setting up

The recording session took place on February first and second 2019 and was engineered by Lachlan Goold. Lachlan is an experienced engineer in both large format and DIY spaces, so was perfect for this recording. We configured the recording setup so that each musician used headphones with the sound containing a feed of their acoustic instruments and electronics. Given the small space the musicians would also hear their acoustic instruments naturally, as shown in Figure 63. As all the electronic sounds were only coming through the headphones, and not into the natural space of the room so we could gain greater control over the resultant mix of sounds and also request a specific balance between acoustic and electronic sound in the headphones. I felt confident that this controlled environment would give the material a differentiation from the versions we have performed live. I believed hearing the electronics more clearly would enable greater detail in the way we enacted them in the performance. The recording session is an opportunity to put into practice the skills acquired in combining the improvisation with acoustic instruments and technology in the most sonically controlled environment.

To facilitate the performer analysis of each track, I needed to film each performer from a clear angle that showed them playing their acoustic instrument and the electronic devices. This part of the recording setup was challenging. I had a camera on each musician, plus two back up cameras in case of camera failure. Keeping all the cameras running, starting

and stopping after recording each track, and ensuring that each camera was setup with appropriate framing required more focus than I had expected. I felt momentarily distracted from the music making when I needed to set up and monitor the camera recordings, but once the session was running all the cameras recorded clear footage.

As with most Trichotomy recording sessions, we wanted to keep the recorded takes of each track to a minimum. I find after a few runs through the work we lose the spontaneity, and it reduces the spark of the live performance. We agreed to keep all tracks to a maximum of three takes, with ideally only one or two being recorded. If the band were happy with the first two, we would not do another.

7.2.2 Berardi/Foran/Karlen studio recording

After learning from the experience recording material with the group Trichotomy, I felt more prepared heading into the studio recording with the second trio. I planned to record six songs in this session, the same number as in the Trichotomy session, and we had more studio time allocated. The breakdown of material was similar for this recording—four or five songs were works we had been playing live extensively, with one track a graphically notated work, and one to be spontaneously improvised.

Similar to Trichotomy, this group has been performing together for many years, having toured extensively around Australia, and has released two studio albums. The musicians in this group are highly experienced in recording studios, and we allocated two days to complete the recording. This would enable adequate time to set up audio and cameras. The studio for this recording was the main live room, Studio 4, at JMC Academy in Brisbane. This studio contains the same piano, the Kawai GL-40, as in the studio at John Parker's, thus it was a suitable option to ensure the piano sound would remain consistent across the two recordings. The JMC studio allowed more space for the band, the electronic gear and the cameras than what we had at John's and I also engaged a camera-woman to run the video this time, rather than taking care of it myself. This would reduce my stress as I would not need to worry about ensuring the cameras were located correctly and set to record.



Figure 64: Berardi/Foran/Karlen with engineer Addison Joy

We recorded on the 1st and 2nd of August 2019, with the session engineered by Addison Joy, one of the JMC Academy audio technicians. I had worked with Addison previously, and he has recorded several groups in the JMC studio, so he knows the sound of the room, and the gear included in the studio. I'd also recorded on the piano in the room previously, so had a sense for what to expect for the sound of the piano in the space. Similar to the Trichotomy recording, each musician setup the same electronic devices as specified in Chapter Five and kept them in place for the entire recording session, thus each track features the same electronic setup.

My electronics were the same as in the Trichotomy recording, although after setting everything up on the first morning I decided not to use the OWOW Wiggle Gesture controller. During the initial setup and recording tests, I felt like it was disrupting the way I play. Perhaps in a gig there is more scope to take chances, but on the recording I wanted to play my best and be a little more careful with how I controlled the electronics. Thus I left it on the piano in case I wanted to come back to it. Rafael also brought along a reverb unit, the MXR Carbon Copy Deluxe Analogue Delay pedal. Similar to his other devices, this is a floor controlled effect pedal, and features a tap tempo on the delay. Rafael thought he might integrate this into his setup during the two days, separating the Reverb and Delay functions

across two units, the MXR and the existing Roland Space Echo. Rafael has tested the unit, and felt confident he could include it in his setup without issue.

The session ran smoothly over the two days, with the sizeable space in the room advantageous for the group, helping reduce the spill from each instrument into other players' microphones. We setup as far apart as we could in the room, spinning the piano around so the lid was facing away from Rafael and Kristin. As with the Trichotomy session, cameras were setup on each musician, with a clear shot of the player using their acoustic instrument and electronic devices. This footage was crucial in ensuring the musicians could complete the decision analysis. The post-production process was the same as the Trichotomy recording, a bounce was taken of the audio recording, synchronised with the individual performer videos and played to the artists during their analysis session.

7.3 Studio recording analysis concepts

Emmerson (2016) discusses the difficulty for a listener in untangling the electronically produced sound from the acoustic. He asks the question of how the instrument/electroacoustic relationship enhances our experience musically— What are the musical effects of the operational tasks that perhaps we do not see? If we are only hearing a recording, we have no preparation for their arrival. Emmerson goes on to argue that the effectiveness of the cause-effect link “adds considerably to the performers control and hence freedom and expressivity” (p. 347). When the control intimacy between the performer and the hardware/software/acoustic instrument is of a high level the musical output is enhanced, for a musical experience most true to the vision of the composer and performer, or as Emmerson says, a “sense of enhanced relationship emerges” (p. 347). In the following analysis of works in this project, inspired by Emmerson, I do not aim to untangle the acoustic and electronic sounds, but more to articulate how the acoustic and electronic sounds are combined by the performers in a way that creates an extended sound world, a rich musical experience of acoustic and electronic sounds. The analysis engages multiple perspectives and structures.

1. Listener perspective—analysis of the acoustic, electronic parts and musical elements.
2. Performer and composer perspective—Scored representations of the music, devices used, compositional intention and process.
3. Performer perspective—decision streams and analysis.

As mentioned in Chapter Two the reflective analysis involves four clear sections, with two songs analysed for each group. I chose two works from each group after listening to the entire recording session and selecting tracks that I deemed dense in both the acoustic and electronic elements, allowing for a comprehensive analysis of these elements alongside the performer decision streams.

Analysis Categories

1. Musical elements—the musical material content and compositional intentions.
2. Acoustic and Electronic elements—the use of acoustic and electronic sounds, and the role of performative and operational tasks in the work.
3. Performer decision analysis—the analysis by each musicians of their decisions made throughout the track coded in 4 categories.
4. Ensemble decision analysis—resultant analysis of how individual decisions streams align to create shared ensemble decisions and direction.
5. Overall reflection on the work—thoughts on the effectiveness of the acoustic/electronic combinations with comparisons to previous live performance versions of the work.

In this section it is intended that the video recording and scored elements are viewed alongside the written analysis, with these graphic elements intended to assist in clarifying the comments made in the reflection. The scores and full transcribed decision stream for each musician is presented in Appendix two and five, and for a deeper understanding of each performers thoughts during the recording, this can be read while viewing the video recording. An extractt of one of the bass decision analyses is shown below for reference.

Time	Stream	Comment
0:02.932	Material	I'm thinking that I try a new approach to the start of the song... so I'm going to play some melodic fragments straight away, and a good effect with that is the SLICER... it's gives a Tremolo type sound and I cuts up what I'm playing.
0:15.500	Interface	Slider on - just little bits of the melody that I repeat.
0:37.265	Material	And I gradually add some more of the melody.. I'm wondering whether I should start to follow the chord progression, but I'm not sure what Sean is planning to do.
0:48.500	Material	And now the full melody comes out, and I'm kind of sharing it with the piano and alternating to the bass line.

7.4 Trichotomy analysis

Access link to recordings:

<https://www.dropbox.com/sh/2v7hj2d5yarp29t/AAAMxAan2BoXTMDIYv86UhSSa?dl=0>

7.4.1 'Reassemble'



Figure 65: Sean Foran and Samuel Vincent recording

A) Musical Elements

Reassemble was composed in late 2016 and is a composed work, with improvised sections and a fixed form. The piece has been scored in a lead sheet format, featuring a written melody and chord symbols, and the band uses visual cues to move through each section of the music. Each part of the form is of an open length, with the band collectively working to develop a moving dynamic and textural sense of change that pushes the music forward. It consists of five sections, with no part of the form ever returning to be played again. In composing this work I wanted to give it a rhythmic focus, to creating content for John and Sam to work with that enables improvising over some set rhythmic patterns. Thus the piece is heavily based around rhythmic riffs with similar rhythms but changing notes and harmonies. The repeating rhythmic nature over relatively static harmonies give scope for the players to develop looping ideas and parts that engage with the harmony, and create dissonance against it. Importantly, in the C section there is no indication of harmony. Perhaps

it is implied that the harmony is similar to what comes before, but the upper register piano motive as seen in Figure 66 can be underpinned by a variety of low end harmonic foundations.



Figure 66: excerpt from *Reassemble* - C section

This kind of harmonic ambiguity gives Sam scope to rethink his role in the trio, creating varied parts that accentuate or distract from the harmonic situations. In this part of the work the harmony can move in a variety of directions as dictated by the players at the time.

Reassemble - musical form

Introduction	0:00-0:46	Drums commence, groove playing with subtle electronics (mostly delay effect), improvised muted piano
A section	0:47-1:33	Entry of double bass playing fragmented and developed version of bass line, doubled by piano, also with piano improvised right hand parts over the bass line. All musicians incorporating technology in their performance throughout this section. Gradual dynamic increase and increase in rhythmic playing density.
B section	1:33-1:58	Played as written with loud dynamic and dense texture.
C section	1:58-3:35	Sudden dynamic and textural change, piano plays treble written line and engages looping/sampling. Gradual addition of bass and drums with sampled/looped parts and various electronic effects.
D section	4:26-5:21	Soft dynamic transition into D, piano improvised RH material over harmony. Bass creating pad like drones using electronics, drums playing mostly electronic and not acoustic sounds, combining textural sounds and rhythmic parts.

E section	5:21-6:36	Smooth transition into E, bass moves to completely electronic performance (with samples containing pitch and tempo shift) similar to drums, at this point the acoustic piano is the only instrument playing a live acoustic part.
-----------	-----------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 8: *Reassemble* – musical form

Score

The score for *Reassemble* indicates what was given to the performers for the recording session. It presents the work in a standard lead sheet style format, with some basic indications of form, harmony and melody parts. There are no indications regarding direction for use of electronics with the performers free to improvise these sounds. Additionally the drum introduction is not present on the score, this was improvised by John, a part developed over repeated concert performances of this work. There is also no indication of tempo or feel, as the group has collectively decided on this, and it is not needed on the score.

The full score can be found in Appendix two.

Acoustic and electronic elements

Acoustic elements:

1. Drums—Even though it is not indicated on the score, the drums start the piece setting up the tempo and rhythmic feel of the track. Once into the B section the acoustic drums take a more abstract role, moving away from creating rhythmic drive and playing a more broken and fragmented rhythmic feel, connecting with abstract electronic sounds on bass and piano. The acoustic sound is often recorded and replayed in new ways through the RC-505.
2. Piano—the piano part provides a melodic and harmonic role. I am playing a combination of melody, bass line and harmony throughout the work. These acoustic elements contribute to clearly defining the section changes of the work.
3. Bass—Similar to the piano, the bass acoustic parts perform bass lines and upper melodic roles, and similar to drums are also recorded and replayed in new contexts via the electronic devices.

Electronic elements:

The use of improvised technology throughout this track is consistent. The opening

drum introduction uses electronic sounds to enhance the acoustic groove performed by John, and through to the end of the work electronics are still present with the bass and drums performing without their acoustic playing, completing focusing on the technology driven sounds. Table 11 gives a summary of the electronic sounds used throughout the work.

Effect type	Piano	Bass	Drums
Spacial: reverb, panning, flanger, tremolo.	Reverb added to enhance depth and sense of space.	Flange type effect added to bass lines at times, <i>Slicer</i> tremolo style effect.	Heavy reverb used, especially on snare to create a sense of spacial differentiation for the drum kit.
Time based: loop, delay, freeze, reverse, slow-down.	Short loops created of piano melodies (C section), Reverse delays.	Loops created and modified through speed adjustment and pitch change.	Looping of live drum parts, including reverse loops.
Frequency: filters, transposition, modulators, chorus.	Frequency modulators creating pitch transposition (introduction/A section), Pitch shifting.	Pitch change of looped sections create a new sense of harmony—especially evident in the E section.	Modulation and filtering to distort and crush drum sounds.
Textural: density changes.	Sampling of piano notes to create harmonic pads to play over.	Harmonic layering to create density, using sampling of bass notes.	Use of multi-part looping to create denser drum texture than acoustic performance.

Table 9: electronic sounds used in 'Reassemble'

Performative and Operational tasks

The recording of this work highlights the constant combination of performative and operational tasks by each musician. There is a consistent shift back and forth between performative and operational allowing real time control and adjustment of sounds. When

viewing the split screen video recording I am amazed at the amount of physical movement occurring by each of us, we are doing so much more than just playing our instrument. Each musician has a physical flow, shifting through a range of acoustic instrument performance techniques and electronic device controls, sometimes not playing their acoustic instrument at all and spending time adjusting the electronic devices to control the electronic sounds that are occurring in the moment, or preparing some for future use.

Task	Piano	Bass	Drums
Performative	Control of modulation depth via gesture controller. Live looping of piano part, controlled via foot and adjusted via hand.	Live looping while playing acoustic bass.	Adjusting of delay effects while performing acoustic drums. Live looping while playing acoustic drums. Adjusting modulation effects of electronic loop.
Operational	Effect on/off through foot and hand controllers. Scrolling to select loop record patch on Organelle.	Preset of flange effect on Boss unit. Changing loop style for playback—speed, direction.	Pre-setting delay and modulation effects prior to triggering previously recorded loop.

Table 10: Performative vs operational tasks in 'Reassemble'

As is evident in the video recording and noted in Table 13, there is a blend of performative and operational tasks. Operational tasks are usually short actions and involve the brief selection of device, patch or effect parameter. Many of the musician engagements with the electronics are occurring while the electronic sounds are live, with the musicians manipulating the live sound they hear, a performative control. Occasionally I note that enacting an operational task can delay some of the live playing, and have some small effects on the rhythmic accuracy of the playing. Continued development of swift physical control of the acoustic instrument and electronic devices is needed here to enable consistency.

Performer decision analysis

A. piano

When analysing the piano performer decision stream some interesting insights can be gained. The obvious starting point is the prevalence of interface decisions that are being made, with over double the amount of interface decisions over any other category. The formal decisions are very low in occurrence, and mostly align with section changes, with not much thought given to formal changes and development otherwise. Decisions occur on average every eight point eight seconds, with a total of 44 decisions over the six and half minutes (shown in Figure 67). The total numbers of decisions for each category are: Material – 9 decisions, Formal – 5 decisions, Interface – 22 decisions, Interaction – 8 decisions.

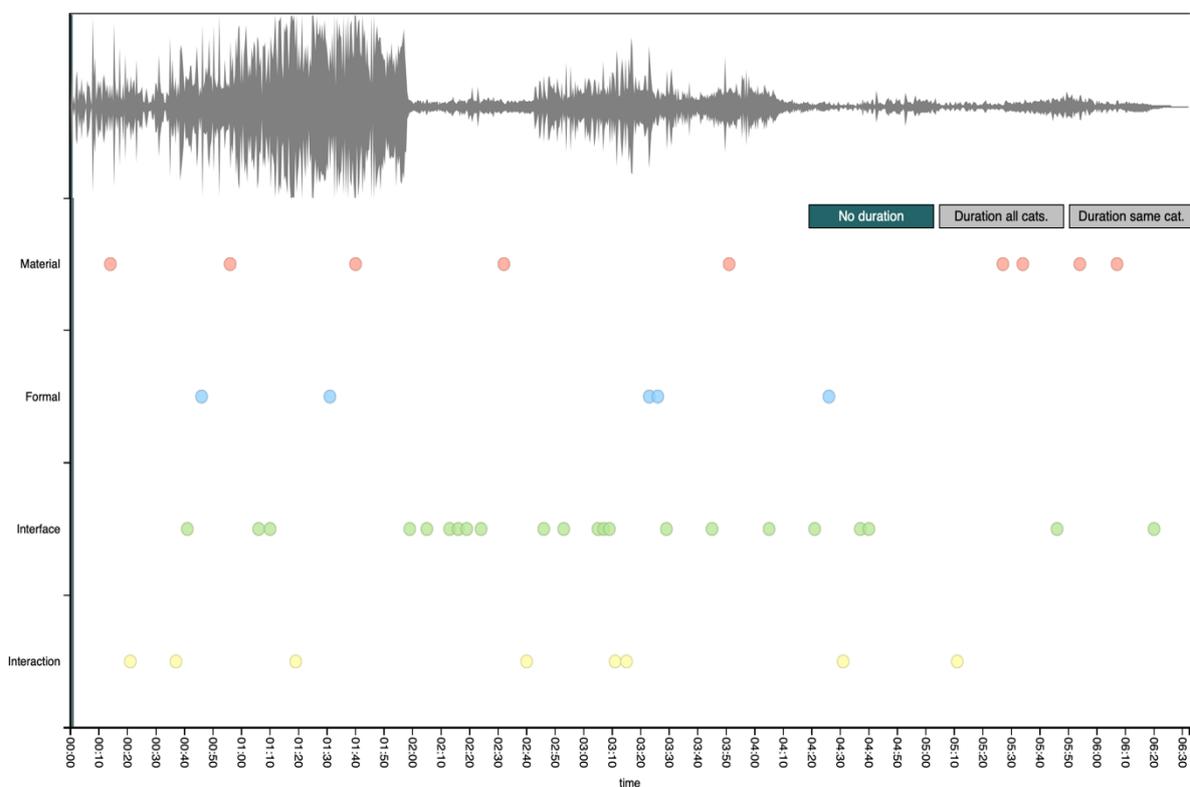


Figure 67: piano ‘Reassemble’ decision analysis showing decisions over time

As mentioned, there is a prevalence of interface decisions, but I also identify a repeating material > interface decision pattern. I think what’s happening here is that I setup some musical materials and then work with these using the various electronic interface devices. After most material decisions there is often an interaction decision and then a cluster of interface decisions, or sometimes a material decision then straight to the interface cluster.

Towards the end of the piece the formal and interaction decisions stop and I

specifically focus on material and interface decisions. This is mirrored in the other musicians, and reflects a sense that the work is coming to a close, so there's an opportunity to focus inward on the musical material and electronic sound in the final moments of the track. In analysing the decision stream language the word 'loop' is found ten times, second only to the word 'effect'. The C section of the work revolves around looped material, so this response aligns with the musical content.



Figure 68: The author, Sean Foran at the piano during the Trichotomy recording session

B. double bass



Figure 69: Double bass electronic setup during recording

The bass analysis is similar to the piano in that the interface decisions feature the most heavily. However, the material decisions are also high in number, with both decisions occurring in clustered groups throughout the work. There are 45 decisions over the six and a half minutes, on average one every eight point six seconds. This is very similar to the piano decision density. The flow of decisions is also to be noted. Vincent starts with mostly material decisions, moving to mostly formal and interface decisions, followed by mostly material again, finishing with interface and interaction. Many of his decisions connect with the other musicians, which will be explored in the ensemble decision stream analysis. Similar to the piano stream, formal decisions occur infrequently, with only seven occurring. However, interaction occurs eight times, but often interactive decisions are occurring through interface decisions - as seen from 02:39-03:35, as seen in Figure 70. The total numbers of decisions for each category are: Material – 14 decisions, Formal – 7 decisions, Interface – 17 decisions, Interaction – 8 decisions.

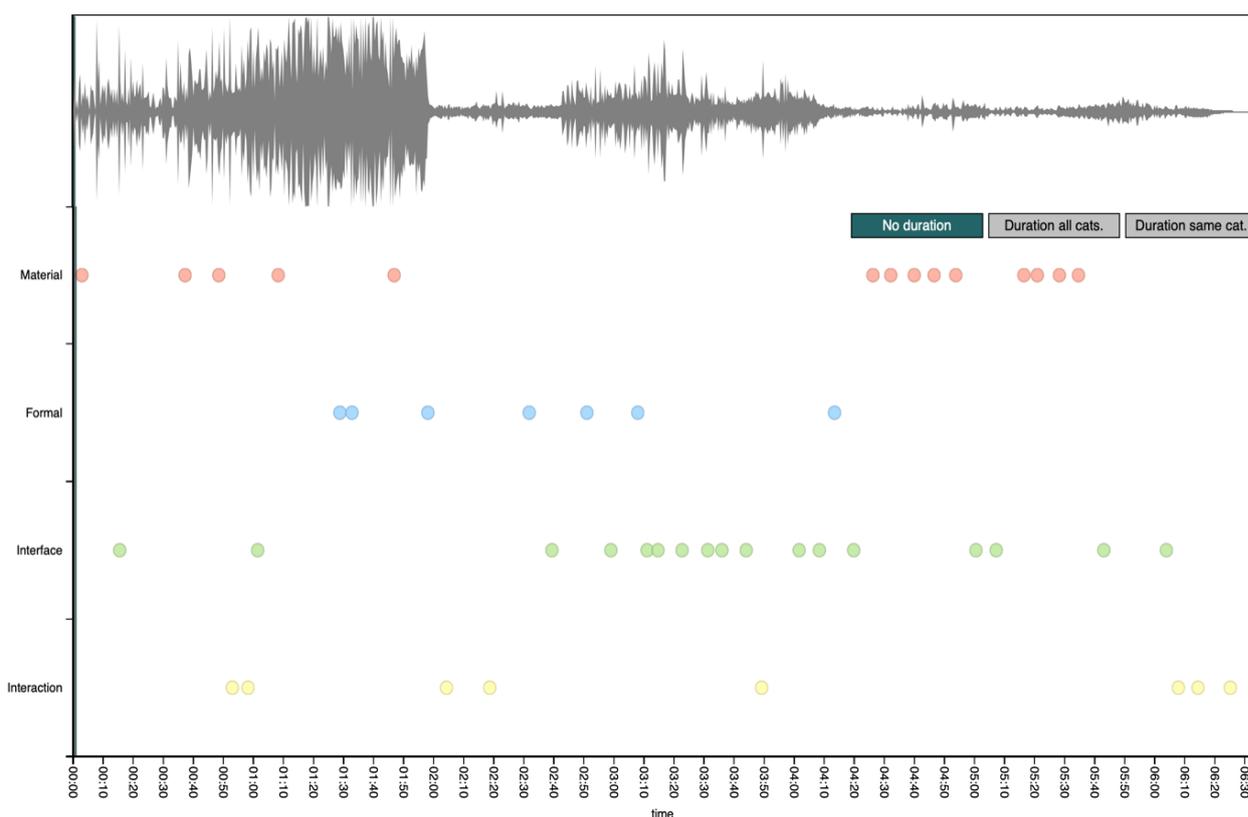


Figure 70: double bass 'Reassemble' decision analysis showing decisions over time

In analysing the decision stream language the word 'loop' is found 15 times, significantly more than any other. The second most common word, 'slicer', only occurs four times. This points to the emphasis Vincent places on the use of the loop function in his

electronic performance and the slicer effect found on the Zoom bass effect unit.

C) drum kit



Figure 71: drum setup during the Trichotomy recording showing placement of devices

The drum part features the highest density of decisions, with 61 occurring over the track, on average one every six point three seconds. The interface decisions far outweigh the other categories here, with double the amount of any other. However, material and interaction both contain 14 decisions each. Similar to the piano, the formal decisions are low in occurrence, with only 6 occurring. Similar to the bass stream, the decisions occur in clusters, with Parker beginning with mostly interface decisions, moving to material and then back to interface, as shown in Figure 72. Interestingly, from 02:49 the material decisions mostly cease. Parker focuses on how he can use interface and interaction decisions to create musical interest. The total numbers of decisions for each category are: Material – 14 decisions, Formal – 6 decisions, Interface – 28 decisions, Interaction – 14 decisions.

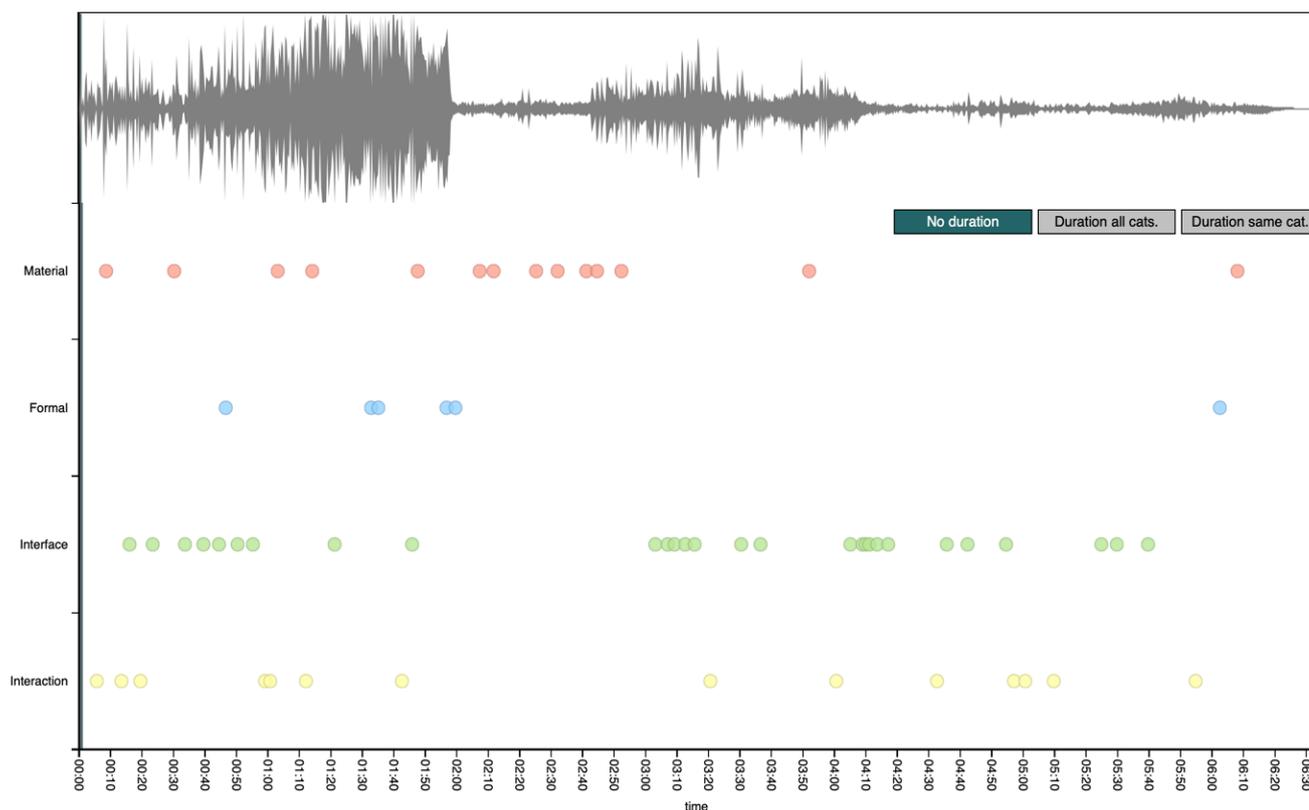


Figure 72: drum decision ‘Reassemble’ analysis showing decisions over time

In analysing the decision stream language the word ‘loop’ is found eighteen times, far more than any other. Second to this is the word ‘piano’, eleven times. This points to John’s heavy use of looping in the performance, but also his interaction with the piano part throughout the performance.

“Reassemble” - Ensemble decision analysis

Each performer completed their decision stream analysis individually, and the resulting decisions streams have been overlaid to find commonalities in decision making, and evidence of transition patters, density. The most striking feature is the group alignment of interface and material decisions from 02:32 – 04:32. This is the C section of the work, with limited composed musical material in the section, just some short melodic motives. This gives the performers some stimulus to explore the music using acoustic and electronic sounds without the boundary of dense composed material to navigate. There is also evidence of the appearance of some patterns across the group where one musician is emphasising material decisions while another emphasises interface or interaction.

Reassemble - Overall reflection

The structure and content of “*Reassemble*” gives scope to the inclusion of acoustic and electronic improvising in a fluid way. The composed musical content has some detail, but is not overly complex—in terms of harmonic, melodic and rhythmic components—and often performers are free to choose how they can interpret the content provided on the score. The C section worked particularly well as the melodic material was transformed through the use of electronics creating sounds that were surprising. When I listen back to the recording I’m often wondering who is making what sound, and I hear subtle layers appearing that create dynamic, textural and harmonic interest. Figure 73 highlights the emphasis the performers have given to interface decisions, with this category containing double the amount of any other decision category.

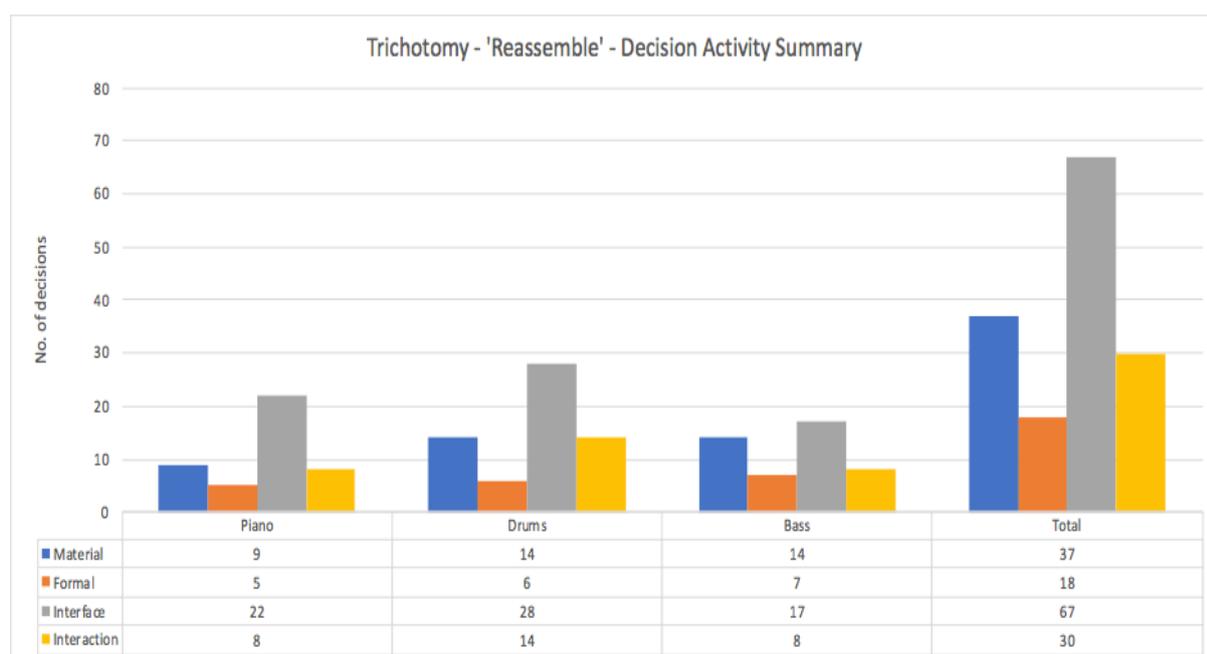


Figure 73: Graph indicating band decision analysis for ‘Reassemble’

On working with the technology

Utilising technology in this work extends the acoustic musical content in a number of interesting ways. I particularly notice the horizontal rhythmic extension where rhythmic concepts are stretched over longer periods of time, filling time in fascinating ways and allowing the musicians to create varied rhythmic patterns against their own parts, and the part of others. Additionally, the sense of vertical textural enhancement allows the players to

playing contrasting patterns—using varied registers or tone colours—continually, while keeping a consistent sonic bed throughout the track. The use of technology allowed the group to maintain interest in sections with static harmonies, through the shifting sounds created by the acoustic and technology based interactions.

In comparing this final studio recording to previous live performances at JMI Live and the Ian Hanger Recital Hall, there are some elements to note.

- a. The JMI performance contains only the A section, with an extended introduction, featuring extensive melodic frequency modulation using distorted arpeggiating figures over a rumbling drum set and layered bass drones. I'm also using the gesture controller and engaging a reverse effect on a piano sample, which is quite effective. The transition into the A section piano groove from the free time introduction works neatly. Similar to the recording session John is creating layered drums grooves to thicken the percussive parts.
- b. The Ian Hanger performance starts with piano using a similar arpeggiating intervallic displacement effect, and Vincent creating layered drones on the bass. Again this introduction is quite extended, with Parker providing rumbling reverberant drums over the piano parts. Parker then moves to layered grooves in the A section
- c. The C section where the cluster of interface decisions occur in the studio recording seems to contain similar amounts of interface type performance, however it can be seen that in this section Parker stays more within a material type of performance, with less electronic interaction.
- d. The live performances are engaging, but structurally are not as effective due to lengthy improvised parts on each section. The length of the work overall in the live concert performance causes it to lose some focus. The recorded version is more concise.

7.4.2 'Stream'

Musical Elements

Stream was composed in late 2016 and is a composed work with improvised sections and a mobile form. The piece has been scored in a lead sheet format, featuring a written melody and some sparse chord symbols. The score does not include directions on form, as

once the players reach the end of the notated section there is no information on improvised structures. This is intentional, with the work being open for performer interpretation in terms of the improvised sections proceeding the main melody. In concert performances *Trichotomy* have often changed the form, moving between multiple repeats of the main melody, freely improvised parts, and repeated harmony sections (indicated by the ‘repeat this for Coda’ section marking on the score). The musical element that underpins the work is the opening piano ostinato, played at first by the piano, but later taken up by the bass (Figure 74). This ostinato provides a rhythmic framework and sets the tempo of the track, with both piano and bass using this element as a generator for electronic parts. The melodic content is simple, a descending melody repeating, with various intervallic additions and varied endings to the melodic phrase over the 33 bars.



Figure 74: excerpt from *Stream* lead sheet - opening piano ostinato

***Stream*– musical form**

Introduction	0:00-01:14	piano starts solo, performing the ostinato, before sampling and looping it. Bass and drums gradually enter with heavily effected parts, creating textural sounds.
Main Melody - Bar 3	01:14-02:22	Bass performs the main melody, unprocessed acoustic sound, piano continues with ostinato and some harmonic accompaniment. Drums blend dry and processed sounds.
Improvised section	02:22-03:08	Bass starts with the ostinato, performed acoustically, Pizzicato, before looping it. Bass proceeds to add Arco parts over the looped riff. Piano improvises a ‘solo’ type part.

Melody - piano version	03:08-03:58	Piano brings the melody back over the looped bass ostinato. Melodic presentation is performed in more free time. Bass performing Arco 'pulses'.
Coda	03:58-05:44	Piano loops bars 21-25, creating a melodic coda. Drums loop and layer rhythmic grooves, bringing in and out effected drum parts on top of the looped drums.

Table 11: *Stream* musical form

Score

Stream is scored with bass and treble clef notation. The opening ostinato is scored for treble clef, but the remainder of the work is in bass clef. It is intended that the double bass performs the notated melody. There are also intervallic harmonies indicated below the melody which act as a guide to the harmonic progression, as there is limited chord symbol notation. The one page score has no further information on form, the group are free to interpret the overall form as they like. Trichotomy have often performed the work by playing through the notated page twice, varying which instrument presents the melody, followed by a looped Coda section over notated material or freely improvised.

Acoustic and electronic elements

Acoustic Elements:

1. Drums—The drum part is less dense in this work than in *Reassemble*. John often performs at a low dynamic level, creating a soft rhythmic pad, sometimes busy, sometimes sparse. There is a focus on cymbal sounds, with John using various types of sticks to create varied timbres from the cymbals. These sounds are processed by his electronic devices.
2. Piano—There is a greater rhythmic focus for the piano in this work, mostly due to the ostinato part entering in the first bar and returning throughout the track. The piano also presents the main melody, subsequent to the arco bass performance of it. The piano version of the melody is performed with a kind of rubato style, drifting on top of the drum and bass parts, at times connecting and at other times operating in its own time scale.
3. Bass—Similar to the piano, the bass acoustic part utilises the ostinato pattern extensively, but Sam uses Pizzicato and Arco playing effectively, running both of

these live performance techniques through his electronic devices.

Electronic elements:

The use of improvised technology throughout this track is subtle, and the video recording is especially insightful in determining when parts are live and when they are sampled and loops moments of the music, returning in new ways to add texture, space and dynamic to the music. As the title suggests the electronics have a kind of ebb and flow to them, washing in and out of the music. Fragments of looped bass, piano and drums fade in, to feature in the foreground, before fading away quickly. The balance between the electronic and acoustic parts is often very close, and I find it often hard to determine which parts of each musicians sound is live acoustic performance. The electronics, although often rhythmically loose and not completely metric, have a human kind of rhythmic suppleness to them, never sounding too robotic or contrived.

Effect type	piano	Bass	Drums
Spacial - reverb, panning, flanger, tremolo,	Subtle reverb added to enhance depth and sense of space.	Reverb used on arco sections, creating non bass type soundscapes and softening the arco attack.	Subtle reverb used, especially on cymbals.
Time based - loop, delay, freeze, reverse, slow-down, speed up	Short loops created of piano improvised melodic parts. Delay used on end of phrases at times, and on looped material. Manipulation of delay time and depth, rhythmic <i>beat repeat</i> style rhythmic delay.	Loops used with pizzicato parts, reverse delay, slow attack on pizzicato notes stretching the time.	Looped drum grooves used, manipulation of samples - reversed cymbal sounds, live altering of sample tempo. Tap tempo aligned with song tempo.

Frequency - filters, transposition, modulators, chorus	Frequency modulators creating random pitch variance, <i>Grain Shifter</i> effect to distort and crumble the piano.	Arco playing with filter creating swirling washing sound.	Modulation and filtering to distort and crush drum sounds, pitch shifting (especially on cymbal sounds).
Textural - density changes	Layers of sampled parts create textural density and harmony.	Looped bass arpeggio enabling live playing over the loop.	Live playing over drum loops creates denser texture.

Table 12: electronic sounds used in 'Stream'

Performative and Operational tasks

Tasks in this track are mostly performative, with the operational tasks limited to setting up some loops—drums, bass and piano—and John can be seen making some small adjustments to his microphone position on the hi-hats. The performative tasks are consistent, with the piano and drums constantly moving through a variety of electronic devices, turning sounds on and off, setting and adjusting loops, and creating textural sounds to play live acoustic parts over.

Task	piano	Bass	Drums
Performative	Live sampling and looping of piano part. Manipulation of delay time and rate.	Live looping while playing acoustic bass.	Adjusting of delay effects while performing acoustic drums. Live looping while playing acoustic drums.
Operational	Scrolling to select loop record patch on Organelle.	Preset of reverb for arco melody. Preset of loop	Adjusting microphone position to capture Hi-Hat closely.

	Selecting Kaoss pad patch.	recording functionality.	
--	----------------------------	--------------------------	--

Table 13: Performative vs operational tasks in 'Stream'

Performer decision analysis

A. piano

Similar to the work *Reassemble*, this work features a heavy amount of interface decisions, with 22 decisions made in the 05:44 track length. The other streams had less than ten decisions in each. There are 43 decisions made in the track, an average of one every eight seconds. The inclusion of sparse musical content—the melody is simple and there is limited harmonic content—may account for the prevalence of interface decisions throughout the work, as it was designed to give space to improvise with the technology and acoustic sounds. There is a clump of interface decisions from 02:37—03:27, shown in Figure 75, this being the part in the form where the bass has the looped Pizzicato ostinato. In this moment I’m improvising some piano melodic and harmonic content, and I think the interface decisions here are setting up the piano part for the rest of the work. The total numbers of decisions for each category are: Material – 8 decisions, Formal – 6 decisions, Interface – 22 decisions, Interaction – 7 decisions.

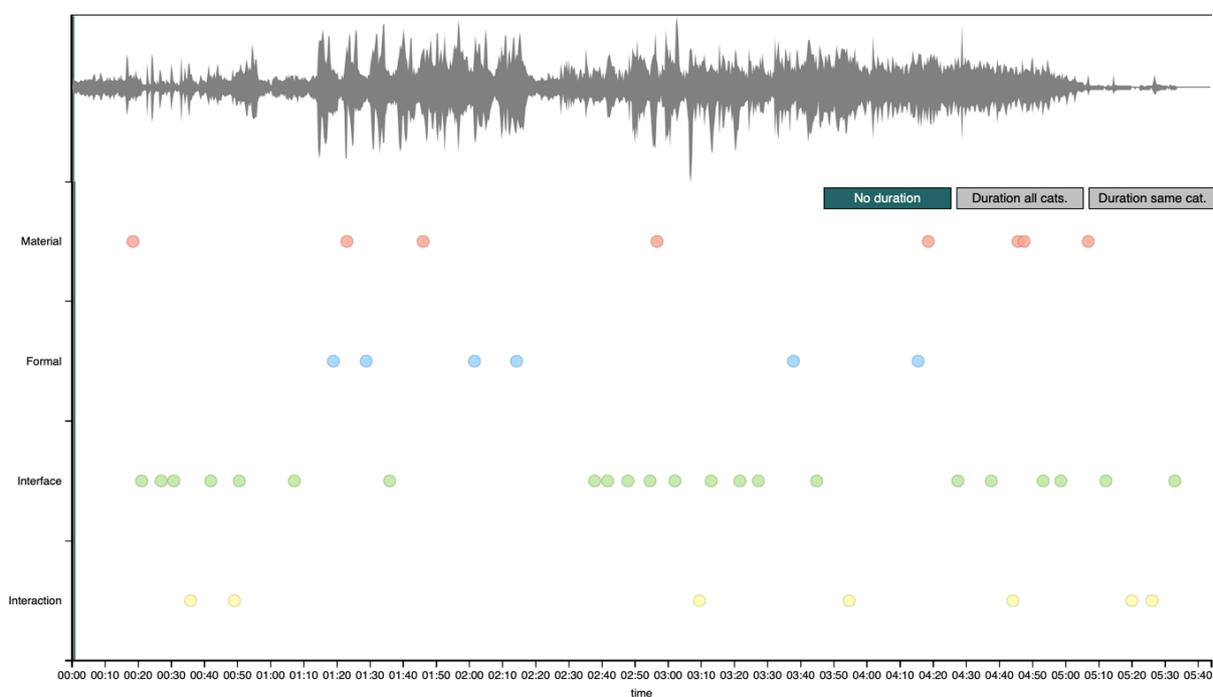


Figure 75: piano 'Stream' decision analysis showing decisions over time

In analysing the decision stream language the words 'loop' and 'Kaoss Pad' feature

the most. When watching the video of this track it is clear that the Kaoss Pad is the device of choice for many of the electronic sounds being created.

B. double bass

The bass decision stream is quite different to the piano, with material decisions featuring the most. Overall, the bass part in this work is less complex, in both acoustic musical content and electronic elements, and subsequently less decisions have been made, a total of 29 with an average of one every twelve seconds. The total numbers of decisions for each category are: Material – 10 decisions, Formal – 3 decisions, Interface – 8 decisions, Interaction – 8 decisions, shown in Figure 76. The material decisions are evenly spaced throughout the first part of the track, however once we reach 03:27 they stop. Upon viewing the recording it can be seen that Sam continues the pulsing pizzicato part with little variation to this. Thus no more material decisions were made. There’s a clear emphasis on engaging with the piano, and subtly varying the bass part through rhythmic and reverb based changes.

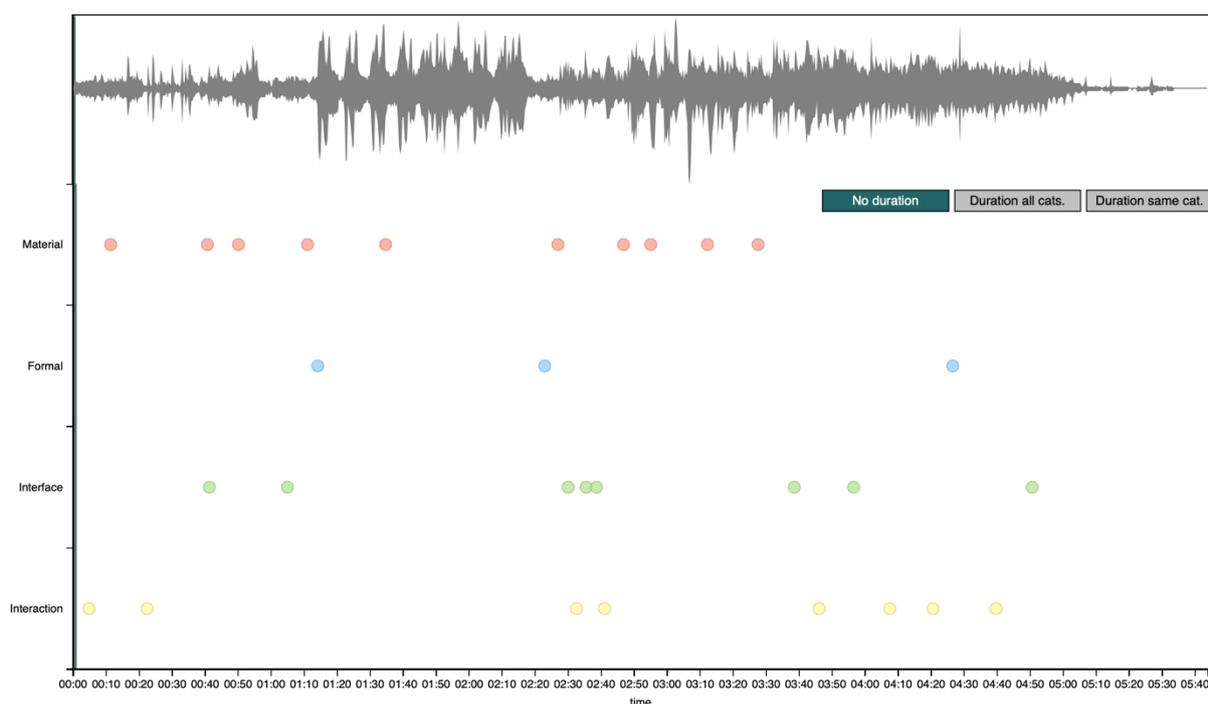


Figure 76: double bass ‘Stream’ decision analysis showing decisions over time.

In analysing the decision stream language the words ‘loop’, ‘reverb’ and ‘melody’ were prevalent, which is a succinct way to distil the bass part into the core elements of what is presented through the work.

C. drum kit

The drum decision stream connects more to that of the piano, with a similar emphasis on the interface decisions. The drum part has 51 decisions occurring, on average one every seven seconds. Although John’s part is often dynamically soft throughout this work, there is a great amount of detail in his playing, and clearly considerable thought as to how he is integrating the technology with his acoustic performance. The total numbers of decisions for each category are: Material – 14 decisions, Formal – 2 decisions, Interface – 27 decisions, Interaction – 8 decisions. Most of the drum interface decisions are made from 03:4 to the end of the work, shown in Figure 77. This connects to where the piano starts playing the ‘Coda’ chord progression, and the music starts to break away from its rhythmic core, becoming more fragmented and effected. John is also the last musician playing in the track, fading his looped drum parts after both the piano and bass have ended.

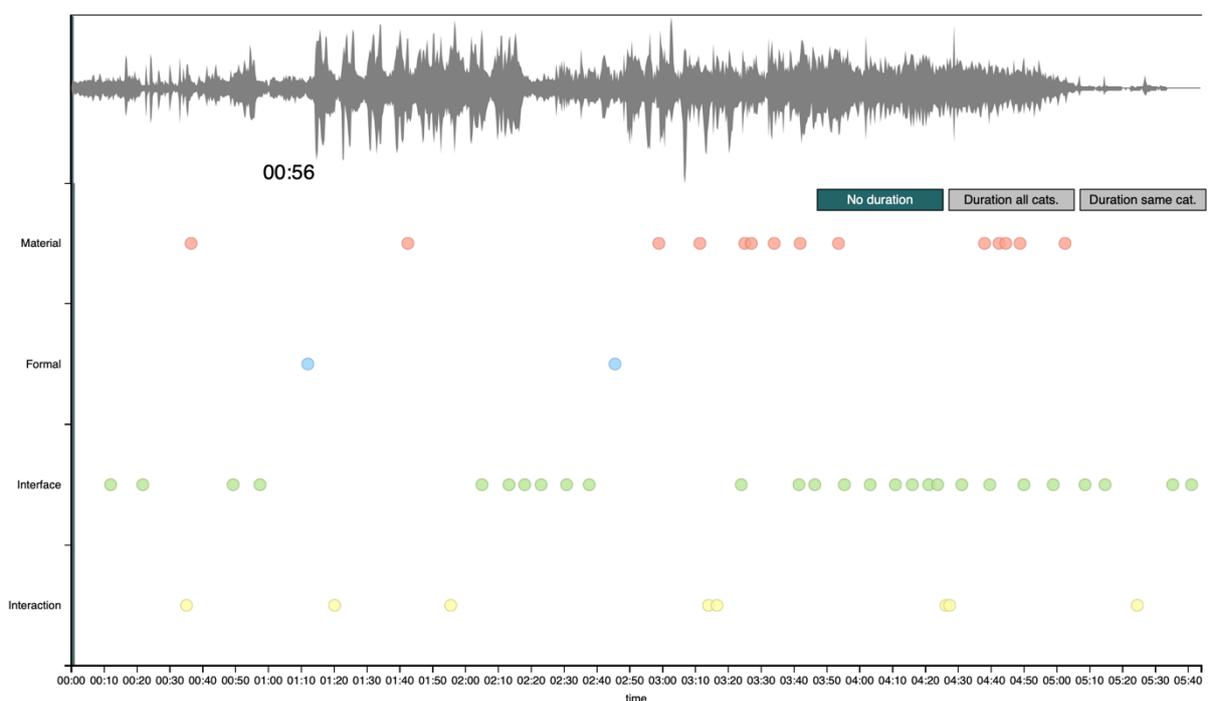


Figure 77: drum ‘Stream’ decision analysis showing decisions over time.

In analysing the decision stream language the words ‘effects’, ‘loop’ and ‘Kaoss Pad’ were the most prevalent. Similar to the piano part, upon viewing the video, John can be seen using the Kaoss Pad in a creative rhythmic way throughout the track, and looped drum parts are often playing underneath the live acoustic drums.

‘Stream’ - Ensemble decision analysis

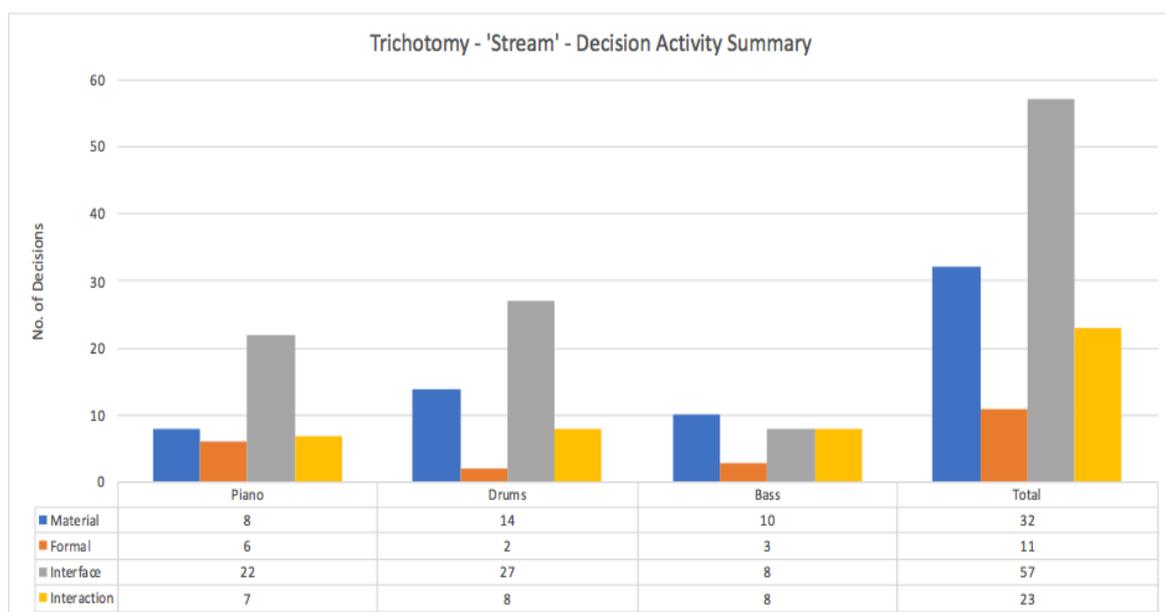


Figure 78: Graph indicating band decision analysis for ‘Stream’

Each performer completed their decision stream analysis individually, and the resulting decisions streams have been overlaid to find commonalities in decision making. In this work the decisions made by each musician work more in a jigsaw manner, with complementary decisions being made before and after each other, in response the parts created by each musician. There are clear moments of focus on interface decisions by both piano and drums, but these occur at different times. There is a small cluster of material

decisions made by the bass and drums around 02:58.. This is due to the piano starting the melodic section, thus causing a material response from the other players. Similar to *Reassemble* the work has a clear emphasis on interface decisions.

‘Stream’ - Overall Summary

This work is more subtle than *Reassemble* in how the musicians engage in improvisation with technology alongside the acoustic improvising. The mobile form is an advantage, and the ostinato pattern provides a solid foundation to work with for multiple instruments. I particularly like the sense of ebb and flow in the music and in how the electronics appear and disappear throughout the work. The dynamic shifts feel natural.

On working with the technology

Utilising technology in this work facilitated the players ability to engage a more abstract sound in their performance. Many of the sounds created by the technology abstract and distort the natural acoustic sounds in surprising and arresting ways, pushing the acoustic sounds more into the background at times. However, to contrast this, the sounds created by the technology are often highly rhythmic and highlight melodic and harmonic moments already featuring in the work. In this way, the technology supports the core musical content, continuously enhancing it in a way that creates ongoing interest through the work in surprising ways.

In comparing this studio recording to the live concert recording from May the fourth, 2018 there are some elements to note:

1. In the live version the introduction is unstable, the piano loop either didn't work, or wasn't audible leading to the introduction having limited impact.
2. The live version is slower, and it sounds laboured. I'm pleased with the increased tempo in the studio recording as I believe it creates a more vibrant feel to the overall performance
3. The use of rubato in the chord symbol section is even more pronounced in the live version, this gave interesting shape to the rhythmic structure of the piece, creating varied macro rhythmic structures.
4. The live version features John manipulating his loops more extensively, and there's large sections of the work where he is not playing acoustic drums. This creates surprising sounds and could be explored more in future performances.

7.4.3 Trichotomy recording session summary

The analysis completed for the works *Reassemble* and *Stream* are designed to explain the musical content, the acoustic and electronic sound worlds, and the performer decisions made when performing these works in a controlled studio environment. The graph below presents a summary of the performer decision analyses for the entire recording session of six works. From this it can be seen that *Reassemble* and *Stream* are not unusual in the balance of decisions across the categories, but are quite representative of the ensemble approach to performing music that blends acoustic improvising and improvising with technology. Decisions made regarding interface elements account for 43% of the total decisions made as shown in Figure 79. The performers are giving large amounts of their thought processes to how they negotiate the interface with their technological devices and even though many of these works had been performed multiple times over years, decision making surrounding these devices is still the primary thought process for the musicians in this group. It is also worth articulating that this research was designed to creatively and successfully combine acoustic improvising and improvising with technology, and while the recordings indicate that this has been achieved, it is clear that the musicians are prioritising interface decisions in their playing, and this is an integral factor to the success of the music.

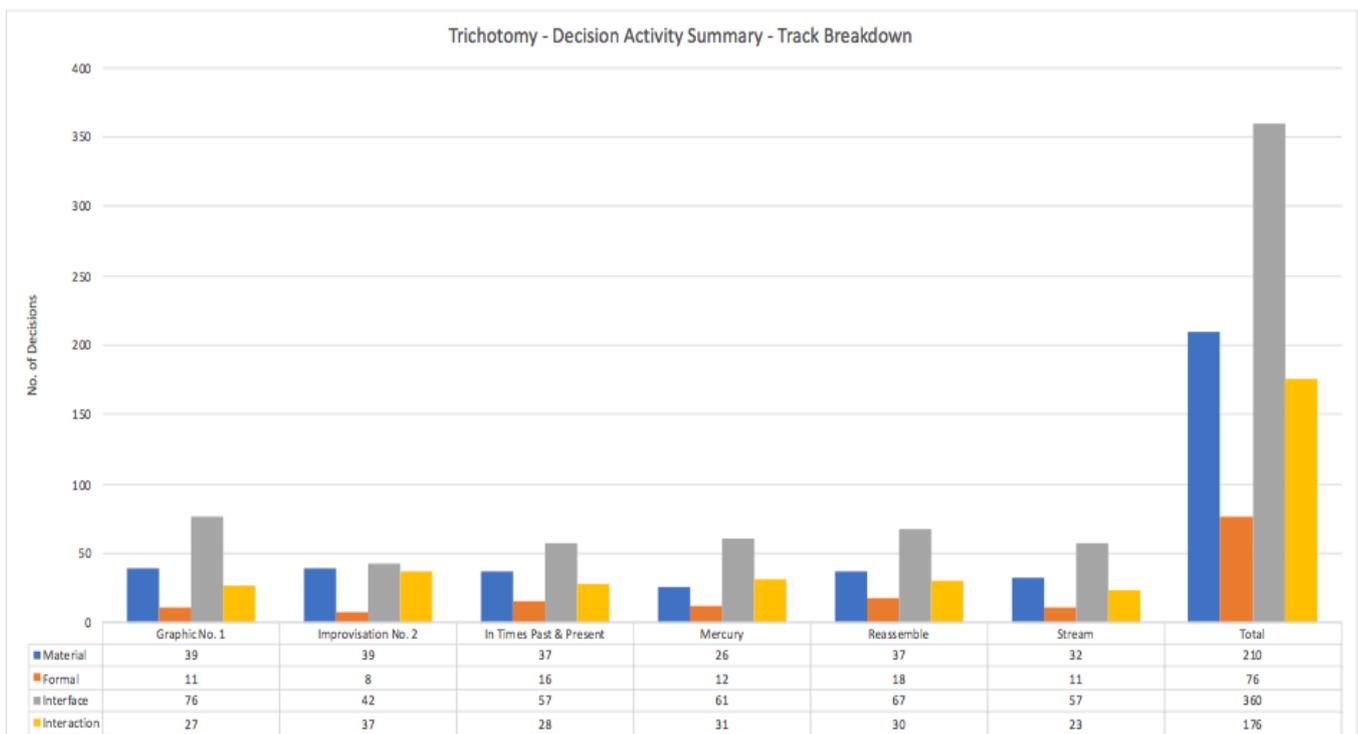


Figure 79: Graph indicating track breakdown of decision analysis for Trichotomy recording

7.5 Berardi/Foran/Karlen analysis

Access link to recordings:

<https://www.dropbox.com/sh/7hklcc4um581e9t/AACXmI4LPKEx17RIpSZmRM-Ra?dl=0>

7.5.1 'Forward Motion'

Musical Elements

Forward Motion was composed in early 2019, written as a mobile form work containing a mixtures of graphic notation and standard melody with chord symbol notational elements and improvised sections. It consists of multiple cells of musical material that the performers are free to move through as they each desire. The harmonic, rhythmic and melodic content is sparse, with short melodies and chord progressions present, the focus is on sound and improvising with these musical cells throughout the work.

'Forward Motion' - musical form

Introduction	0:00-2:06	The score indicates 'one player to start' and for this recording it was Kristin. This was not predetermined. Kristin creates a pad of vocal loops to improvise over, with saxophone creating a similar part. piano part improvises processed melodic material gradually adding rhythmic pulses to hint at the metric structure of the A section
A section	02:06-03:06	Piano introduces clear pulse and harmonic progression, vocal and saxophone looped pads continue softly underneath the piano part. Fragmented processed piano lines hint the B section. saxophone introduces improvised fragmented melodies
B section	03:07-03:47	Saxophone plays melody, loosely interpreting what is scored, with effect processing, vocals absent.
C Section	03:47-05:57	Piano cues section change, joined by vocals, both instruments gradually introducing effects. saxophone plays percussive pops and clicks with heavy reverb—this is looped. The written D section never occurs as the C section

		fades out.
--	--	------------

Table 14: *Forward Motion* - musical form

Score

The score combines lead sheet style chord symbol and melody writing and graphic notation elements—such as symbols and text. The intention here was to give the musicians something different to engage with, to free them from the standard notation system that we would work with in most of the repertoire, but also provide some guidance for the work, moving it away from a piece that is completely improvised. Structurally there are no indications of how long sections should be, or when they should change. Upon discussing this prior to recording we decided that we would feel the section changes as a group, with the potential for individual musicians to cue section changes if it felt acceptable in the moment.

Acoustic and electronic elements

Acoustic Elements:

1. Piano—The piano part provides much of the rhythmic framework in this piece. It creates the tempo at the A section, and defines the slight change in feel at C. It also provides the harmonic progressions heard in the A and C sections, enabling a framework for the saxophone and vocal parts to interact with.
2. Saxophone—the written melodic content for this work is presented by the saxophone, most clearly heard at the B section. Additionally the saxophone improvises melodic fragments and plays long tone notes, with both of these often manipulated by the effect processors.
3. Vocals—The vocal part is highly textural throughout this work, with the vocals only providing clear written melodic parts at the C section. Often the vocals are non-rhythmic, with long tones and floating melodic lines highlighting parts created by the saxophone and piano.

Electronic elements:

The improvised technology throughout this work is often textural and dynamic in effect, with vertical timbral enhancement of each instrument occurring throughout the piece. Continuous loops of saxophone parts create a drone type sound, while layered vocals with varying levels of reverb create a changed sense of distant space to the vocal part. Melodic parts performed by the saxophone use a flanging harmoniser, while the a grainy distorted

timbre created by the piano electronics add to the otherworldly sound that has already been conjured up by the vocals and saxophone. Often in this work the natural sounds of the instruments are covered by the electronic modifications, leaving significantly changed versions of the acoustic instruments to feature in the foreground of the music. There is a changed sense of space created by the use of reverb on the looped vocal parts and drone style saxophone pads.

Effect type	piano	vocals	saxophone
Spacial: reverb, panning, flanger, tremolo.	Subtle reverb added to enhance depth and sense of space.	Reverb used to create sense of depth to live and looped vocal parts.	Flanging filter used on melodic sections, reverb with percussive 'key click' playing creates highly unusual sound.
Time based: loop, delay, freeze, reverse, slow-down.	Small fragments of looped material added.	Layered loops utilised (most evident in the opening section). Loop speed modified creating <i>beat repeat</i> effect to the sound	Various drones created through looping long tones.
Frequency: filters, transposition, modulators, chorus.	Distorted edge to the piano sound, with harmonic intervals added.	None.	Flanging filter used on melodic sections.
Textural: density changes.	Layers of sampled parts create textural density and harmony.	Layering of looped parts.	Layered loops.

Table 15: electronic sounds used in 'Forward Motion'

Performative and Operational tasks

Tasks in this track are mostly performative, with some operational tasks evident - mostly by Kristin through the A section where she can be seen preparing the RC-505 looper for the next part of the piece. There are some quick operational changes on the piano (changes to the Organelle patches) and Rafael also takes the time in the start of the C section to crouch on the floor - this time enables him to edit parameters on the devices, preparing for his entry in the section.

Task	piano	vocals	saxophone
Performative	Live sampling and looping of piano part. Manipulation of delay time and rate. Foot control—turning on/off Max patches.	Recording live loops. Adjusting loop volumes and effect depth. Adjusting rhythmic values in looped parts.	Recording live loops. Turning on/off reverb.
Operational	Scrolling to select loop record patch on Organelle. Selecting Kaoss pad patches.	Selecting of live effect on the RC-505 looper.	Adjusting reverb depth and loop volume, length.

Table 16: Performative vs operational tasks in 'Forward Motion'

Performer decision analysis

A) piano



Figure 80: The author, Sean Foran at the piano during the Berardi/Foran/Karlen recording

This decision analysis indicates a high prevalence of interface decisions, more than double any other decision, with 26 made in the duration of the work [05:57]. The total numbers of decisions for each category are: Material – 11 decisions, Formal – two decisions, Interface – 26 decisions, Interaction – 4 decisions. There are 43 decisions made in the track, on average one every 8.3 seconds. These interface decisions are mostly evenly spaced across the work, with the final one minute of the track consisting only of interface decisions, shown in Figure 81. Upon reviewing the video this section it can be seen that I'm moving rapidly between the piano and the Kaoss Pad, playing fragments of chordal material on the piano and manipulating the performed—and sampled sound—on the Kaoss Pad. There are minimal instances of the formal and interaction decisions. The work lacks extensive formal considerations—there are limited section changes written—so this is not surprising.

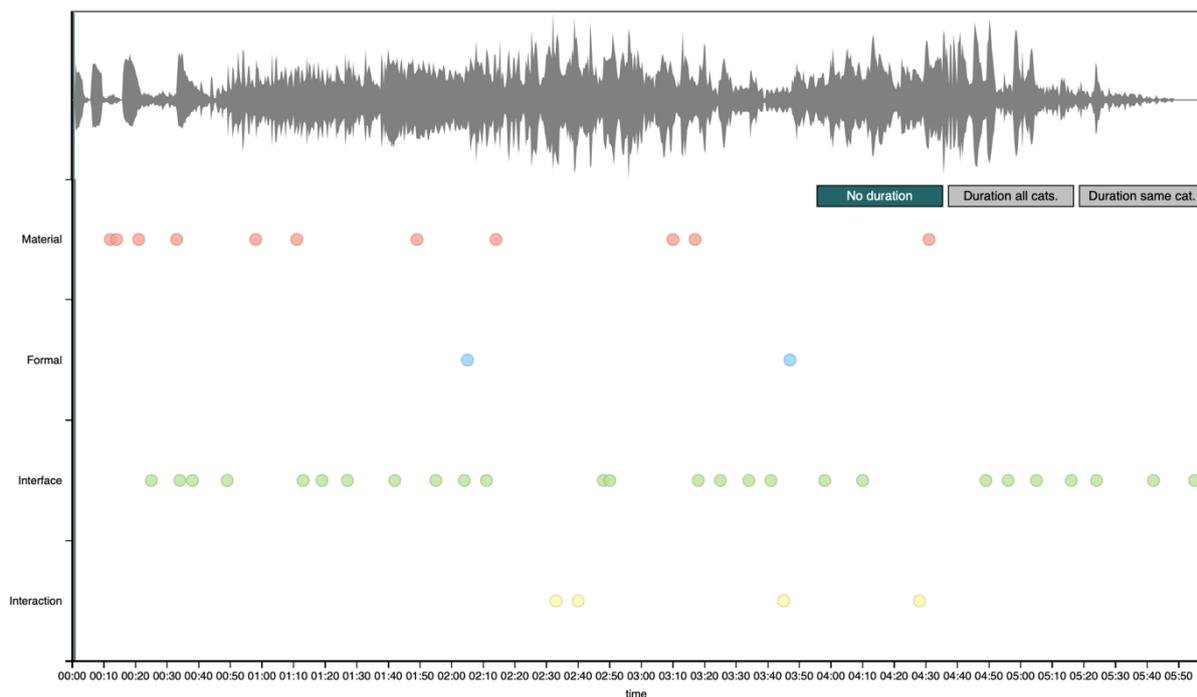


Figure 81: piano 'Forward Motion' decision analysis showing decisions over time

Interaction decisions are low, and when I listen to the recording I get a sense that even though we are listening to each other, there is more mental attention on crafting an individual piano sounds that contribute to the group dynamic, rather than playing parts that respond to Rafael and Kristin.

B) vocals



Figure 82: Kristin Berardi during the Berardi/Foran/Karlen recording session

The vocal decision analysis displays a similar pattern to that of the piano with a high number of interface decisions, outweighing the other categories. Kristin makes 36 decisions in the performance, an average of one every ten seconds. The total numbers of decisions for each category are: Material – 5 decisions, Formal – 1 decision, Interface – 23 decisions, Interaction – 7 decisions.

The most notable moment in this decision analysis is the period from 0:45–03:45, where there are solely interface decisions occurring, shown in Figure 83.

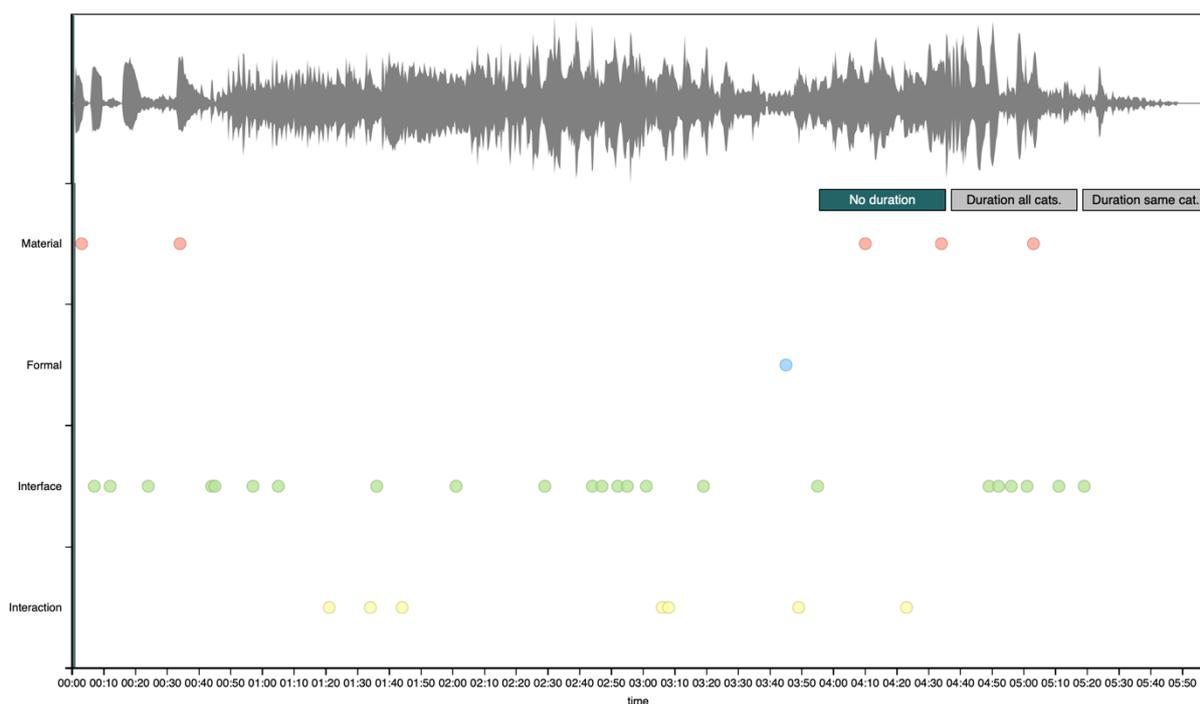


Figure 83: vocals ‘Forward Motion’ decision analysis showing decisions over time

In this part of the performance, Kristin is focused on manipulating existing looped material that she has recorded previously in the work. There’s some operational tasks in effect here as well, Kristin is preparing for her next acoustic entry in the piece. While we still hear vocal material in the performance, there is no acoustic vocal material produced again until 03:55. This entry is thoughtfully considered, with Kristin responding to both piano and saxophone parts in her delivery.

C) saxophone

Figure 84: Rafael Karlen during the Berardi/Foran/Karlen recording session

The saxophone decision analysis is also similar to the piano and vocal decision analyses, with a high number of interface decisions, outweighing the other categories. Rafael makes 47 decisions in the performance, an average of one every seven point five seconds. The total numbers of decisions for each category are: Material – 6 decisions, Formal – 6 decisions, Interface – 31 decisions, Interaction – 4 decisions.

The first three minutes of the work display an abundance of interface decisions, with only three other decisions made from other categories, shown in Figure 85. As is evident in Rafael's decision activity log (Appendix five) much of this time is focused around his decisions surrounding setting and implementing the looper and Space Echo delay device.

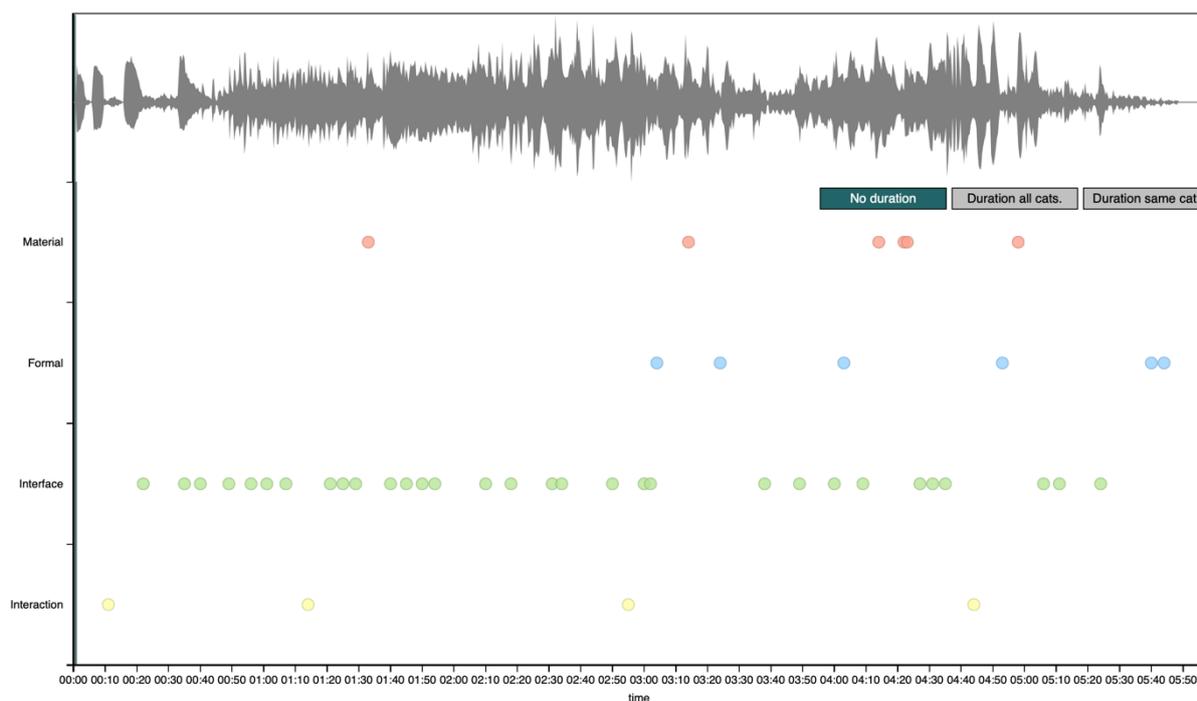


Figure 85: saxophone ‘Forward Motion’ decision analysis showing decisions over time

There are multiple decision made regarding adjusting the sound enacted by the effects and ensuring an appropriate blend with the other instruments. Later in the work (from three minutes to the end), there is a more of balance of decisions across the four categories as Rafael moves between negotiating acoustic and electronic sounds and creating parts that interact with the notated form of the music, the piano and vocal parts.

“Forward Motion” - Ensemble decision analysis

Similar to the process for the Trichotomy decision stream analysis, each performer completed their performance decision analysis individually and the results have been compared. Figure 86 clearly shows the prevalence of the interface decisions, this can be attributed to both the limited written content, and the mobile form structure, where performers are free to select musical material from the scored page freely. Interestingly this did not result in an increase in formal decisions—the saxophone made more formal decisions than other instruments, which can be attributed to the use of melodic material to cue and indicate section changes. These melodic moments were often performed by the saxophone. Most of the interface decisions for all instruments occurred after 02:50, at this point in the work, the A section had solidified in its rhythmic approach, and shortly after the saxophone presents the B section melody. From here onwards all performers spend much of their time

curating their acoustic sound using the technology, there are less defined acoustic changes in sound and material. The melody at B is acting as the climax of the work, and subsequent to this performers shape dynamic and texture slowly, moving the work towards its conclusion.

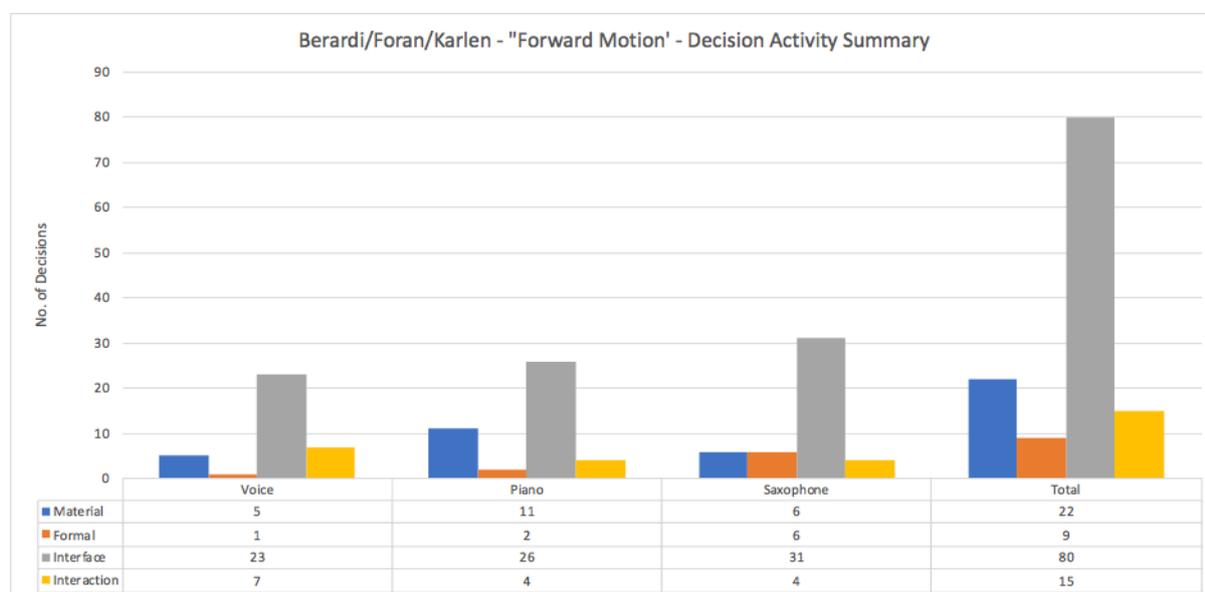


Figure 86: Graph indicating band decision analysis for ‘Forward Motion’

‘Forward Motion’ - Overall Summary

This work was composed specifically for the studio recording session. We spent some time in the studio rehearsing so the group was comfortable with the material, the score, and the intention with the work. I have included this piece in the complete analysis section as it presents a contrast to the material that the band had been playing through live performances over the years. By analysing a new work—played and recorded for the first time in this recording session— the analysis serves to provide context to how the musicians combine acoustic improvising and improvising with technology in a brand new piece of music, demonstrating how they can transfer their acquired skills from the existing repertoire already rehearsed, into a new work.

The mobile form structure and graphic notation was an effective way at presenting new material that didn’t require excessive focus on the notated chart. My intention with the composition was to provide enough composed direction to stimulate the musicians, but still allow space for them to be creative with their improvised acoustic and electronic parts. Sonically it complements the other material in suite of music recorded, and demonstrates that even though the work had not been extensively ‘road tested’ through repeated performances,

the developed skills using technology can be transferred to this piece with interesting musical results that create a cohesive group sound.

On working with the technology

Utilising technology in this work significantly extended the sense of play in the collective improvised sections. Sounds change as the musicians respond to the surprising sounds created by each player. As the work contains several sections that the band move through on cue, using technology to improvise sounds significantly altered the variety of sounds possible, and thus gave the group the ability to craft longer more varied and engaged improvised moments. The slower tempo also was advantageous as there was more time for the musicians to craft sounds, and also physically adjust parameters on the devices. Even though the use of technology creates additional layers the sensitivity of the performers has still allowed space in the music, with electronic and acoustic sounds often weaving in and out.

7.5.2 ‘Don’t Fade Away’

Musical Elements

‘Don’t Fade Away’ was composed in early November 2018, in preparation for the Berardi/Foran/Karlen performance at the Ian Hanger Recital Hall on the 14th of November. The work is constructed in a composed, fixed form method with multiple melodic sections occurring over set harmonic progressions. The structure is linear, with the musicians moving through the main melodic sections, improvising over a repeated harmonic progression before returning to the main melody. The various parts of melodic content are designed to be performed by any of the instruments in the ensemble, allowing for variation each time the work is performed.

‘Don’t Fade Away’ – musical form

Pre-Intro 1	0:00-01:03	Initial entry by saxophone, quickly followed by vocals. This section is not indicated on the score, freely improvised, centred around a B pedal note created with Rafael’s loop pedal. Sparse piano accompaniment.
Intro 2	01:03-01:19	Piano cues this section, completely skipping the material notated for Intro 1.
A section	01:20-01:37	Vocal and saxophone both perform the melody, with the addition of piano the second time.
B section	01:38-02:28	Melody continues, played by all musicians.
C section	02:29-02:47	Melody continues, harmony parts performed with the saxophone playing the upper harmony, vocals the bottom.
D section - solos	02:48-05:29	Piano introduces this section performing the ostinato pattern. Ostinato pattern is looped and played underneath the live piano throughout this section, acting as a rhythmic pad. Vocal is gently added, building in dynamic and textural density with the addition of electronic sound. Saxophone enters once the section has developed in dynamic and textural density, also with layered electronic sounds— loops and processed live saxophone. Piano follows vocals in building the complexity of

		the part by adding electronics to the acoustic piano. All parts from saxophone and vocals are improvised.
Intro 2 – A section	05:0-06:34	Repeat of A section melody, this time performed by piano (first time) and joined by saxophone for the second.
B section	05:46-06:35	Piano, vocals and saxophone perform melody, as previously.
C section	06:36-07:04	Piano, vocals and saxophone perform melody, as previously.

Table 17: *Don't Fade Away* - musical form

Score

The score is constructed mostly in a lead sheet style format, with melodies notated in treble clef and chord symbols included where appropriate. There is more detail included than just the treble clef melodies, with the inclusion of bass clef notation in the D section, clearly showing the specific ostinato patterns to be played. In this solo section chord symbols are intentionally absent. The player is encouraged to make decisions surrounding the harmony drawn from the notes played in the ostinato, and the key signature at the time.

The score is concise, with no specific indication of which instrument is to play the various treble or bass melodies, this can be determined by the musicians.

Acoustic and electronic elements

Acoustic elements:

1. Piano - In this work the piano part is centred around the two ostinato patterns
 - a. Main melody ostinato

Bass line can continue through intro 2 and A sections

Figure 87: Ostinato pattern #1 in 'Don't Fade Away'

b. Solo section ostinato



Figure 88: Ostinato pattern #2 in 'Don't Fade Away'

Both of these parts are played consistently through the work, and are crucial in communicating the rhythmic and harmonic foundations for the piece. The acoustic piano parts are also utilised to communicate the harmonic progression, with most of the harmonic variation occurring at the C section.

2. Saxophone - All of the treble clef melodies in the work are performed by the saxophone, with improvised saxophone melodies also present in the introduction and D section. The saxophone has a primary melodic role in the work

3. Vocals - The acoustic vocal part is similar to the saxophone, featuring in a primary melodic role, often sharing melodies with the saxophone either by performing them in unison or in harmony. Vocals feature as the main melodic instrument at the D section, which function as a 'solo' section, allowing improvising of the harmonic progression by both the vocals and saxophone

Electronic elements:

The use of improvised technology throughout '*Don't Fade Away*' provides continuous enrichment to the sound through timbral extensions in both horizontal and vertical manners. Vertical extensions are primarily created through layering of instruments, with both the vocal and saxophone recording looped phrases and layering these to create a changed density. Saxophone and vocals also produce horizontal extensions to their sound, evident with drone type creations from both instruments. These unending drones create an un-natural sound, prolonging the acoustic sound longer than would be possible naturally. The vocal part takes this further, using rhythmic *beat repeat* style modifications of the sound (on the RC-505), engaging a rhythmic manipulation through the electronics.

The natural acoustic piano sound is blurred with a grainy, rhythmic distortion, creating pulsing distorted additions to the piano part (via Organelle). Horizontal and vertical extensions to the piano part also feature, with looped ostinatos integrating with the natural

piano sound, at times making it difficult to discern which parts are acoustic and which are electronic.

Modification of the spacial world are also evident, with the vocals highlighting changes in spacial depth of the vocal sounds, creating an otherworldly sound to the vocals, distant and immersive.

Effect type	piano	vocals	saxophone
Spacial: reverb, panning, flanger, tremolo.	Subtle reverb added to enhance depth and sense of space.	Reverb used to create changed sense of depth and dreamlike vocal quality.	Subtle reverb and slow echo to create sense of distance.
Time based: loop, delay, freeze, reverse, slow-down and speed up.	Looped ostinatos utilised.	Loops extended through freezing and rhythmic stuttering of looped material.	Drones created through looping long tones.
Frequency: filters, transposition, modulators, chorus.	Rhythmic distortion applied to acoustic piano. Sweeping Phaser creating a subtle 'whooshing' movement to the piano ostinato. Rhythmic grainy delays added to enhance repeated notes.	None.	Chorus effect added to enhance thickness of melodic parts.
Textural: density changes.	Subtle layering of short piano samples.	Layering of looped parts.	Layered loops and drones to create harmony.

Table 18: Electronic sounds used in 'Don't Fade Away'

Performative and Operational tasks

Performance and operational tasks are both evident in this work. In the opening section after Rafael crafts an initial drone using his loop pedal he uses performative tasks to add a sweeping filter to it, and fine tunes the level of it in the overall mix. Later on he engages in operational tasks, preparing his looper for the option of adding a new loop. Kristin engages a cascading repeating effect on her vocals and uses performative tasks to manipulate the depth and rate of this to create a constantly changing vocal sound. The piano performative tasks are evident with foot control of effect dynamic level, and hand manipulation of the Kaoss Pad effects. In the D section I'm moving quickly from the keyboard to the Kaoss Pad triggering the *grain shifter* patch which creates grainy rhythmic stutters to the sound. Operational tasks such as adjusting volume on various effects prior to implementation are also evident.

Performer decision analysis

A) Piano

The piano decision analysis reveals 50 decisions made of the seven minute work. The density of decision making is similar to the previous analysis with decision made every eight point four seconds on average and a clear emphasis towards interface with 27 interface decisions made, more than double any other category. The total numbers of decisions for each category are: Material – 11 decisions, Formal – 3 decisions, Interface – 27 decisions, Interaction – 9 decisions.

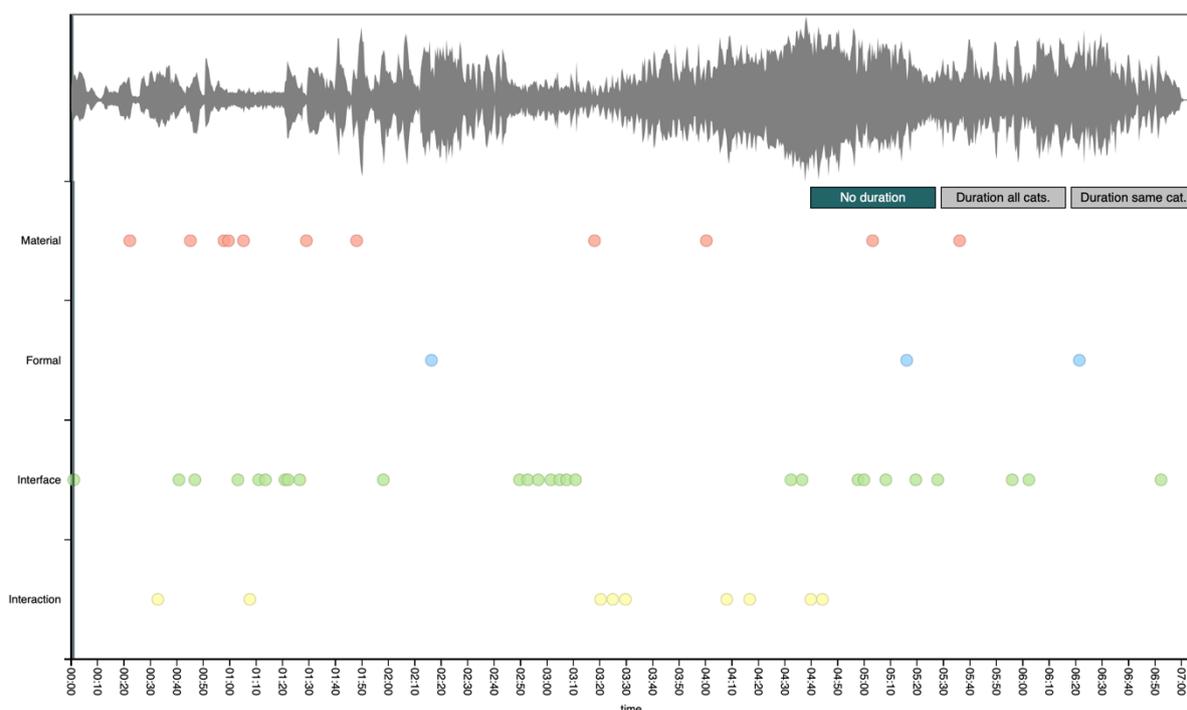


Figure 89: piano 'Don't Fade Away' decision analysis showing decisions over time

There is a cluster of interface decisions from 02:49— 03:10, shown in Figure 89. This aligns with the start of the D section, and I'm engaged with attempting to loop the left hand ostinato and also create some manipulations of it. The D section is the solo part of the work, and after the cluster of interface decisions, most of the interaction decisions occur at this time as I attempt to interact with Kristin in my playing.

B) Vocals

The vocal decision stream analysis shows a lesser number of decisions made, 28 decisions with an average of one every fifteen seconds. The total numbers of decisions for each category are: Material – 4 decisions, Formal – 4 decisions, Interface – 14 decisions, Interaction – 6 decisions. Kristin takes more time with her decision making in this work, the slower, more gentle aspects of the work connect with this. Acoustic ideas and electronic sounds are approached with care, with slow explorations and sound manipulations appearing in her parts.

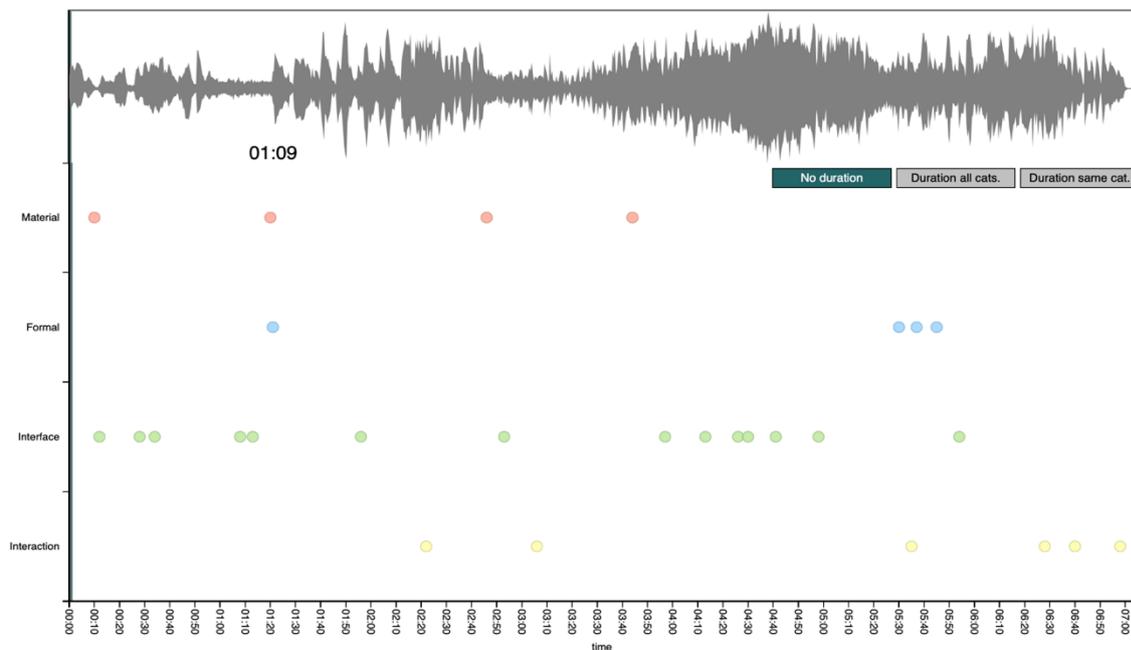


Figure 90: vocal ‘Don’t Fade Away’ decision analysis showing decisions over time

Material decisions are absent from the second half of the track, with Kristin focusing on interface and interaction from the D section (the solo) onwards, shown in Figure 90. This is a similar strategy to previous works, with interface and interaction forming the integral part of the thinking in the more open improvisational sections.

C) Saxophone

The saxophone decision analysis significantly emphasises interface decisions, with 25 of the 37 decisions interface ones. The total numbers of decisions for each category are: Material – 6 decisions, Formal – 2 decisions, Interface – 25 decisions, Interaction – 4 decisions. Rafael makes an average of one decision every eleven point three seconds, with a cluster of interface decisions appearing in the first half of the track. In this time period Rafael is engaged in Operational and Performative tasks extensively, playing acoustically and using technology via looping of musical material and live manipulation of the saxophone sound.

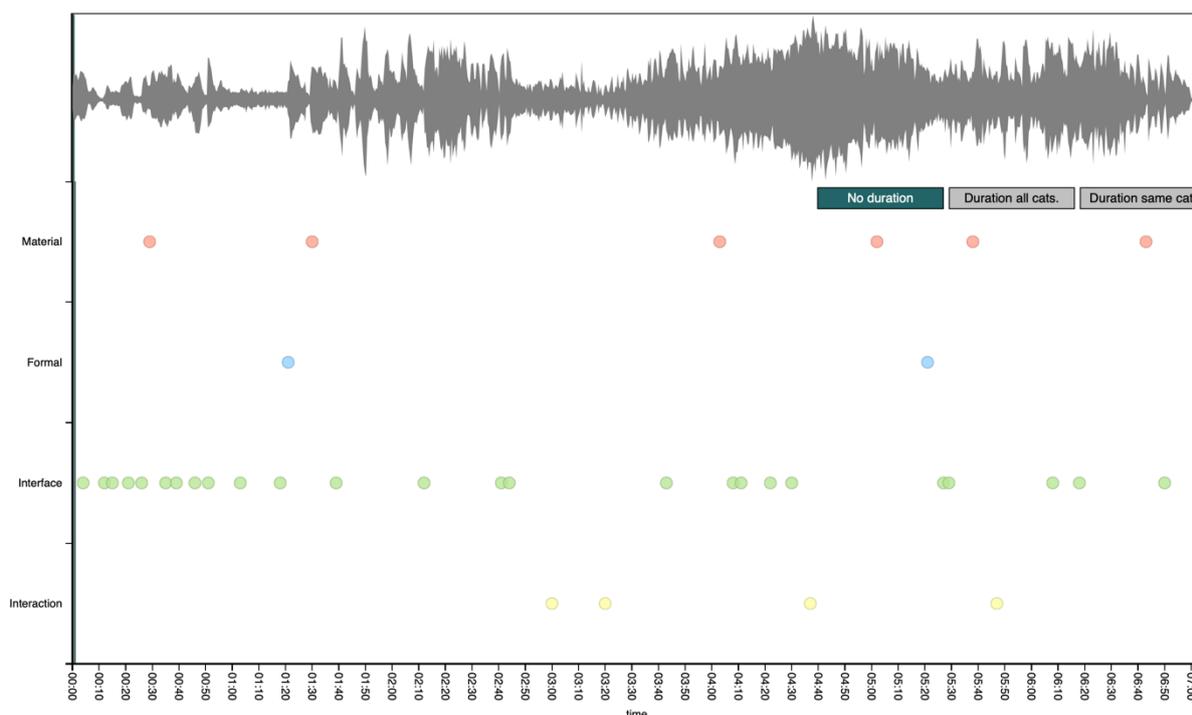


Figure 91: saxophone vocal ‘Don’t Fade Away’ decision analysis showing decisions over time

The analysis demonstrates the extent to which these devices are dominating his thinking through this period of the work. Interaction decisions do not occur until 04:03, the D section. Similar to piano and vocals, interaction and interface decisions feature through this solo section predominately.

‘Don’t Fade Away’ - Ensemble Decision Analysis

This work was designed in a contrasting way to the piece *Forward Motion*. It follows a more traditional melody - solo - melody structure, and uses more of a conventional jazz lead sheet notation. The use of the ostinato parts in the introduction and solo section provides a foundation for other instruments to interact with, and uses electronic sounds to extend how accompanying musical material is created in these sections.

On working with the technology

Utilising technology in this work enabled the band to create parts that could not exist in a purely acoustic settings. These parts—harmonic layers on the vocal parts, continual rhythmic patterns on the piano and constant drone notes on the saxophone—heighten the sense of drama and noticeably alter the dynamic shifts. Overall, the effect of the combination of acoustic and technology based improvisation is a significant increase in the emotional

intensity of the work throughout.

Don't Fade Away has been performed multiple times in concert settings prior to this recording session, and in comparing the studio recording to the live concert performances I note the following elements:

1. The live concert versions all feature the 'Intro 1' section. This part does not occur in the studio recording, as at the time I decided to enter with the intro 2 phrase after the vocal and saxophone drone style opening. Even though this worked, the Intro 1 part is a great beginning to the work, and allows for another opportunity to explore technology based improvised sounds over composed acoustic material.
2. The 2018 recording also includes an additional saxophone solo section over new harmonic material. This was subsequently removed to give the performers less harmonic content to negotiate and open up the work to greater flexibility in using technology without written musical constraints.
3. The live concert recordings all feature a faster tempo and louder dynamic, which creates a more intense feel to the work. The slower tempo featured in the studio recording allows for the performers to craft different kinds of electronic sounds—such as drones and long reverb tails. Even though these delays and reverbs are present in the concert settings, they are more challenging to make work in faster tempos.

What I hear in the studio recording is a more gradual and smoother blend of improvisation with the acoustic instruments and the technology throughout the work. Dynamic and textural shifts are controlled, and connect across the musicians. Some of the electronic sounds used in the concert performances— such as delays, distorted rhythmic repeats, looped sections, and heavy reverbs— are present in the studio recording, but are used in a more considered way, crafting a more coherent final result.

The overall decision analysis summary (Figure 92) points to the heavy emphasis on the interface decisions, which is formed out the experimentation present in the introduction and D section mostly. The work has given the musicians scope and space to focus on the electronic devices in their playing, but still allowed them to engage with composed material and acoustic performance elements.

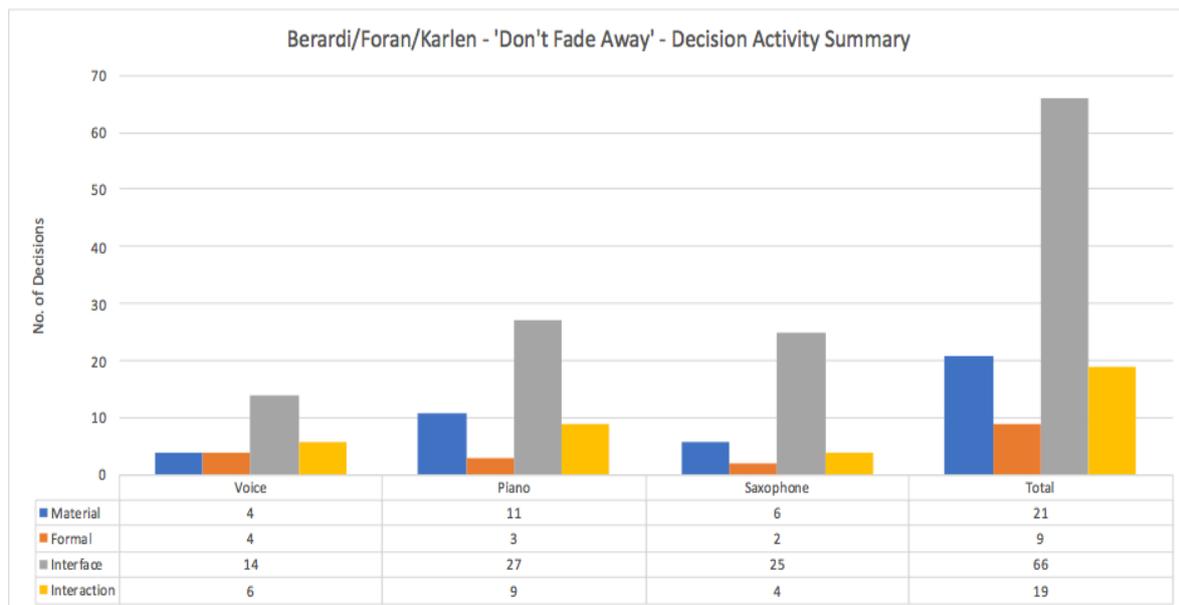


Figure 92: Graph indicating band decision analysis for ‘Don’t Fade Away’

7.5.3 Berardi/Foran/Karlen recording session summary

I have included a graph below (Figure 93), similar to the one presented for the *Trichotomy* recording session. This shows a summary of the performer decisions for each work recorded, and a total summary of all tracks. Similar to *Trichotomy*, there is a prevalence of the interface decisions, as they accounted for 53% of the total decisions made in the *Berardi/Foran/Karlen* recording session. The recorded works were spread in concept—they included fixed and mobile form works, traditional lead sheet and graphic notation elements, and a purely improvised track. Many of the pieces had been performed repeatedly at concert performances allowing the musicians to test acoustic and electronic ideas and concepts in the work. This concert preparation and spread of musical content structures gives some robustness to this data, for the musicians approached the recording session with an understanding of their electronic devices and the material. Similar to *Trichotomy*, the musicians are giving priority to thinking about the technology in their playing, and can use varied forms of musical structures to engage improvisation with the technology and acoustic instrument improvising.

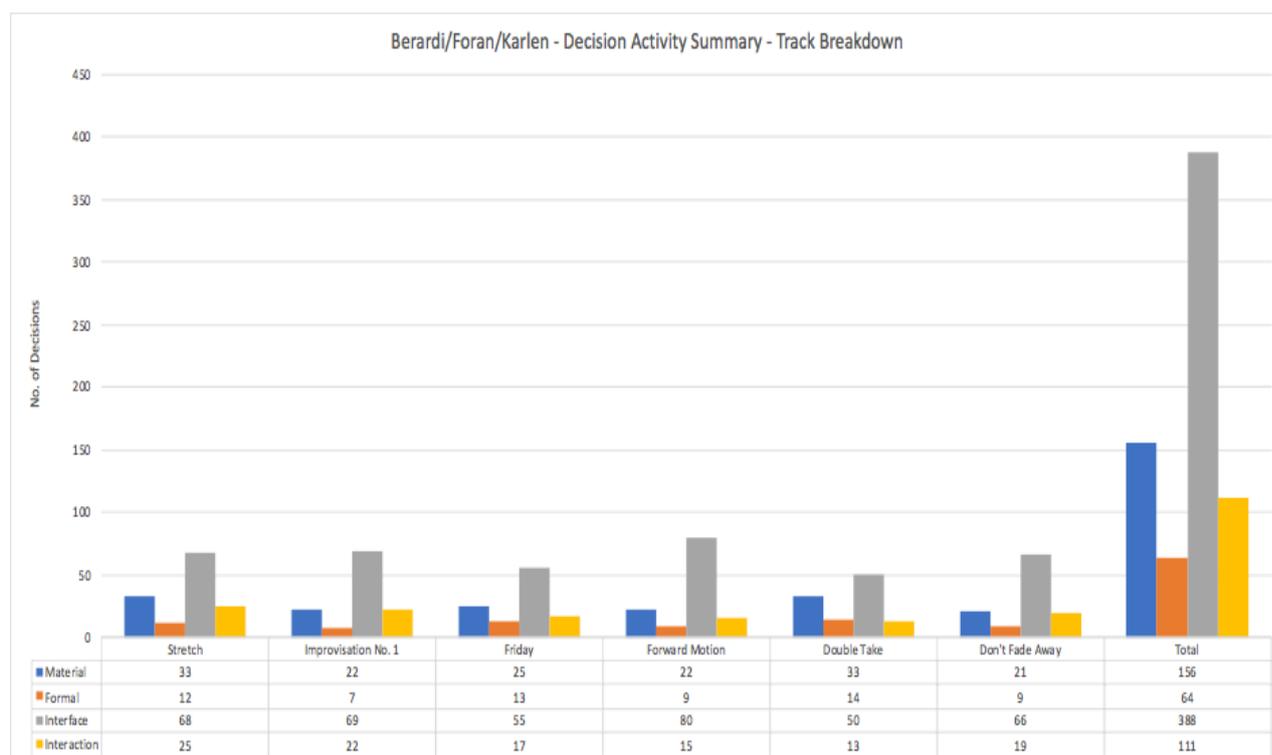


Figure 93: Graph indicating track breakdown of decision analysis for Berardi/Foran/Karlen recording

7.6 Ensemble comparison.

The recording sessions for both ensembles created exciting new versions of the works previously performed in this research, and recordings of new music created for the recording session specifically. As explained earlier in this chapter, each ensemble recorded a selection of material, with each track filmed, a camera focused on each musician. After undertaking the individual performance decision analysis and musical analysis, this part of the chapter investigates the differences in decisions when observing the ensembles comparatively. This ensemble comparison is a useful part of the final analysis in this research, as it helps balance the potential bias within each band, and assists me in finding a more complete picture of how these musicians, and groups, are engaging with acoustic instrumentation improvisation and improvisation with technology.

The graph below, Figure 94, gives a clear representation of each ensembles decisions throughout the music. We can see that both ensembles utilised decision making that focused around *Interface* decisions, far above any other. As the aim of this research was to combine improvisation with technology and acoustic improvising, this is pleasing to see, and I think

the design of the musical material for both groups has allowed the musicians to focus heavily on interface decisions in their playing.

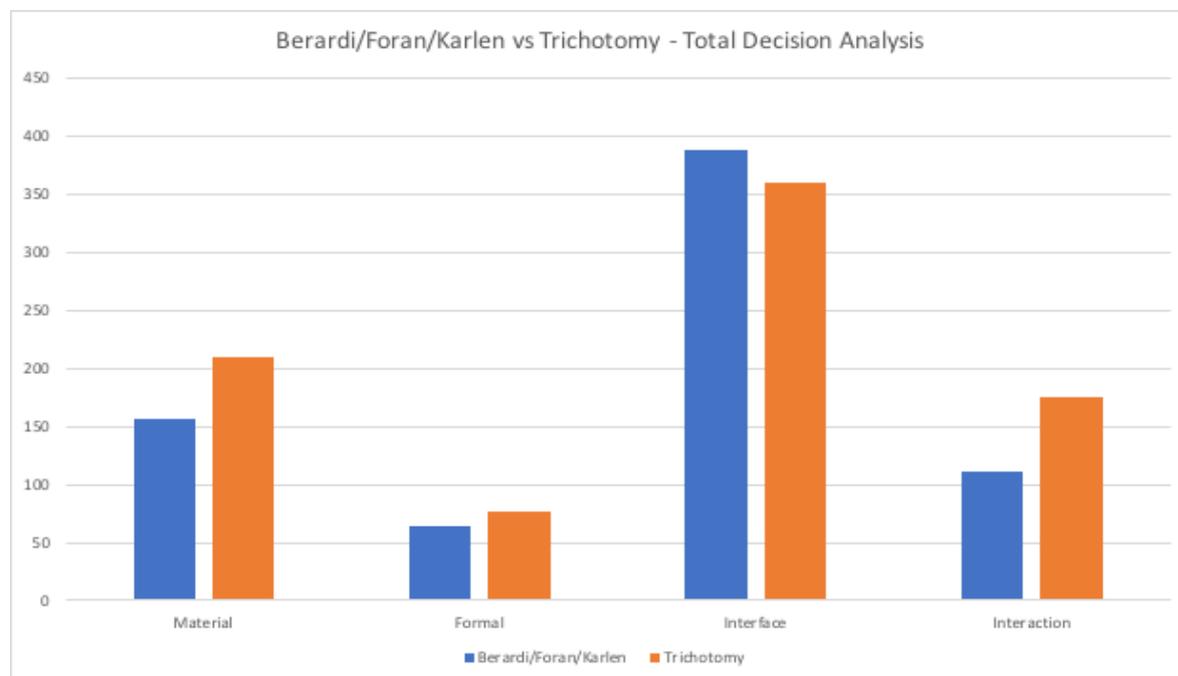


Figure 94: Ensemble decision analysis comparison

To further clarify the breakdown across these decisions categories, the tables 22 and 23 indicate the total decisions made across each decision stream for the six works recorded and analysed by each group. This information is more useful than the graph, as a longer piece of music may cause greater numbers of decisions made, and would show higher bars in the graph. What I am interested in highlighting in Tables 22 and 23 is the percentage of activity column.

In performing the music in this recording, the group *Trichotomy* made interface decisions 43.79% of the time. The group *Berardi/Foran/Karlen* made interface decisions 53.96% of the time. Both groups made tiny percentage of formal based decisions, with the formal decision stream being the lowest percentage category for each ensemble.

Trichotomy Instrument Summary					
Stream	piano	Drums	Bass	Total	Total % of activity
Material	64	89	57	210	25.5
Formal	32	19	25	76	9.2
Interface	129	138	93	360	43.7

Interaction	58	73	45	176	21.4
-------------	----	----	----	-----	------

Table 19: Trichotomy instrument decision summary

Berardi/Foran/Karlen Instrument Summary					
Stream	piano	vocals	saxophone	Total	Total % of activity
Material	52	69	35	156	21.6
Formal	25	22	17	64	8.9
Interface	150	99	139	388	53.9
Interaction	33	42	36	111	15.4

Table 20: Berardi/Foran/Karlen instrument decision summary

These numbers open up the understanding in how each group is approaching the music performed. In commencing this research I expected that improvising with technology in combination with acoustic improvising would require the performers to devote a significant part of their mental processes to confidently operate the electronic devices. I didn't know how much they would think about it, but this analysis reveals that decisions surrounding these interfaces is high, and consistently high across both groups.

Decisions regarding formal aspects were low in each group, even though the music performed utilised various formal structures, ranging from free improvisation, graphic notation and lead sheet formats. These formal decisions are limited, perhaps just acting as functional decision making, allowing the music to flow, allowing the performers to engage more of their decision making in other areas.

7.7 Chapter Conclusion

This chapter has presented an analysis of the studio recordings completed for the groups *Trichotomy* and *Berardi/Foran/Karlen*.

Both groups recorded six works in the studio, documented with a multi-camera video setup. From this suite of recordings, I chose two tracks from each group for a detailed analysis. This analysis is multifaceted, firstly presenting an overview of the musical content, the acoustic

and electronic elements, and then explaining the performer decisions made throughout the recording—highlighting what the performer was thinking during the creation of the music. This analysis is insightful when read in accompaniment with the video recording of the music, enabling the reader to see, hear and understand where the sounds are coming from at selected times in the music. Subsequent to the detailed analysis, I presented an overview of the recording session, providing insight into the overall ensemble thinking across the works, and how each ensemble compared to each other.

The key outcome from this chapter is the extraction of performer decision analysis from the studio recording. The studio recording environment allowed for optimum performer control after a period of live performances, and the resulting analysis shows the significant emphasis the performers are placing on decisions regarding *interface* elements – that being the interaction between them and the technology and their instrument. The transcripts located in Appendix five give greater clarity to the detailed thought that all performers are giving to the use of technology during their performance. Varied musical structures, and musical notation stimulus was used for each ensemble, with the works using graphic notation, and less formal composed notation allowing for higher numbers of *interface* decisions to occur. These works gave the musicians greater scope for improvising, with significant time open to incorporate the use of technology.

In this chapter the musical material analysed highlighted the development of the music from the earlier live concert examples and the continued focus on the technology by the performers across the varied type of works recorded. Additionally, data from the two ensembles showed the similarity in decisions made by each group.

The resulting studio recordings represent one captured recordings of these works, of a fixed moment in time, and are not provided to demonstrate a superior version of the pieces over the live concert examples. Rather, the studio environment was useful in enabling the performers careful sonic control over the acoustic instruments and technology, and thus facilitating recordings of this music that demonstrate the coherent interaction between acoustic improvising and improvising with technology in a studio setting.

PART C

CHAPTER EIGHT: CONCLUSIONS

8.1 Reflections and achievements

The original motivation for this research project was to investigate how two existing improvising jazz groups with acoustic instrumentation can develop new work and pathways for creating music together. I was interested in how real-time electronic manipulation of acoustic sound could create varied sonic possibilities in these groups, on stage and in the recording studio.

The principal research aim was to explore the process in creating new music for jazz trio that engages acoustic improvisation and improvisation with technology. By analysing the musical content, use of technology, and the musician's reflections on their decision making, this thesis has attempted to articulate the musical potential of improvising with technology in a jazz context. For this study I chose two professional jazz groups that I have performed and recorded with extensively in my career and undertook a focused study of the development, performance, and recording of a suite of new work. These musicians in these groups are skilled acoustic improvisers but had limited experience in implementing technology as part of their performance skills, and thus the project used testing sessions, rehearsals, live performances and studio recordings to enable the groups to develop maximum musical cohesiveness with each other, the music and the technology. To realise this new music in the most complete way, I thought deeply about my transition from practitioner to researcher. From the start I was considering process, content, documentation and the final artistic output, which would demonstrate and realise the musical representation of the research aims. I referred to Nelson's (2013) summary of inclusions in an artistic practice as research submission, and used a multi-modal form of research enquiry. I presented the research through:

- a. A final artistic product presented in a durable record— clear multi-frame video recordings of the studio recording sessions enabling a visual understanding of gesture to sound relationships from each musician; video recordings of individual testing sessions, ensemble rehearsals and live concert performances.

- b. Documentation of process—images of technical settings for each musician on the stage and in the studio, copies of the sheet music used by each musician, and images from recording sessions and performances demonstrating musician configuration and physical relationships to gear and each other.
- c. Reflective writing—case studies of artists that create music incorporating improvisation with technology alongside acoustic instrument improvisation, explanations of technicalities of the selected pieces of hardware and software, individual performer reflections on the concert recordings and detailed performer reflections on the final studio recordings of each piece of music.

In Part A, I referred to my background and the musicians in this project. The design of the research raised a series of questions including what technology would be effective for improvising musicians, how each musician's role within the ensemble can change, and how I could present the musician's analysis of the resulting work. I discussed the artistic methodology in a multi-modal research technique as a pathway to being responsive, driven by the demands of the work and the dynamic of the artistic practice. I presented the context in which I have approached technology within the creative process, outlining how this research uses existing technology to connect with the musical process of improvising musicians, extending their performance modalities. Part A also explains the development of the work to be performed and recorded, drawing on frameworks for composition and improvisation. I created new material for each ensemble using fixed and mobile forms, enabling a group sound to evolve organically.

The literature review articulated how I approached the understanding of what Live Electronics encompasses, and how I have adapted this definition in my project to reflect the concepts of musicians improvising with technology in a jazz based context. Following this, in Chapter Four the case studies highlighted selected artists who use improvisation with acoustic instruments and technology as a core part of their performing and recording practice. These case studies were critical reference points in my musical process, serving as inspiration for my conceptual and compositional content, but also for the participant musicians, providing an audio/visual reference point of what has been created by other contemporary artists. As so much of the musical content in this research is focused around improvisation, I also presented some consideration to improvisational techniques and the roles that musicians inhabit within improvising groups. The addition of improvisation with technology causes a shift in performer

improvising process, a change in the intuitive balance, and the sense of performer connection to sound.

The last chapter in Part A presents explanations of the electronic hardware and software selected for each musician and the technical setup for stage and studio. The choice of technology for each player is based on creating versatility in the electronic sounds created, using multiple devices to layer electronic sound, and creating a setup with an effective ergonomic layout. The technology chosen facilitates agility, enabling the performers to use it in a way that extends their acoustic instrumental performance process on their instrument.

Part B explores the development of the music and group skills through the documentation of process. The initial testing sessions enabled the musician to learn the selected technology to an operating level so they could be embedded alongside the already highly developed instrumental technique. After the preliminary testing sessions, I rehearsed each group before embarking upon a series of performances over a three-year time period. The performances featured recurring material, new works and spontaneously improvised music, in a variety of venues. As part of this performance process I presented an analysis of selected performances with the live recordings highlighting how the groups utilised acoustic improvising and improvising with technology in live concerts. These performance learnings formed the basis for the performance processes used in the subsequent studio recordings.

After the performance series, each ensemble completed a studio recording of six pieces of music, and from this collection I selected two works from each ensemble for deeper investigation. I analysed these works via overall musical elements, electronic inclusions, individual performer streams and the construction of an overall performer decision summary. This highlighted the ensemble thought given to the musical material, the technology, form and ensemble interactions. The performer decision analysis streams were insightful, with each performer analysing their performance in close detail, breaking down their performance decisions into four categories and commenting on many specific moments in the music. Alongside the analysis, presenting the final studio recordings in an audio-visual manner was a critical outcome of this research. Enabling a visual link between sound, written analysis and image allows me, and the musicians, to see where the sounds have come from. When looking back at these recordings and thinking, *How did we do that?* and *Where are those sounds coming from?*, the multi-screen videos can give a perspective on both sonic creation and performer reactions that is particularly insightful.

The process that my collaborators and I undertook in this research has led to a change in how I think about, write, perform and record music. I was curious how each group would

adapt to this alternative way of performing music, but over the research period the improvisation with technology has become embedded within the sound of the music each group produces. Using musical material with varied parameters—fixed and mobile forms, scored works, and spontaneously improvised pieces—enabled the musicians to find varied ways to use these electronic manipulations of acoustic sound in these musical situations. Throughout this research the musicians have learned the technology in testing sessions and rehearsals, but the real musical development and unlocking of potential in the acoustic and electronic combinations occurred in ensemble settings, on stage, and in the recording studio. Each performer has developed a new hybrid acoustic-electronic performance style, enabling them to control technology and their acoustic instrument while performing composed and improvised music.

Spending time with the musicians in these ensembles, in studio testing, and performance situations has been invaluable in thinking about my process, and how the other musicians can effectively engage with technology within their improvising experience. Raymond McDonald and Graeme Wilson's research into musical identities in an improvising ensemble reflects on a critical element that relates to my music creation—"an individual improviser may contribute to the music with a particular intent; but both musical content and intent will be shaped by the identities which that individual can construct for themselves and others within the social and temporal context of performance" (Wilson and McDonald, 2016, p. 569). The group shapes the sounds created by the individual, and further to this, "that musical contribution may be interpreted, and responded to, in idiosyncratic and unpredictable ways by the other improvisers" (p. 569). I find this even more evident when considering the effect that improvising with technology has on the music being created by each performer. The unpredictability present in improvised music is far extended when improvising with acoustic instruments and technology. The music created here has used technology and extended performance practices by the musicians to create a new hybrid electronic-acoustic group sound, but through the use of jazz based music frameworks and the improvising coherence found within each group, the music is still recognisable as having a jazz stylistic base. It draws upon many of jazz improvising skills already existent in the performance styles of the groups but enhances them, creating distinct new group sounds, where the musical possibilities from the acoustic instruments have shifted through the inclusion of technology. The performance skill that the musicians have brought to the music in this project has enabled the resulting recordings to be of superior musical detail and quality, a vibrant contribution to the contemporary jazz community in Australia. The sound of each group is distinct, clearly

drawing on the musical concepts observed in the case studies outlined, but with a distinguished group sound, using enhanced jazz improvising techniques harnessed from time spent cultivating a shared understanding of the music, the technology and the group improvising process.

8.2 Research sub questions

1. What software and hardware devices are functional for performers of piano, double bass, drum kit, vocals and saxophone to enhance their acoustic sounds?
 - The musicians in this research utilised a range of hardware devices, mostly single stompbox style effect pedals and tabletop multi-effect units. Each performer engaged with multiple devices in their performance setup, layering effects during their performance and selecting effect units that were suitable for the physical performance processes of their instrument.
 - As part of my piano performance setup I used the Ableton Live software with multiple MIDI controllers – hand and foot control devices. The versatility in this software was enhanced by the varied MIDI controllers. This created a more complex setup for the piano technology, and a more challenging operating situation during performances.
 - I was cognisant of the inherent technological skill of the musicians in these groups, and focused on presenting technology to the musicians that featured clear tangible interface designs, with visual and tangible feedback to the musicians. The interface difficulty and user skills needed to reach a nexus that would push the artists, yet allow them creative musical results.
 - The technology is a tool, and in this project acting as an extension to the acoustic instruments. As the musicians continue to enhance their physical skill and sonic awareness of the potentialities with the technology, the choices will continue to vary.
 - I also hope that this project will be of use to the wider music community, so the technologies chosen are all available through retail channels, with many standard brands used.
2. When improvising with technology, what sonic choices yield satisfying results in a jazz trio format?

- In this research I found that each performer developed a sense for what electronic sounds worked for them, and what was physically possible with the technology and with their instrument. Certain kinds of electronic manipulations of the acoustic sound would recur, appearing in the concert recordings and in the studio recording, and often similar electronic concepts would be implemented by musicians across multiple pieces of music. In these cases the musicians have developed a new physical process, an enhanced sense of physical control across their acoustic instrument and the technology. By returning to electronic sounds that complement the acoustic properties of the instrument, some decision making time is reduced, enabling the musicians to get on with the music making, rather than negotiating the devices themselves.
 - Recurring electronic choices included delay effects, layered looping, rhythmic manipulations of sampled sounds, distortion, reverb, harmonisers, and filtering. Delay and rhythmic manipulations of samples enabled the musicians to interact rhythmically with themselves and the other musicians on stage. It created a sense of playfulness to the electronic sounds. Layered loops, samples, harmonisers all gave the musicians opportunity to create textural and harmonic changes in the music. Essentially the electronic manipulations of the acoustic sounds facilitated changes to the core musical elements in addition to creating unusual sonic representations of the acoustic instruments. Musicians made recurring choices because they were hearing sounds that they felt connected to the music, and the other musicians could respond to.
3. Can the same depth of interaction between acoustic improvising and improvising with technology occur in both live concert and studio settings?
- The live performances and studio recordings documented in this research demonstrate that interaction between acoustic improvisation and improvising with technology can be musically rich and satisfying in both studio and live concert environments. However, in the studio there was a more careful control of sound. In both recordings sessions we could set up in a way that restricted bleed of sound from one instrument into another. This helped when each musician was live processing their acoustic sounds. Also, we could take time to gain an ideal balance of electronic effects and acoustic instrument sound in our headphones. This clarity enabled greater confidence in improvising with the technology and enhanced the interaction between

acoustic and electronic sounds. This kind of studio process can be useful for other jazz musicians who wish to create technologically enhanced live performances in studio settings.

- The ensembles were less rushed in the studio than at a live performance, so greater care was taken in the performance of each work. The studio environment was more ideal for enabling the musicians to produce the most detailed blend of improvising using the acoustic instruments and electronic devices.
 - However, in both live and studio settings, the depth of interaction between acoustic and electronic sounds was the result of each performer developing new extended techniques on their instrument. Their existing acoustic skill was transformed, with new physical processes and listening modes engaged.
4. What kind of scoring practices will be effective to communicate new music that includes improvisation with technology to the participant musicians?
- The music created as part of this research featured a variety of scoring practices – lead sheet style, graphic notation and text based directions, and some works were completely improvised, needing no score for the musicians to work from. As I outlined in Chapter Two, the notation does not focus on giving the performers specific directions as to when and how to improvise with electronics, but rather I have connected to Rebelo's (2010) idea of notation as production – where the score is a place for collaboration between the performer and composer. Rebelo is not situating this concept from a jazz perspective, and in my groups, the score is always a place of collaboration.
 - That research revealed that although there may be scoring practices that are effective in communication performance directions with technology, my performers did not use scores that included this. The musicians needed no scored direction in how to improvise with technology, instead making decisions based on experience, intuition and group dynamics.

8.3 Future directions

As I conclude this research project I am thinking about the future. Improvising with acoustic instrumentation and technology is now a core part of my performance practice in these ensembles, and I'd like to develop the concepts and processes conceived in this

research further. My current thinking covers three areas:

1. Varied technologies?

During the five years I spent developing a performance practice that embedded improvising with acoustic instruments and technology, I have become adept in using the selected devices for my setup. My collaborators also feel a certain level of comfort with their chosen technology. A potential development for each musician— and group—is to change the technology used. The difficulty here is deciding what the musicians would like to hear, and what their current setup is not providing. What change could address this and how much learning they would require for a new piece of technology? A constant challenge was getting a clear, clean acoustic sound into the electronic devices, but also keeping the interface easy to approach. Continued testing of various hardware and software would be ideal, again working to find an optimum operating level for the musicians. Changing technology is exciting, but presents a new set of sonic and physical challenges.

A) Gesture controllers

Throughout this project I used the OWOW Wiggle gesture controlled, mapped to various parameters in Ableton Live. It was a challenge to wear this device and adapt my piano performance technique to the movements required to activate parameter changes via the controller. I'm curious how this device could work with the other musicians. Kristin could be a smart choice, as she could hold the gesture controller, having no need to hold her instrument. Her movements could be more controlled, and thus more effective in enacting the effects. I can also investigate other wireless gestural controllers such as the Enhancia Neova MIDI ring controller.

B) Max for Live

I think I only scratched the surface of some Max for Live possibilities. The ability to map Max effects to various parameters across the incoming sound of my piano opens up vast possibilities for a shifting sonic experience. When using selected Max effects I found the use of the Randomizer inspiring during my playing. When active it would randomise parameters in the selected audio effect creating sounds I didn't expect. Future developments here would be some deeper exploration of more curated mapping of randomisation, and more curated use of Max effects and their ability to shape incoming sound.

C) Sampling each other?

At some concert performances we had inadvertently sampled each other during the performance. This occurring during moments of loud dynamic—for example, while the Trichotomy trio was playing at a loud dynamic I'd start recording a piano loop, but because of the spill from the drums and bass into the piano microphones the loop would include drum and bass sounds. This kind of practice was not intentional, and can create additional sonic layers to the sound which can quickly become messy. However the concept, if controlled, could be something to explore. A potential technique could be microphones on the drums feeding into a channel on Ableton Live setup at the piano. Thus I would have the potential to sample and effect drum sounds.

2. A different band?

I am aware that the music produced in this research is very much the product of the musicians as the music itself. If the same devices, sheet music and recording situations were transplanted to another group, would the result be the same? My instinct is that it would not, as there is a shared musical development, and group sound present in this music, removing the individuals compromises this. However, I'm interested to see if these musicians—and myself—have created some transferrable skills that can be implemented in other groups? Kristin and myself have both performed solo concerts using technology recently, and I plan to collaborate with another pianist utilising technology soon. I'm curious to see if the skills developed in this project can assist in a faster implementation of the music for a new musical ensemble. Additionally, this research shows how skilled improvisers can blend acoustic improvising and improvising with technology in a trio setting, and outlines a process for others to follow

3. Rodrigo Constanzo - multilayered analysis

The decision stream analysis process that each musician completed was developed by the Portuguese researcher Rodrigo Constanzo. As explained in Chapter Two, Rodrigo's research he only investigates one solo musician improvising at a time. In my project we had three musicians playing together, and then three decision streams for the one audio track. I would like to investigate ways of producing a visual representation of the three streams layered so we can visually understand how the musicians thinking converge at various points in the music. This is something Rodrigo and I are discussing and looks to be a fascinating development of this research data and future research data.

8.4 Concluding thoughts

Morten Qvenild raises the concept of *flow friction* in his research and I think it is a useful concept to conclude with. Morten outlines friction when relating to various tools connected to the instrument including sound, composition, performance, rhythm and the instrument setup of his augmented piano (Qvenild, 2016). For an ensemble improvising with technology and acoustic instruments, there must be an awareness of the levels of these moments of friction, a group empathy towards physical and technical control of technology alongside musical elements, and an openness to embedding this friction in improvised musical experiences.

In the music created with my performance collaborators we have focused on using technology to extend the sonic possibilities of our acoustic instruments, and changing the way we improvise as an ensemble. The process involved a series of activities, with the performances and recordings produced demonstrating the variety and depth of sound that can be created when electronically modifying acoustic sounds in real-time. The acoustic sound was always the generative source, and this pathway of music making to me feels like a worthwhile development in modern jazz performance and recording situations.

When thinking about the overall concepts for the group to develop a confident and cohesive approach to improvising with technology and acoustic instruments, I have formulated a brief list of considerations, in no particular order:

- a. **Remove physical barriers**—use technology physically suitable for the instrument. This may involve creating new physical skills, but it must work from a physical perspective.
- b. **Encourage experimentation**—use free improvisation with technology to create sound. Do this in rehearsal and in concert performances.
- c. **Create options and choice**—setup musical situations where multiple electronic outcomes can be facilitated. The layering of electronic sounds with multiple pieces of technology is useful here, so performers can use varied sonic ideas in their performances.
- d. **Textural thinking**—broaden your sound to be more than one voice. Looping and layering creates new ways of interacting in the band.
- e. **Non-rhythmic concepts**—use technology to create rhythmic and non-rhythmic sounds, just as you would your natural instrument. It does not need to be exact, embrace tempo fluctuations and inaccuracies.

- f. **Change your role**—Use technology to manipulate your usual role in the ensemble. Single line instruments can suddenly create harmony and polyrhythm.
- g. **A robust setup that gives flexibility**—the setup must enable improvisation within the electronic sound generation, but also stability. The gear needs to work consistently, and give a reliable sound output. Having a setup that can be used on tour is useful for maximising performance opportunities.
- h. **Monitoring**—you must hear everything to prevent dissociation with the resultant sound, and a clear awareness of the ensemble sound.
- i. **Process**—The process of rehearsal testing, to performance situation to recording studio gave all the musicians time and space to test, learn, experiment. The pressure of the gig was important and helped us prepare for the studio session.
- j. **Gigs**—you need to try it in real-time, in the pressure of the gig. This enables you to know if the acoustic and electronic combination can really work and if the performers have the confidence to execute it.
- k. **Don't focus on the scores**—these quickly became irrelevant as performers made their own choices with the technology. In giving my collaborators scope to create their own electronic sounds and processes their agency in the music was increased and the music became a true reflection of the band in a new form.

Lastly, these groups now have a changed approach to sound creation, and now if we play a gig without the electronic devices, it is a strange feeling. Our thinking has shifted, the way we play our instruments has shifted, the sounds we expect to hear from each other has shifted, and how we approach collective improvising has shifted. Through embedding improvisation with technology with our acoustic improvising we have unlocked a new and unfamiliar sound for these groups that had already created so much music together over many years. The use of technology in this research project has enabled the musicians to alter how their core musical elements are created, and then perceived by the other players in the group. The musical stimuli has been interpreted by using the acoustic instruments and pieces of technology simultaneously, which has become a new skill for each musician. Layering of acoustic and technologically created sound features throughout the music, with the technology creating sounds that were not possible using purely acoustic instrumentation. However, the skill is still in the acoustic sound generation, and to think you could grab a bunch of pedals and 'turn on the effects' is short-sighted. Implementation of the technology over a considered musical situation, with high levels of control over your acoustic instrument and ensemble awareness,

is crucial for an authentic and relevant musical outcome. Contemporary jazz in Australia covers a wide range of sounds and styles, and this new body of work demonstrates how skilled acoustic musicians can take their highly developed improvising skills and put them into a new context which extends the sounds possible on their instruments, and their improvising.

This research has given me insight into what can be possible for improvising musicians when they step outside their acoustic worlds, retaining real time acoustic music making, but bringing in new ways of improvising with sound by using technology. Our physical music making processes have changed. I am excited to see where I can take it in the future.

PART D

APPENDICIES

Appendix 1: Studio Recording Session - Multi-camera videos

Trichotomy - Access link:

<https://www.dropbox.com/sh/2v7hj2d5yakp29t/AAAMxAan2BoXTMDIYv86UhSSa?dl=0>

Recorded at the Trichotomy home studio, Ardisia St, Arana Hills, Brisbane.

February 1-2, 2019

Studio Engineer: Lachlan Goold

Mix: Lachlan Goold, Addison Joy

Track list:

1.	Mercury	07.23	Composed, fixed form
2.	Reassemble	06.36	Composed, fixed form
3.	In times past and present	06.14	Composed, fixed form
4.	Stream	05.44	Composed, mobile form
5.	Graphic No. 1	07.11	Composed, mobile form
6.	Improvisation No. 2	06.12	Freely improvised

Berardi/Foran/Karlen – Access link:

<https://www.dropbox.com/sh/7hklcc4um581e9t/AACXmI4LPKEx17RIpSZmRM-Ra?dl=0>

Recorded at JMC Academy Studio, Grey St, South Bank, Brisbane

August 1-2, 2019

Studio Engineer: Addison Joy

Mix: Addison Joy

Track list:

1.	Friday	08.17	Composed, Fixed form
2.	Don't Fade Away	07.04	Composed, Fixed form
3.	Double Take	06.51	Composed, Fixed form
4.	Stretch	08.31	Composed, mobile form
5.	Forward Motion	05.57	Composed, mobile form
6.	Improvisation No. 1	06.27	Freely improvised

Appendix 2: Scores

Trichotomy access link:

https://www.dropbox.com/sh/99oskor0qdoilpw/AACgqUSiXpSORMSVe7N_jr-Ea?dl=0

Berardi/Foran/Karlen access link:

<https://www.dropbox.com/sh/q1khukk90xiieoz/AADoyVGXOkm-Ot4Oiw1nFzXIa?dl=0>

Appendix 3: Technology setups & instrument specifics

a) Instrument setups

PIANO TECHNOLOGY SETUP
Critter and Guitari - Organelle
Type of device - Hardware effect processor using Pure Data program
Interface/control method - Foot pedal, mini button style piano keyboard, knobs for parameter control. Small screen for visual feedback
Audio – feed/send Original performance setup used signal from SM58 microphone direct in. Modified this to include Art ProMix to receive audio from SM58 and 2xDPA 4099p and K&K Pure piano microphones. This enabled a richer piano signal to the Organelle, covering a wider pitch range, and more evenly in dynamic.
Functionality - A versatile piece of equipment that creates a vast range of electronic effects with multiple tactile controllers. Simple interface, and easy to move through patches. I find the effects to be unusual, and often unpredictable in their output which connects with my acoustic improvising.
Ableton Live 9
Software program— multiple effects available
Interface/control method - Various MIDI controllers - Foot, Gestural, touchscreen
Audio Feed – 2 x DPA condenser microphones
Functionality – Complex program that allows huge variety of real time audio processing. Easily controlled by various MIDI controller. I have preselected various effect patches and mapped them across the various MIDI controllers to give a range of control and layering possibilities with the program.
Volume pedal – Roland FV
Type of device - Foot controlled volume pedal
Interface/control method - Foot control
Audio – From Organelle
Functionality – Useful for volume control without taking hands off the keyboard
Keith McMillen -12 step
Type of device – MIDI controller—Foot Operated
Interface/control method - Foot control— 12 pressure sensitive pads
Audio - None , mapped to Ableton Live
Functionality - MIDI controller mapped to a variety of parameters in Ableton. Looping, effect on/off. Useful when both hands are playing. Setup developed to include this as the Logidy 3 button controller became limiting.
Logidy MIDI controller
Type of Device - MIDI controller—Foot Operated
Interface/control method – Foot control – 3 button
Audio – none, mapped to Ableton Live

<p>Functionality - MIDI controller used prior to transferring to the 12 Step. 3 buttons, stomp box style, so has quite a loud ‘click’ when depressed. Used during selected performances, but discarded before recording sessions</p>	
<p>Lemur</p>	
<p>Type of Device – MIDI/OSC controller application</p>	
<p>Interface/control method – Software application for wireless Ableton Live control</p>	
<p>Audio – none, Customisable touchscreen MIDI controller</p>	
<p>Functionality - I prefer the touchscreen to the laptop and I am trying to keep away from the laptop as much as possible. Through Lemur, the Ableton session is mapped to include volume fades, effect on/off, and various effect parameters.</p>	
<p>OWOW - Wiggle</p>	
<p>Type of Device – Wireless MIDI Controller—Gestural</p>	
<p>Interface/control method - Gestural controller, 3 dimensional, with 3 buttons for isolated control of each direction</p>	
<p>Audio – none, Mapped to Ableton Live</p>	
<p>Functionality - The device is strapped to my right wrist and is mapped to three different parameters in three effects patches in Ableton Live.</p>	
<p>Korg Kaoss Pad – KP3</p>	
<p>Type of Device – Hardware multi effect unit</p>	
<p>Interface/control method - Touchscreen hardware effect unit with XY touchpad and buttons for pre-saved effect preferences and live looping</p>	
<p>Audio – Audio from Art Pro Mix—including SM58, DPA, K&K Pure piano microphones.</p>	
<p>Functionality - The touchscreen is ergonomically effective for the piano giving quick access to effect parameter change, and the 9 buttons for pre-saved favourite patches facilitates easy transitions between patches.</p>	
<p>AUDIO INPUT DEVICES</p>	
<p>DPA 4099-P (x2)</p>	<p>Condenser Microphone – sound sent to Ableton Live and Organelle/Kaoss Pad(via Art Pro)</p>
<p>Shure SM58</p>	<p>Dynamic microphone – sound sent to Organelle/Kaoss Pad via Art Pro</p>
<p>Art ProMix</p>	<p>Three channel microphone mono mixer—summing sound from DPA, SM58 and K&K, and sending sound to Organelle/Kaoss Pad</p>
<p>K&K Pure Piano</p>	<p>Three head microphone pickup system, mounted on the underside of the piano – sound to Organelle via preamp</p>
<p>Audio Interface</p>	<p>I originally used PreSonus AudioBox 2 channel in early performances. This was limiting so I changed to the Roland Rubix 44, a 4-channel interface. Final recording session uses Rubix 44.</p>
<p>DOUBLE BASS TECHNOLOGY SETUP</p>	
<p>Zoom B3</p>	
<p>Type of device – hardware, multi-effect processor</p>	
<p>Interface/control method - Foot pedal</p>	
<p>Audio – in effects loop, taking signal from double bass pickup</p>	

Functionality - Multi effect processor, hardware, with three effects able to run simultaneously
EBS MicroBass II
Type of device — Preamp/DI - Hardware EQ box with effects loop
Interface/control method – Foot pedal
Audio Feed – in effects loop, taking signal from double bass pickup
Functionality – Used as overall Bass preamp to control the bass sound - EQ - and easily mute effects line.
TC Electronic Ditto X4
Type of device – Hardware 2 track looper with effects
Interface/control method - Foot control
Audio Feed – in effects loop, taking signal from double bass pickup
Functionality – Effect unit, hardware, Two track looper with some preset effects - reverse, double/half speed.
DRUM KIT TECHNOLOGY SETUP
Roland RC505
Type of device – Tabletop hardware unit - 5 track looper with multi-effects
Interface/control method – hand operated
Audio – in effects loop, multiple microphones used
Functionality - Track and input effects alongside 5 individual loops. Hand control facilitates ease of use with drums
Hungry Robot ‘The Karman Line’
Type of device — Hardware effect unit– joystick delay and oscillator
Interface/control method – hand operated
Audio Feed – in effects loop, multiple microphones used
Functionality – Lo-Fi Delay pedal - Joystick operation enables control over pitch modulation and LFO in an abstract way
Korg Kaoss Pad Quad
Type of device – Tabletop hardware unit- Multi-effects processor and sampler
Interface/control method – hand operated
Audio Feed – in effects loop, multiple microphones used
Functionality – Multi effects plus 4 track sampler with resampling capabilities. Touchscreen and unit size is useful for pairing with RC-505
Art Series Studio V3 Tube MP
Type of device – pre-amplifier
Interface/control method – hand operated
Audio Feed – Microphone preamp with effects loop to drive microphone signal to effects
Functionality – Preamp with effects loop to take signal from microphone through the stomp box and tabletop effect units. This was added in after early performances to give greater control over the microphone signal into the effect chain.

AUDIO INPUT DEVICES	
Rode NT5 x 2	<p>Condenser Microphones, one running into the Art Pro, the other direct into the XLR input on the RC-505. One NT mounted on a stand for consistent sound, the other on a goose neck microphone stand attachment to allow John to adjust the position of the microphone as needed. Microphone positioning and specific models shifted throughout performances.</p>
VOCAL TECHNOLOGY SETUP	
Roland RC505	
Type of device – Tabletop hardware unit - 5 track looper with multi-effects	
Interface/control method – hand operated	
Audio – in effects loop, multiple microphones used	
Functionality - Track and input effects alongside 5 individual loops.	
Greenhouse Effects Retro Sky Delay	
Type of device — Hardware effect unit	
Interface/control method – Foot control pedal - mounted for hand operation	
Audio Feed – in effects loop	
Functionality – Analogue delay with phaser - The delay moves from fast slapback to complete self-oscillation	
Hungry Robot Stargazer Reverb	
Type of device – hardware effect unit – 2 channel reverb	
Interface/control method – Foot control pedal - mounted for hand operation	
Audio Feed – in effects loop	
Functionality – Two channels of reverb that are switchable	
Radial Voco Loco	
Type of device – pre-amplifier	
Interface/control method – Foot control pedal - mounted for hand operation	
Audio Feed – Microphone preamp with effects loop to drive microphone signal to effects	
Functionality – Preamp with effects loop to take signal from microphone though the stomp box and tabletop effect units. This was added in after early performances to give greater control over the microphone signal into the effect chain.	
AUDIO INPUT DEVICES	
Microphone	SM58 dynamic

SAXOPHONE TECHNOLOGY SETUP	
Boss ME-50	
Type of device – hardware effect unit	
Interface/control method – foot operated	
Audio – in effects loop	
Functionality - Multi-effect processor with 3 channels and a modulation pedal	
Boss RC-30	
Type of device — Hardware 2 track looper with effects	
Interface/control method – Foot control pedal	
Audio Feed – in effects loop	
Functionality – 2 channel loop pedal with some limited on-board effects.	
Roland RE-201 Space Echo	
Type of device – hardware effect unit	
Interface/control method – Foot control pedal	
Audio Feed – in effects loop	
Functionality – Modern emulation of the classic Roland Space Echo rack unit. Reverb and Delay (with rhythmic tap).	
Radial Voco Loco	
Type of device – pre-amplifier	
Interface/control method – Foot control pedal	
Audio Feed – Microphone preamp with effects loop to drive microphone signal to effects	
Functionality – Preamp with effects loop to take signal from microphone though the stomp box and tabletop effect units. This was added in after early performances to give greater control over the microphone signal into the effect chain.	
AUDIO INPUT DEVICES	
Microphone	Sennheiser E865 condenser

b) Piano technology specifics

1. Organelle patch selection

Quad Delay	I had been looking for a delay patch that created a delay that was not firmly repetitive and robotic. I wanted something that cascaded, that changed, and also had scope for variation while running. The Quad Delay patch uses four delay lines with control over the feedback time/amount of each delay line.
Guitar to arp.	The incoming pitch is analysed, and then a synth voice is created and plays arpeggios from the note. The arpeggio intervallic pattern can be changed, and the Organelle knobs can be

	used to change tempo, resonance, Dry/Wet, and cutoff.
Rhythm delay distortion	A parallel delay and distortion patch. Delay and Distortion can be triggered independently and knobs manipulate tempo, delay rhythms, feedback amount and distortion 'on' time.
Granular freezer	Audio is turned into a granular cloud that can be manipulated. Knobs control grain size, density wet/dry and spread. A shimmering, ambient kind of sound that gives a lushness to the piano. it is also able to be 'frozen' via the aux switch (which can be controlled via the foot pedal) and this gives an interesting 'pad' to play over
Overloop	The Overloop feels like an improvising loop machine. It is easy to record and loop audio, then play some new material over the existing loops with many layers possible. You can blend old and new loops of varied length and there is delay that can be added to the looped layers.

2. Kaoss Pad patch selections

Present Number	Effect Name	Effect Details
3	LF19	MidAutoPan - A Low Frequency Oscillator that creates vibrato through modulation of the volume. The XY controls vary LFO speed and depth
4	DL10	ReverseDelayMix - a delay effect with a reverse of the sound. XY controls delay time and depth
5	LF23	SlicerHPF - a rhythmic LFO with the XY controlling slicer speed and HPF (High Pass Filter) cutoff and resonance.
6	GRN3	MidGrainShifter - a type of granular style sampler with the XY controlling cycle speed and length
7	SNP3	Sampler - the XY controls sample direction and HPF cutoff/resonance
8	MD11	Decimator - XY controls the sampling frequency and bit depth, creating a distortion of the sound

3. Ableton Live audio effects selected

- A. Looper: The Ableton Looper is a simple yet powerful loop generator. I am using it in a metrically free method—where tempo and length are not set or locked to the program, loops are generated by my start and stop controls. I am able to easily layer loops, undo, reverse the loop and quickly clear them to start from scratch. The Looper is first in the chain of effects so I can easily run live loops dry, (without effects) or switch between various effects on the loop live.
- B. Frequency shifter: This patch allows me to change the frequency content of the incoming audio. The result is something like a phaser or chorus type effect where the piano sounds like it is bent and layered on top of itself. There is a metallic kind of sound, and modulations to the pitch and timbre that give a significantly altered piano sound.
- C. Reflections Reverb: This reverb is easy to control, and I have mapped controllers for the decay time and Dry/Wet. The inclusion of Reverb is an excellent way of placing the piano in different spaces, and creating depth and dynamic in the parts.
- D. Phaser: A great effect that brings a kind of sweeping sound to the incoming audio. It is a modulation effect, the audio signal is continually modified, and I like the sense of movement it gives to the sound.
- E. Big Money and Auto filter: Filter effects can be quite useful, as a way of enhancing or minimizing parts of the incoming audio. The auto filter and Big Money can create significant tonal variation and moving filter effects that blend well with other plugins.
- F. Ping Pong Delay : The ability to easily manipulate the time, length of repeats and number of repeats allows huge variety in the way the delay sound can interact with the live piano sound. This effect facilitates interesting rhythmic performance and it is extremely versatile in how I can manipulate the delay sounds using controls on the iPad.

4. Max for Live Randomizer effects

- A. Frequency Shifter— similar to the shifter selected in the standard Ableton plugin track, but now in the Max plugin section, it has the benefit of being paired with the randomizer.
- B. Grain delay—a kind of granular synthesis effect where the incoming audio is broken into small grains. The controls within the plugin allow you to change delay time, pitch, and size of these grains.
- C. Resonators—This is a strange piece of processing. The incoming sound is sent through five delay lines, all with their own control of pitch shifting. The tonal and harmonic variation is wide.
- D. Subtractive looper—The subtractive looper is an interesting variant on the standard looper. It features four separate layers, with a range of parameters in each layer—length, suppression, smoothness and phase - that can be randomised. Once the four loops are created and playing, the parameters can be randomised, giving unknown responses to the audio input. A sense of improvisation to a loop!
- E. Pitchswitch — Pitchswitch allows you to create a sequence of changed pitch and then further manipulate the tonal quality.

c) Double bass technology details

1. Zoom B3 multi-effect unit patch selections

Effect Patch	Description
Bass Muff	Distortion style patch, emulating an Electro-Harmonix Bass Big Muff pedal.
Octave	Adds an octave below the performed sounds
Reverse DL	Reverse delay - a long delay (2500ms) with a reverse of the input sound occurring
Arena	Large space reverb (often used with bowed parts)
Slicer	Rhythmic effect - the sound is chopped up by a set rhythmic value and repeated

Appendix 4: Concert video recordings

Access link:

<https://www.dropbox.com/sh/na1gb2s0worzpk6/AADVt9XOUjrcWxnlaUaCpXJua?dl=0>

Trichotomy

Recording	Ensemble	Venue	Date	Material
1	Trichotomy	Ian Hanger Recital Hall, Griffith University, Brisbane	10th March 2017	In times past and present
2		Ian Hanger Recital Hall, Griffith University, Brisbane	10th March 2017	Reassemble
3		JMI Live, Brisbane	27th July 2017	Reassemble
4		JMI Live, Brisbane	24th November 2017	Mercury
5		Ian Hanger Recital Hall, Griffith University, Brisbane	4th May 2018	Stream
6		JMI Live, Brisbane	22nd February 2018	In times past and present
7		JMI Live, Brisbane	9th May, 2019	Mercury

Berardi/Foran/Karlen

Recording	Ensemble	Venue	Date	Material
8	Berardi/Foran/Karlen	Brisbane Jazz Club, Brisbane	16th March 2017	Stretch
9		Brisbane Jazz Club, Brisbane	16th March 2017	Double Take
10		The Jazzlab, Melbourne	2nd March 2018	Double Take
11		Orange Studios, Christchurch	26th May 2018	Double Take
12		Orange Studios, Christchurch	26th May 2018	Stretch
13		Ian Hanger Recital Hall, Griffith University, Brisbane	14th November 2018	Don't Fade Away
14		Peggy Glanville Hicks House, Sydney	17th December 2018	Don't Fade Away
15		Ian Hanger Recital Hall, Griffith University, Brisbane	3rd April 2019	Don't Fade Away

Appendix 5: Complete performer decision analysis

a) Trichotomy

1. Link to all decision analyses for each track:
<https://www.dropbox.com/sh/r6zdpqs10tptiaw/AAALZhJtPsdUWImkL50yU5Ja?dl=0>
2. Decision analysis for works discussed in Chapter Six

'Reassemble'

A. Piano

Time	Stream	Comment
00:14.5	Material	Decide to add to the awesome drum groove by entering with a mute piano motif. Minimal, something that I can develop.
00:21.8	Interaction	Luckily, piano and bass entered at the same time, and I quickly work in with Sam to fill the gap in between his phrases.
00:37.4	Interaction	I hear Sam hinting at some of the changing chords, so I modify my lines to suit and add a few accented bass notes.
00:41.3	Interface	Using the gesture controller here, I've got the parameter turned on the affects the frequency shift amount on the LFO effect.. I don't really move my hand in the right direction though, so the modulation doesn't come through so well.
00:46.7	Formal	A clearly presentation of the main intro melody & bass line pattern here, so I can connect more with the bass part.
00:56.7	Material	Getting more rhythmic... there's no effects on so I can create more detail in the acoustic part, plus the harmony is relatively static and lends itself to rhythmic developments.
01:06.9	Interface	I try to get some Kaoss Pad effects onto the line quickly... the 'Decimator' distortion patch is selected, but there's just not enough time.
01:10.6	Interface	Trying again, but I need to stay on the pad for longer, and I can't as I'm in the middle of a two hand phrase!
01:19.9	Interaction	everyone is getting deep in the groove here.
01:31.4	Formal	Visual cue to the band... we need to move to the next section.
01:40.5	Material	The drums loops are great, and it encourages some rhythmic embellishments from me.
01:59.9	Interface	I'm trying to scroll through patches on the Organelle while keeping the RH melodic motif going.. and in time.. This is tricky.

02:05.2	Interface	I've selected the Overloop patch and hit record with the foot pedal, while I think about adjusting parameters with one hand... in the end I decide not to until the loop is going.
02:13.5	Interface	Yep, I can hear the Overloop, which creates this strange delayed loop sound, it's working as intended.
02:16.8	Interface	Trying the Kaoss pad again without much luck, I think I'll move on from this.
02:19.3	Interface	So I put the reverb on Ableton... there's a heap of aural space in this part of the music, so perhaps this is a good time to engage the heavy reverb.
02:24.6	Interface	Not bad... but I think I can layer more on the Organelle, so I start to record another live part
02:32.7	Material	Now I've got some more rhythm to work with in the loop and this inspires me to play around with it in my live playing.
02:40.3	Interaction	The loops are not metric though, so I'm finding it hard to stay in time with the band.. It's not a problem if I drift off into my own time space, but I can't quite decide where to be yet.
02:46.3	Interface	Trying the Kaoss again, but no luck.. I'm not sure what is going on.
02:53.5	Interface	Ah... I realise the effect depth on the Kaoss Pad is way down.. no wonder I can't hear it.
03:05.1	Interface	I quickly turn on the "Pitch Shift" on Ableton... I like bringing it in for a short section.
03:07.5	Interface	And then I turn it off again... I'm going for the 'effect in and out' kind of thing.
03:09.4	Interface	Same thing.. a short burst of the 'pitch shift' effect.
03:11.7	Interaction	And then off.. This weaving of the effects in and out is engaged.
03:15.3	Interaction	This time I'll leave it on for longer to see what happens.
03:23.1	Formal	Bringing in the motive that gives the band the cue - I'll move to the chordal part of this section soon.
03:26.7	Formal	Time to turn off the Organelle loop, thin the texture out for the section change.
03:29.5	Interface	I hit the sample button on the Kaoss Pad stop and samples that are playing.
03:45.6	Interface	Turning on the 'Phaser' effect on Ableton for something different.
03:51.7	Material	Not hearing much though.. perhaps I need to play something different, or louder?
04:05.8	Interface	I navigate back to the main mix page of Ableton on the iPad, not sure of what I'm going to change to.

04:21.6	Interface	And turn off the 'Filter' effect on Ableton... let's clean up a bit.
04:26.5	Formal	Cueing the section change.
04:31.7	Interaction	Ah yep, there's still some loops running, but I can't really turn them off right now! Hands are busy! I don't think they sound that strange...
04:37.7	Interface	Thinking perhaps I can get to the Kaoss Pad in between the phrases, but There's not enough time.
04:40.9	Interface	Moving across the Kaoss touch pad so the effect it setup to grab part of the end of the phrase, it's on the reverse delay patch.
05:11.9	Interaction	Some really nice intimate sounds here.. I think they are from the piano., but some are also from the bass I think. It's this point I'm not sure!
05:27.8	Material	Everything is getting soft and sparse, so I start to record a loop on Ableton using the foot controller.
05:34.7	Material	And now loop recording ends... not sure how this will turn out, but even if it's quite abstract that'll work.
05:46.2	Interface	And reversing the loop... it's quite subtle.
05:54.2	Material	The drums are building, so I'm happy to stay sparse on this chordal riff.
06:07.9	Material	The bass change takes me by surprise, but I think I should just stay on my pattern.
06:20.8	Interface	And fading out effects.

B. double bass

Time	Stream	Comment
0:02.932	Material	I'm thinking that I try a new approach to the start of the song... so I'm going to play some melodic fragments straight away, and a good effect with that is the SLICER... it's gives a Tremolo type sound and I cuts up what I'm playing.
0:15.500	Interface	Slider on - just little bits of the melody that I repeat.
0:37.265	Material	And I gradually add some more of the melody.. I'm wondering whether I should start to follow the chord progression, but I'm not sure what Sean is planning to do.
0:48.500	Material	And now the full melody comes out, and I'm kind of sharing it with the piano and alternating to the bass line.
0:52.988	Interaction	Bass line now... but still with slicer... doesn't sound so bad.
0:58.248	Interaction	I'm wondering about taking the slicer off.. I can see it's on, and I'm not sure when to quickly get it off.
1:01.429	Interface	And off.. phew, this cleans things up a bit.
1:08.263	Material	Just acoustic bass here, a nice change to the start.
1:28.780	Formal	Cue the next section from Sean, so I reiterated the melody for the last time.
1:32.823	Formal	And section change.
1:46.854	Material	Just sitting on the groove here, there's some scope for me to change up the bass sound, but it's grooving so I don't want to change the ensemble sound at this point.
1:58.073	Formal	And another section change cue from Sean.. I expected this was coming.
2:04.293	Interaction	Thinking about my next entry, I've got some time while the piano is setting up the two note motive.
2:18.677	Interaction	Loop time.. my idea here is to setup something textural, a scattering of notes that are related to the piano part. I'm going to use 3 layers on one loop track and then speed them up to double their speed to create a kind of crazy twinkling effect.
2:31.808	Formal	End of the first loop recording.. this will all happen very quickly here as I'm going to layer notes on top of each other.
2:39.366	Interface	Start the next layer recording.
2:51.022	Formal	End second layer loop recording.
2:59.000	Interface	Starting 3rd loop recording.

3:07.950	Formal	Ending 3rd loop recording. That should be enough to a triadic type harmony.
3:11.050	Interface	Dialling in the effect for the double speed.
3:14.672	Interface	And then I've activated the double speed effect, might as well while I'm down there.
3:22.682	Interface	Adjusting the loop volume... It needs to be a little louder.
3:31.249	Interface	I keep adjusting it because it's much higher in pitch than I expected.... so I'm not sure what I'm hearing. Eventually I realise it's there.
3:35.943	Interface	Now I'm riding the volume knob, fading the loop in and out for dynamic effect. This is quite effective I think.
3:44.015	Interface	Yep, that's quite clear there, working well.
3:49.172	Interaction	And now I'm thinking - 'I wish I could do this and play at the same time!'
4:01.647	Interface	Loops faded out, double speed off, and now I'm back up, thinking about what is coming next.
4:08.395	Interface	Thought about adding effects, but then decided not to.
4:13.445	Formal	Thought about entering, but decided not to. It's nice with just the piano and little bits of drums.
4:19.819	Interface	Clearing loops and effects, I need it all blank for the rest of the song.
4:26.226	Material	Thinking about pizzicato... so close, but then I've decided to go back to the bow.
4:32.148	Material	Bow up, arena reverb on. I think I'll do some kinds of loop.
4:39.963	Material	So now I'm planning on building a sustained chord, three notes stacked on top of each other.
4:46.580	Material	Second note.
4:53.790	Material	3rd note.
5:00.500	Interface	Ok, ha.. this is cool...I fade it out with my foot, I'll bring this back once I have the next chord ready.
5:07.250	Interface	I took a few tries at stopping and storing the loop. It's a double tap function, which sometimes is a little messy.
5:16.469	Material	And now the second chord, same concept.
5:20.934	Material	2nd note.
5:28.283	Material	3rd note.
5:34.630	Material	4th note!

5:43.080	Interface	Alright, this is tricky to do while holding the bass. First I need to get the level of both loops appropriate, then trigger each loop to play.
6:03.893	Interface	And now I add some kind of effect to the loops.
6:07.884	Interaction	Yep, there it is, doubled and higher in pitch. It's a weird sound, but I'm enjoying it.
6:14.401	Interaction	Mixing them both together, trying some blending, hopefully it shimmers. C9 chord I think.
6:25.154	Interaction	And fade out...

C. drums

Time	Stream	Comment
0:05.645	Interaction	I'm changing the FX depth on the Kaoss Pad here (pitch & delay).. it's just drums at the moment, so there's some scope for me to do stuff. I've set the global tempo to match that of the song.
0:08.600	Material	I've preset the drums with sizzle cymbals, paper floor tom, paper snare, gong on snare and gong on tom 1... this will give varied sounds on the acoustic kit that I can then process.
0:13.462	Interaction	Trying to get a nice blend of acoustic sound and delay effect... but I don't want to be too overpowering with the effects.. perhaps I'll loop this.
0:16.034	Interface	Yep.. starting a loop recording as the ideas are working.
0:19.493	Interaction	Ah, nice, the bass part works quite well against the mute piano... I can play with this.
0:23.392	Interface	And end loop recording, the loop is playing, it works well against the piano + bass.
0:30.230	Material	Move to sticks... all the muted sounds (piano/bass) are complementary and some change on the drum part is good.
0:33.660	Interface	Turn off freeze of pitch shift.. I can trigger it manually.
0:39.514	Interface	Thinking about turning off the delay and I do.. I've noticed distortion is on.
0:44.452	Interface	Manually triggering some Kaoss but then I thought to just set it on freeze again.
0:46.612	Formal	New loop.. things are getting dense, and then I use the Kaoss Pad while recording the loop.. Not sure if the distortion is actually doing anything.
0:50.373	Interface	Messed up hitting the loop again, but that's fine for now.
0:55.226	Interface	Yep, looping for sure this time.
0:59.116	Interaction	I'm listening to the loop and adjusting volume... it needs to blend with the acoustic kit.
1:00.711	Interaction	And now I've turned the snare mic off completely so I can have it just dry.. there's enough going on with the loop.
1:03.100	Material	Time to change to sticks now that the groove is established.
1:12.100	Interaction	This is a good groove... how can I add to this? Perhaps I can loop it?
1:14.100	Material	Can I turn this loop up any louder?? Not really.. it'll peak on the recording.. If this was a gig I'd probably push it harder.

1:21.196	Interface	When we started the headphone was just off my ear, nice for natural sound. Now I've moved it back on the ear so I get just a bit more loop. That's what I needed.
1:32.771	Formal	The next section was coming and we did a clear visual cue (eye contact) to make sure we hit it together.
1:35.100	Formal	As the section transitioned, the loop continued, I didn't really think to turn it off...(and then I tried to quickly) so the first section was in 6, now we're in 5.. so I thought... hmm, this'll be interesting.
1:42.600	Interaction	It sounds good.. but I'm thinking perhaps to turn it off soon.
1:45.838	Interface	So I quickly hit the fader, barely noticeable.. good that I could do it quick and it didn't mess anything up.
1:47.600	Material	Busier pattern over the 5 groove to give density.
1:56.763	Formal	Looking to the cue for the section change.
1:59.600	Formal	This section needs to drop instantly... mostly just piano, it needs to be the focus.
2:07.276	Material	Side stick hi hat - 3 beat motive against the piano pattern. Essentially a 5:3 pattern.. this is cool.
2:11.721	Material	Long hits again the short hi hat... I like these contrasting sounds.
2:25.256	Material	Setting up a different pulse on the floor tom.
2:32.055	Material	Now I transition to the actual 5 pattern so I can lock in more with the piano part.
2:41.189	Material	Ideally I want this to be a non-linear pattern.. don't want it to be too 'loopy' and boring - but still complement the piano + bass in a way that locks in.
2:44.600	Material	Adding the kick drum.
2:52.332	Material	Changing to the snare hit... gives it a bit more depth.
3:03.100	Interface	Turning off the Kaoss Pad Freeze - (pitch and delay_... I realised the gain was down anyway... but I need to prep for something new regardless.
3:07.014	Interface	Went to bring up the gain but not enough time...
3:09.227	Interface	Bringing up the gain, so I can add the joystick modulator.
3:12.600	Interface	More!
3:15.600	Interface	More!.. I'm just gradually adding it... it's hard to know when it'll kick in.
3:20.600	Interaction	Good.. now I can hear it coming through.

3:30.387	Interface	I'm really messing with the joystick modulator here and get some varied sounds... the effects can get repetitive unless I change them. The bass is crazy cool which I'm enjoying.
3:36.544	Interface	Turning up the mic gain... still playing the same time pattern.
3:51.994	Material	Hinting at 4:5 here.. works well in the midst of everything.
4:00.600	Interaction	Fading down so I'm under the piano chords.
4:05.102	Interface	Gently adding effects.. but I can't hear it.. so more gain, then touching the pad.
4:08.945	Interface	Same again, still can't hear it.
4:09.923	Interface	And more.
4:11.100	Interface	And more.. this seems to be fruitless at this point...
4:13.600	Interface	Ah.. here it is.. but this took way too long to get right, so I'm not so happy.
4:17.096	Interface	Adding the looper... perhaps this work. This should grab a sound when I touch the pad (depending on where you touch).
4:32.629	Interaction	Put the stick down, but still using the Kaoss Pad.
4:35.715	Interface	Right.. so no drums, I'm turning up the mic gain heaps, perhaps I can grab some of the piano and bass and feed it though. I've done this at gigs and it worked well.
4:42.326	Interface	Change to a Filter effect on the Kaoss Pad.. trying to get the right sound.
4:54.556	Interface	And change to reverse looper on the Kaoss Pad... I'm trying heaps of stuff here to see what I feel is most effective.
4:57.085	Interaction	Turning up gain again, perhaps I can pick up some piano+ bass in my mics and process it through the effects?
5:00.637	Interaction	Yep.. that's working, Like it.
5:09.723	Interaction	I can get some rhythmic stuff happening here, it seems to be working.
5:24.845	Interface	Loops off... just in case I need a new one.
5:29.746	Interface	Start loops and fade in... will they sound any good? I'm not sure?????
5:39.681	Interface	Cool... strange but I like it... gentle fading up and put through the modulator.
5:54.822	Interaction	Yep.. this gives a new sound to the existing loop!
6:02.504	Formal	Visual cue - is this the end?
6:08.100	Material	I'm fading the loops slowly, but thinking what is the new loop I'm hearing?? Piano? Bass? Sounds great!

'Stream'**A. piano**

Time	Stream	Comment
00:18.400	Material	The piece starts with a repeated ostinato pattern, I plan to loop this so I can play some interesting material over it, but I'm a little worried as to exactly how it'll turn out - rhythmically!
00:21.000	Interface	Loop started - I'm using the Ableton looper, mapped to iPad controller, and running on the MAX track on Ableton. This seems to be the easiest looper for the music at this moment. The iPad touch control works well, and I think it'll be accurate.
00:26.900	Interface	And loop recording ends... so hopefully the loop is playing now, although I keep playing live to maintain intensity, I don't want it to drop. I'll somehow blend the live playing and loop soon.
00:30.700	Interface	Now I want to engage some effects on the looping pattern, and the live piano, so I turn on the Frequency Shifter effect on Ableton (via the iPad).
00:35.800	Interaction	I go to add some Kaoss pad, but I hear the Frequency Shifter kicking in, sounds great, so let's give it a little bit of time on its own I think.. it's an interesting sound.
00:41.900	Interface	Manually triggering the Kaoss Pad with the grain shifter effect. I'm using it at the end of the phrase to extend notes. This gives more interest to the lines.
00:49.000	Interaction	I can hear the loop clearly here, it's sitting pretty well, so I can work the Kaoss grain shifter with my live playing for a while.
00:50.500	Interface	Some more varied pad motion to create movement in the effect and varied rhythmic patterns. I like this action on the Kaoss Pad.
01:07.100	Interface	I quickly hit the hold button the Kaoss Pad so I can play two hands and still have the grain shifting effect running, this is working

		nicely and allows me to really get back on the piano.
01:18.900	Formal	I'm thinking we need to move to the main melody, so it's probably worth takin the frequency filter effect off.
01:23.000	Material	And I play along with the loop for a bit, then stop it so I can control the music live. This is a good way to transition out of the loop, and it should be the start of my cue.
01:28.800	Formal	Visual cue to Sam on bass to start the melody.
01:35.900	Interface	I thinking about adding the Kaoss Grain shifter again, but there's not quite enough time to get there.. damn!
01:46.000	Material	I decide to double the bass melody in fragments.
02:01.500	Formal	But I've still been thinking about where I can get the Kaoss pad in, so I try to add it just quickly here... there really isn't enough time, I need to make this work somehow.
02:14.200	Formal	This one seemed to work a little better.. but still quite short.
02:37.800	Interface	There's some space here in the music and the ostinato is getting a little boring, so I use the foot controller to turn on the Ableton Pitchswitch effect. This creates interesting intervallic variations of the notes.
02:41.700	Interface	That worked for a moment, but it's quite distinctive so I turn it off again, and I try to time my changes with the addition of the bass ostinato.
02:47.800	Interface	I'm quickly moving through the Organelle patches, looking for the OVERLOOP one, but it's a little tricky to do quickly. I'm preparing it for later in the song where I'm sure I can use it. This is the only thing about the Kaoss Pad that I don't like.
02:54.500	Interface	Back to the Kaoss pad Grain shifting effect. I'm liking this one. Cool sound and easy to enact.
02:56.600	Material	First time I grab a live sample. This one is recorded as a one shot

		(Kaoss Pad), so I've recorded a small grab of piano, and can trigger it to play once every time I hit the pad.
03:02.000	Interface	Triggering of the sample, plus it's running through the Kaoss grain shifter. I've got no idea what parts of the sample it'll grab, or really how it'll sound, but I like what I hear.
03:09.400	Interaction	I really like that glitch beat repeat type effect that's running from the Kaoss Pad. It gives some rhythmic structures, but doesn't completely align to the band, but doesn't sound too 'out'!
03:12.900	Interface	And again.. I hit the sample one-shot playback. it is quite rhythmic and fun to play over.
03:21.600	Interface	Time for something different, the Ableton Frequency Shifter again, but this time it's on the other Ableton track, so I'm manually controlling the parameters changing.
03:27.200	Interface	As I play this melody I notice the Kaoss pad effect is still on.... sounds super cool, but I don't want to overdo it, so I quickly switch it off.
03:37.800	Formal	I've enjoyed the Frequency Shifter, but it's time to turn it off.
03:44.800	Interface	The melody is getting a little plain, so I use the foot controller to turn the Pitch Switch effect back on, it's gives a crazy sound and the randomiser that is chained to it creates constant variation.
03:54.600	Interaction	And off.. I'm enjoying bringing sounds in and out.
04:15.400	Formal	Moving into the Coda part of the track, I think I'll get more abstract with the melody and move away from it soon.
04:18.500	Material	I can hear some of the Organelle here.. I'd like it to be louder, or just more present, but there's no way I can get my hands off the piano to change anything.
04:27.400	Interface	Looper record - Organelle. I wonder what the loop will turn out like.

04:37.500	Interface	I've hit the Organelle looper record button, and I'm looking at it thinking about how I might like to modify the loop... what can I mess with!
04:44.000	Interaction	I'm really hearing the wacky Organelle loops (OVERLOOP patch) which like, so I give them some space to be heard.
04:45.600	Material	Upper register playing is working well, there's a good amount of space between my live and looped parts, plus of course the bass.
04:47.400	Material	Yep, I'm enjoying this, abstract sounds that sound highly improvised.
04:53.200	Interface	I quickly add another short layer to the Organelle loop.. a denser texture will hopefully be effective.
04:58.500	Interface	The loops are running on the Organelle, so I can get in and modify the delay time and depth. Two hands!
05:06.800	Material	Two hands back on the piano, it's good to be able to alternate between the piano and effects. The Kaoss pad is quite tactile and easy to quickly grab sounds.
05:12.100	Interface	A quick addition of the Kaoss Pad Grain Shifter, just for some variety.
05:19.900	Interaction	Now that the bass and drums are quieter I can hear the other layers of loops... super interesting stuff, and I work to start gradually fading sounds out, but also manipulating the Organelle loop by varying the loop time and decay.
05:26.000	Interaction	What the hell are these loops? I didn't really hear them in all the layered sounds! Is it me? Sometimes it's SO hard to tell.
05:32.900	Interface	Just turning a bunch of effects off, and then I can gently fade the Organelle loop out.

b. Drums

Time	Stream	Comment
0:11.939	Interface	Using the microphone under cymbals with the Pitch Shift effect on the RC505. I want to get different cymbal sounds to start.
0:21.724	Interface	Fading in and out cymbal mic to create some dynamic variation.
0:35.050	Interaction	Changing pitch with effects and using side stick for a varied timbre from the cymbal.
0:36.422	Material	Mic is gained enough so it picks up other cymbals too.. this creates some more varied sounds and textures.
0:49.236	Interface	Now using other mic, (snare drum), this is running through the Kaoss Pad, I've got it set on looper, pitch shift and reverb.
0:57.404	Interface	Experimenting with running the Kaoss Pad signal through joystick modulator pedal.
1:11.972	Formal	Change to 'twigs' for the start of a new section, it sounded like the main melody was about to start. Also, just for timbral change it's effective.
1:20.126	Interaction	Trying to see what the Hi Hat will sound like through the RC505 pitch shifting effect.. this could be an interesting sound.
1:42.426	Material	Playing busier as section develops, but I've realised I can't do electronics now, my hands are busy!
1:55.462	Interaction	With the stick under the arm, I can quickly get to the electronics and back to two sticks.
2:04.972	Interface	I'm trying to check some gain levels, the balance is important, plus I'm working on the pitch shift idea to see if I can extend it.
2:13.200	Interface	Experimenting with short bursts on the Kaoss Pad to see if it picks up the Hi-Hat sound, and grab it as a loop.. this is difficult but sounds like it's working.

2:17.972	Interface	Now I think it's time for an effect change so I change to delay on Kaoss pad, first real change in effect sounds.
2:22.972	Interface	I tap tempo for the effects on the Kaoss Pad to align the delay speed with the tempo of the track.. this is so helpful for creating rhythmic accuracy (well, more accurate than no tempo!)
2:30.760	Interface	A slow fade on the Kaoss Pad so as there's no abrupt sonic changes.
2:37.642	Interface	Also running sounds through Joystick Modulator, so there's some layering to the effects which I like.
2:45.463	Formal	Getting into the new time through the form, there's a bit more space to try things on the pad here, I'm trying to not muddy everything.
2:58.817	Material	Moving into using both drumsticks, a nice density change once I've spent some time on the pad.
3:11.319	Material	I'm trying to play textural, busy, but light so I complement the piano riff.. but also the bass has those heavy swells, so I want to play something different to that.
3:13.972	Interaction	Tilting mic, I think I was trying to pick up more the hi-hat sound.
3:16.516	Interaction	Stick under the arm again, this gives me the ability to shift the mic, and adjust sounds on the Kaoss Pad.
3:23.913	Interface	Checking tap tempo again... working on timing of the effects with the tempo of the music.
3:24.972	Material	Slow fade for dynamic interest.
3:26.972	Material	Snare, briefly, but it is a cool change!
3:33.921	Material	Busy, light, in time playing that gives rhythmic focus while the piano is playing free rhythm.
3:41.472	Interface	Freezing the Kaoss Pad Pitch Shift effect, this will now always run if the volume is up.
3:41.835	Material	Stick under arm again, leading up to this I was thinking how can I

		keep this rhythmic thing going and use the electronics? it is tricky!
3:46.284	Interface	Turn off the transpose function, this affects both Mics, so I tried to turn it off in time with the music.
3:53.515	Material	Busy hi-hat.. this is cool, connecting to the start of the track.
3:55.301	Interface	Set up a loop... this will be good to set up, I'm wondering how this can sync with the bass, but I think I'll try it anyway.
4:03.149	Interface	And now I've set the loop end point, it's pretty long, I was trying to be quite precise with the loop point.
4:10.857	Interface	Turning off the Kaoss Pad Pitch Shift freeze and triggering it manually to get some rhythmic interest in the effects.
4:15.972	Interface	Trying to use it rhythmically here so the effects are triggering in time with the music.
4:20.972	Interface	Getting more abstract here, changing the sound by sliding around.
4:23.680	Interface	I thought I could develop this by moving between the Kaoss Pad and joystick modulator... as I was playing I was thinking about which mics are running through each part of the effects chain.
4:26.209	Interaction	I'm adding more of the modulator into the sound, I'm not hearing enough of it and I wanted more in the sound.
4:27.330	Interaction	Yep, now I can hear it, but I keep working on the level, so it really comes through.
4:31.034	Interface	I'm alternating between sweeps and rhythmic, we're at the coda, so this is going to repeat and there's scope for me to try some stuff.
4:37.972	Material	I think two sticks would be good, but then I quickly realise I want the pitch to be different going through the microphone.
4:39.563	Interface	So now I make the move to change the pitch and hit freeze on the Kaoss Pad.
4:42.386	Material	Pitch hold function, it's a higher pitched sound which I like.

4:44.427	Material	Introducing fast 4:3 shuffle on the ride cymbal, this creates something new.
4:48.750	Material	That's great I think, I'd like to hear it as a loop.
4:49.945	Interface	Start loop recording, but I thought I'd play it in as little components and layer it up.
4:58.878	Interface	Loop end point.
5:02.472	Material	I need the mic gain down a bit, the overall band seems to be getting softer.
5:08.534	Interface	The loop is going, and it's coming through the joystick modulator, the music is quieter, so I think it'd be cool to see what the modulated loop sounds like.
5:14.647	Interface	Since things are getting a little abstract, I thought I'd change the global tempo of the loop.
5:24.456	Interaction	Some really subtle joystick modulator effects here which are a cool blend with the shifting tempo.
5:35.236	Interface	Sounds like it could be the end, so I start fading the loop out, and everything as this is the master volume.
5:40.972	Interface	Yep, slow fade out continuing, this is most likely the end.

C. double bass

Time	Stream	Comment
0:04.795	Interaction	Initial start, I thought I should get the reverb on (arena) and reverse delay. I know I'm going to bow some stuff, and the piece is called STREAM, so I want to create some kind of 'water flowing' type sound.
0:11.345	Material	I'm trying for a really subtle entry, right up high near the bridge, so this sound should be very 'un bass like'.
0:22.387	Interaction	I can kind of hear what I was going for... but it's blending in so much with the drums.. it's quite subtle. it is there though.
0:40.648	Material	Digging into more, as I still want it to be more present.. but it's not coming through that much.
0:41.237	Interface	Turned on the space echo to give this concept a little more body... still not super present, but I think it's adding to the atmosphere.
0:50.072	Material	As the piano gets into that motif a little more I play a little more intently on my idea... I think it's matching the piano vibe nicely.
1:04.916	Interface	Trying to turn everything off.. I've heard the piano loop played live now, so we're moving to the main melody, that I'll play. I think I'll leave the reverb on though; it'll soften the sound of the bowing which should be good.
1:11.000	Material	Just checking the note...
1:14.083	Formal	Visual cue from Sean... yep, it's time for the melody.
1:34.652	Material	Now I thinking that I forgot to slightly adjust the headphones to help me hear the natural piano.... so I'm hoping I can hear it enough to stay in time.
2:22.888	Formal	Bow down, section change and I'm going to move to an effected bass sound after the reasonably acoustic playing of the melody.
2:26.873	Material	Starting to double the piano arpeggiated part, and from experience

		playing this track I know I need a few bars of the loop so it to be consistent and stable, so I'm planning to loop at least 4 bars.
2:29.965	Interface	Loop start.
2:32.531	Interaction	And end... only 2 bars, but it sounded even. John also was noting in rehearsals that he often had trouble hearing the loop, so I was really digging into it.. and thus played a lesser amount of the loop, as it was hard to keep even at loud dynamics. Keeping dynamic consistency between bowing and pizz. is hard too.
2:35.432	Interface	Reverb off, I don't need it anymore I think.
2:38.546	Interface	Listening to the loop.. hoping it's even enough to be acceptable... it is nice to let it sit for a bit. I've just picked up the bow, not sure what I plan to do with it.
2:41.000	Interaction	Wow... some indecisions with the bow, I was thinking about how I usually play it, but then I thought, hmm.. maybe I'll shift it a bit here, so I was evidently a bit conflicted. Then I put the slow attack FX on the Zoom B3.
2:46.749	Material	And since I've decided to use the bow, the reverb needs to go back on.
2:55.000	Material	I'm going for some slow attack bow strokes, starting on G, but I liked them , so I started moving them around in pitch. Not really connecting with the loop timing... free rhythm.
3:12.227	Material	I've heard the melody again now, so I can move some of the bass notes to match its harmony.
3:27.527	Material	Once I heard the melody come in I thought the bowing was a little overbearing, so I've moved to pizz., just to lighten the texture and support the melody.
3:38.500	Interface	Now we're getting the slow attack on the pizz. notes which sounds good... I did forget to take off the reverb, but no big deal. The piano melody is quite rubato here, so I'm also giving more space in my

		playing.
3:46.056	Interaction	it is a little hard here to find exactly where Sean is phrasing.. it's in free time, and I'm not sure if I need to stay in time with him.
3:56.500	Interface	Ah, I've remembered to take the reverb off. and I'm thinking that I need to completely stop each note, so that the attack is clear. Taking off the reverb helps with this.
4:07.456	Interaction	I'm gradually increasing the rate of the pulse here to match the increased busyness of the piano part.
4:20.519	Interaction	And increasing it a little more, it works nicely with the drum part.
4:26.500	Formal	Checking for any cues... but we're still going.
4:39.615	Interaction	And now I'm slowing down, feels like the crescendo is over.
4:50.596	Interface	That's the fade out loop button, I think now the main melody is over, it's time to wind down.

Berardi/Foran/Karlen

- a) Link to all decision analyses for each track
<https://www.dropbox.com/sh/8urhj1nd5h1x1ji/AABolW3aoncXKjjbBr2qTUx-a?dl=0>
- b) Decision analysis for works discussed in Chapter Six

'Forward Motion'**A. vocals**

Time	Stream	Comment
00:03.5	Material	I'm starting on the F#... top note of the chord indicated in the chart
00:07.0	Interface	There's a good chunk of reverb and delay running, and I start recording a loop of these sounds
00:12.0	Interface	overdubbing.. first I listen to it before I add another layer
00:24.5	Interface	Now it is playing
00:34.9	Material	This time I just sing over the loop.. no more layers for now
00:44.3	Interface	some fine adjustments of the loop volume
00:45.8	Interface	I'm adding a track effect now.. Beat Repeat
00:57.9	Interface	Yep...that's the beat repeat.. I can manipulate the loop length and repeat point.. this gives it a changing rhythmic placement and I can interact with the piano and saxophone repeating notes.
01:05.1	Interface	I realise... why don't I just use my other hand.. then I can adjust the level of the loop and the beat repeat point at the same time. The rhythm is significantly changed now, it's a fast, short loop.
01:21.9	Interaction	I'm just keeping an eye on Sean.. seeing where it's going on the piano
01:34.3	Interaction	Giving more space to the piano and I'm making small changes to my loop and the beat repeat rhythm
01:36.7	Interface	I actually fade the volume right out on the loop
01:44.4	Interaction	also keeping an eye on Rafael to see what he's up to

02:01.5	Interface	still working the loop volume and beat repeat length...
02:29.3	Interface	Slowly fading the loop back in
02:44.0	Interface	beat repeat down
02:47.8	Interface	and now volume down on the loop
02:52.7	Interface	and now I change the track effect
02:55.2	Interface	but change my mind and go back to what I had
03:01.3	Interface	just checking to see what's programmed into the input effects... I run through each one before settling on one
03:06.1	Interaction	I've decided on an input effect and I'm just about to enter when the saxophone starts a melody.. quite forcefully.. the notated melody halfway through the chart. The only real single melodic part in the work.
03:08.7	Interaction	I glance at Rafael... 'Oh.. I won't sing then' I think.
03:19.4	Interface	I think, perhaps I'll do something more subtle, so I fade the loop back in slowly
03:45.5	Formal	loop completely out.. sounds like this section is finishing
03:49.0	Interaction	I notice the piano is starting the final notated section
03:55.2	Interface	I take the effect off.. I just think that this part should start clean
04:10.2	Material	I try to sing the same melody as the piano top note.. but phrased behind the piano
04:23.1	Interaction	Now I lock in with the piano
04:34.3	Material	I'm manipulating the melody and rhythm here.. the piano is quite repetitive so there's some scope for me.
04:49.7	Interface	I can loop this... so I do
04:52.8	Interface	a couple of mishits on the loop button
04:56.7	Interface	and now some overdubbing on the loop

05:01.4	Interface	and finally, loop playing
05:03.5	Material	I'm actually thinking about the downward arrows notated on the chart.. that's the inspiration for the lines
05:11.3	Interface	I bring the volume down on the new loop
05:19.6	Interface	and I go back to the original loop thinking that I can bring this back in, and it'll give the piece some clear structure.

B. piano

Time	Stream	Comment
00:12.0	Material	Cool intro by Kristin and the delay inspires me to get into the piano strings and create some soundscape ideas to complement
00:14.5	Material	I go for a string scrape.. but it's not really the right vibe... to dissonant perhaps
00:21.4	Material	Not quite sure what to do.. the vocal part is sounding fine on its own now.
00:25.9	Interface	Making sure my foot is over the Organelle volume pedal
00:33.2	Material	I opt for a simple intro. I selected a note from the opening chord, and work with the score direction of 'any speed'.. I'm trying to interlock with the vocal part
00:34.7	Interface	While I do this I'm slowly fading the Organelle in where I've selected a delayed distortion patch
00:38.7	Interface	I'm thinking about turning on the Kaoss Pad, but I don't really know what sound and how I'll use it.. so I hold off a little
00:49.4	Interface	great.. now I can add the Kaoss Pad to this, with a Pitch shifting High pass filter effect.. the natural piano sound is really getting pushed around into something different
00:58.8	Material	I'm listening to the sax and vocal parts and trying to bounce off them plus also create a sense of pulse in the music
01:11.0	Material	Gradually adding in another note to start to reveal some harmony
01:13.1	Interface	I get the idea that I can sample this. that'd probably be quite cool. So I use the sample pads on the Kaoss Pad
01:19.4	Interface	Nice.. now I can bounce off my own single note motive and start to move away from it in the live part
01:27.2	Interface	Ahh. the Pitch Shifting is more effective in a higher range, so I get more melodic in my right hand playing

01:42.7	Interface	I play the sample again.. I've made it a one shot, so it just plays once... I need to re-hit it each time I want it to play
01:49.1	Material	Starting a clear tempo and indicating the feel for the first real main theme in the work.
01:55.0	Interface	Kaoss off.. just cleaning up the sound a bit so I can transition into the next section
02:04.6	Interface	I've also gradually pulled back on the Organelle, and navigated to the 2nd page on the iPad... getting it ready to engage some effects through it later
02:05.0	Formal	New section, clear harmonic theme here
02:11.4	Interface	I hit the delay on the foot pedal (Ableton) thinking this could work nicely in this section
02:14.6	Material	Playing more staccato to see if the delay is happening.. did I press it hard enough?!?!
02:33.1	Interaction	A glance to Rafael.. the saxophone is sounding great!
02:40.5	Interaction	I'm liking all of the sounds swirling around, so I just keep the harmonic motive repeating
02:48.2	Interface	I'm looking for a way to add some effects using my feet to I engage the Ableton Max Patch PITCH SWITCH. This features a changing intervallic pitch shifting sound, which creates random pitched manipulations.
02:50.8	Interface	Delay on via the footswitch
03:10.9	Material	Cool, that's Rafael playing the notated melody that is the next section. I decide to keep on the chordal pattern as it works under the melody
03:17.1	Material	I thin my part out to just the right hand, so the left hand can get over onto the iPad and enable some effects
03:18.9	Interface	I go to start recording a loop, but decide against it.. the music doesn't need it here, and perhaps a thinning of the texture is good right now.

		Plus the delay on the single note is kind of cool
03:25.4	Interface	I take the opportunity to scroll through some Organelle patches.. I always find this difficult, so finding the right moment to do it is important
03:34.2	Interface	I've settled on one, and I think it's the OVERLOOP.. the multilayered delayed looper which I can control via the foot pedal
03:41.3	Interface	Fading in the Organelle, and as I looped just a few short chords I'm getting this constant sustain type sound.. quite lovely
03:45.8	Interaction	The pad provided by the piano and saxophone loops give me a bit of time to prepare my next part.. I think about adding the Kaoss pad.. but then decide not to.. I've used it enough
03:47.7	Formal	New section.. the final notated part on the chart
03:58.2	Interface	Turning the ring modulator on through Ableton.. I'd like to add some subtle effects to this chordal pattern
04:10.1	Interface	Yeah, I like that, but the level needs to come down a little, so I adjust
04:28.5	Interaction	Whoa. Sounds unlike anything I've heard from Rafael.. so cool. I'll just keep on this pad so there's a solid contrast for his sounds
04:31.4	Material	trying to get some muted notes in.. but the pitch really isn't right.
04:49.0	Interface	I've played an existing Kaoss sample.. it is OK.. but I can do something better
04:56.8	Interface	I engage the sample record, and sample some higher pitched chords
05:05.0	Interface	More sampling of chords
05:16.1	Interface	and I'm using the pad to manipulate the samples
05:24.5	Interface	and more.. I'm filling up the sample pads
05:42.2	Interface	Fading some of the Kaoss effects
05:55.4	Interface	but then I realise that I can't fade the samples.. I just need to stop them.

C. saxophone

Time	Stream	Comment
00:11.6	Interaction	thinking about how to compliment the vocal entry
00:22.1	Interface	perhaps going for the delay, or maybe a 'hold' function on the multi-effect unit
00:35.0	Interface	and the Space Echo.. somehow I'll integrate this
00:40.6	Interface	checking that the effect flow is working
00:49.3	Interface	octave below was set, sounds cool
00:56.1	Interface	looping the octave below
01:01.3	Interface	activating the loop. I don't want to add another layer, so now it's just playing this drone kind of thing.
01:07.0	Interface	I'm turning off the space echo to add more definition to the attack.. the chart has quarter notes, so I can get that more clearly now.
01:14.2	Interaction	I'm trying to fit in-between the piano notes, and I'm planning on looping this at some stage
01:21.7	Interface	yep.. loop start
01:25.2	Interface	and now loop active... I've kept this short so it can easily overlap with the other parts in the music -= piano and vox
01:29.5	Interface	I'm checking what's actually on and creating sound... sometimes it's good to double check where the effects are coming from in the chain.
01:33.5	Material	changing to octave above, from the current octave below effect. I want to add a higher texture to the music, this note should carry through the harmony without much clash
01:40.8	Interface	thinking about adding some space echo, but decided not to.. the texture is working the way it is
01:45.4	Interface	I'm starting to loop the high octave part
01:50.0	Interface	loop end point

01:54.0	Interface	I'm pulling down the level, it's a bit overpowering in the overall texture
02:10.6	Interface	trying for a gradual fade of the loop so it's not overly intrusive
02:18.7	Interface	I go for the space echo, but quickly decide on the Boss Delay instead, it's more subtle which the music calls for at this point
02:31.3	Interface	I've started this new part, but I need to check that everything is 'on' as I think... I can't quite hear it as I thought, the effect came out more processed and delayed than I was expecting, so it' kind of threw me
02:34.6	Interface	I'm looking for varied combinations of the space Echo and Boss Phaser, so for each phrase I'm turning pedals on/off to see what it sounds like
02:50.9	Interface	I'm turning the octave above off, so for my next phrase it'll be the actual pitch which should create a clear change in texture (and pitch!)
02:55.9	Interaction	the piano is clearly into another section in the piece, so I decide to add a long note to complement this
03:00.6	Interface	I go to turn off the space echo, but I move to the Boss unit first, I'll come back to this
03:02.4	Interface	Now it's off
03:04.6	Formal	I'm planning on bringing in the next melody section, so I turn on the phaser to create a sonic change for this... I' want it to be a new sound
03:14.5	Material	I'm just repeating this with some small variants to the melody, the effects sounds quite good with it, so I kept it going.
03:24.0	Formal	the piano has stopped, so I'm thinking we should move to the next section
03:38.8	Interface	delay off, I'm getting prepared to move on
03:49.4	Interface	I'm trying for a super gradual fade of the loop from the beginning
04:00.0	Interface	I've also switched to the other loop track, so it's clear for me to use

		later, and then I can also come back to the original if need. Some prep time here while the piano is playing
04:03.1	Formal	it is clearly a new section here, so I feel like there's a call for sonic change again
04:09.8	Interface	I'm once again assessing what's on currently (in the effects) and thinking about what I want to turn on for my next entry
04:14.7	Material	I go to play, but the music is sounding quite complete.. I think I can delay my entry a little longer
04:22.0	Material	The vocal melody is clear, so perhaps I can add something really different to that.. the vocal and piano are so delicate, and I don't want to overpower that
04:23.6	Material	So I try some clicky, droplet kind of sound, I think there's some reverb running to enhance
04:27.4	Interface	It sounded cool... so I add the space echo to give the clicks and pops more presence and try some more notes!
04:31.2	Interface	yeah, that's cool. I'll loop that!
04:35.9	Interface	I actually lay down two layers of the clicky stuff, so it overlaps on itself... interesting, but still out of the way of the vocal/piano
04:44.0	Interaction	I'm thinking about what else you can add.. but I'm not so sure what, and I don't want to just jump in
04:53.8	Formal	Checking for any cues from Sean/Kristin.. perhaps we're getting to the end.. it's sounds a little that way
04:58.7	Material	Do I need to do anything else? or can I just manipulate what's there?
05:06.0	Interface	I do change the Boss unit effects - on or off, I can't be sure, but if I do come in again, it'll be different.
05:11.0	Interface	Loop fade.
05:24.2	Interface	I'm not doing anything else, so I get more comfy to work the loop fade

		out
05:40.2	Formal	Looking for a visual cue for the end from Sean/Kristin
05:44.5	Formal	and the final loop fade - how should this end? Which loop should finish??

'Don't Fade Away'**A. Vocals**

Time	Stream	Comment
00:10.0	Material	Initial entry.. I'm trying to complement the saxophone sustain, and I'm also hovering over the Roland Effect - Flanger... but I don't engage it
00:12.7	Interface	I decide to go with the ROLL effect... it's a cascading repeat that I can control with the depth/rate.. I've learnt that I need to keep control over it though
00:28.0	Interface	I'm starting to experiment with depth
00:34.0	Interface	Ah... I've found a spot here where it's responding nicely
01:08.2	Interface	Cool.. a weird sound from Rafael.. I like it.
01:13.1	Interface	and Roll effect off... time for something different
01:20.7	Material	I'm trying to internalise the groove and feel of the piano lines
01:21.3	Formal	Visual cue with Rafael to start the melody section
01:56.8	Interface	I'm starting to think about adding in some delay... so I start to slowly add it in
02:22.9	Interaction	Nice piano groove. I'm connecting with this
02:46.8	Material	Concentrating on holding the note.. no vibrato
02:53.2	Interface	Thinking about what I'll do when I come in.. so I turn the flanger back on in prep for my entry
03:06.3	Interaction	But I wait for the piano to settle and decide on what effects are used so I know how to interact with this... there's no hurry here
03:44.1	Material	I'm improvising but not really hearing any of the effects coming through
03:57.1	Interface	So eventually I mess around a bit with the depth, and just turn it off.. it's not adding much
04:13.0	Interface	now I add the ROLL effect back in... this will work I think
04:26.7	Interface	This is great.. it's creating this pulsing pad of the vocal repeats
04:30.4	Interface	and now I use the MIX knob on the pre-amp to turn the overall effect level down and fade it under the natural vocal sound
04:41.5	Interface	Now I turn the ROLL off and go back the flanger.. I'll try it again.. perhaps it'll be more prominent with the louder dynamic
04:58.4	Interface	ah I'll just turn it all the way up.. why not! .. I still can't hear it enough.. it's so subtle
05:30.3	Formal	and off.. new section and it needs to be cleaner

05:35.4	Interaction	Looking at Rafael.. 'aren't you supposed to be playing now?'
05:37.6	Formal	and now the visual cue.. Raf is in here.
05:45.7	Formal	cue.. my entry for the next melodic section
05:54.7	Interface	a touch more delay needed
06:28.9	Interaction	more cool piano stuff.. nice grooves Sean!
06:40.1	Interaction	Watching the piano for timing and pulse
06:58.2	Interaction	Watching Rafael for the cut-off on the final note

B. Piano

Time	Stream	Comment
00:01.000	Interface	Just checking on some of the pedal positioning.. I think I'll use the foot controlled looper and certainly the Organelle, so I want everything to be in place
00:22.200	Material	I'm trying to get an idea of the pulse of the sax loop here.. perhaps I can connect with it.
00:32.800	Interaction	Kristin's phrases are cool, and I want to complement this somehow, I think I need to keep out of her range to start with.
00:40.800	Interface	I'm about to enter with a low note, but then I think about whether I want to have some effects running on the organelle. I first check that the volume is down so I can fade it in when I need to
00:45.100	Material	and my entry.. simple, and Organelle volume still right down
00:46.800	Interface	I'm also fading in the Organelle straight after I play that note.. but I can't hear it just yet
00:57.800	Material	I go to complement the low note with some upper register chords, but decide that there's already a heap going on in the vocals and sax, let's keep the low note for now.
00:59.500	Material	So I hit another one.. I'm obviously making sure I match the harmony here
01:03.100	Interface	I'm getting ready for a potential loop here, but I realise that the Organelle volume is up, and it'll probably sound better when I play a more consistent rhythmic line
01:05.200	Material	I start my repeating line, the Organelle effects are coming through quite clear here, I like it
01:07.600	Interaction	The Sax phaser effect is a great complement to the Piano effects.. that's my nod of approval to Rafael.
01:11.000	Interface	I'm liking this line, and I'm preparing to loop it.. probably with the footswitch
01:13.500	Interface	start of the loop
01:20.900	Interface	I'm really liking the Organelle distortion, especially the rhythmic nature of it.
01:22.000	Interface	end of the loop
01:26.500	Interface	hmm.. loop isn't really present. I'm not sure if it's just really quiet, or if something went wrong in the triggering. Luckily, the free rhythmic melodic stuff works, plus I'm still hearing the Organelle.
01:29.000	Material	I decide to shadow the melody a bit here, but keep the Organelle in.. It's giving some great rhythmic presence

01:48.000	Material	I think this part needs a bit more support, so I bring back the live arpeggiating pattern.
01:58.100	Interface	perhaps that rhythmic distortion is getting to repetitive, or distracting.. so I fade it out
02:16.300	Formal	this section needs to be clean from the loops and other effects so I turn the loop off, and I've already faded the Organelle.. I'm focusing on just playing solid time and grooving with the sax and vocals
02:49.600	Interface	Once I start the treble register RH pattern I go straight for the iPad.. I'm going to loop this and it's easier to do with my other hand.
02:52.700	Interface	Loop start
02:56.700	Interface	and loop end.. that feels pretty good
03:01.500	Interface	Just making sure that channel is right up.. I'm still playing over the loop, but when I stop I'd like it to have a decent presence in the mix
03:04.800	Interface	I turn on a max patch which also has a randomiser setting enabled.. I straight away think - whoa.. that is too intense and distracting from the gentle music
03:07.400	Interface	So I quickly hit it off again
03:10.800	Interface	I think a better option would be the Phaser effect, which still sounds interesting, but isn't too dominating
03:18.000	Material	I'm giving some more space to my lines, trying to break up the live piano part so I can hear the loop peeking through.. I want to do it gradually, not just suddenly stop.. that doesn't work for the live-electronic mix
03:20.300	Interaction	I'm listening to the loop and just trying to play stuff in time with it, a little loose, but still connected
03:24.900	Interaction	Nice vocal entry Kristin... it connects with the piano really well
03:29.700	Interaction	Now that I hear Kristin is in I move to the changing bass note harmony... this is the 'solo form' that Kristin can improvise over and it gives me some more harmonic options to explore
04:00.300	Material	Just keeping it moving here.. both hands are quite busy, it's mostly acoustic piano.. the loop is in the background somewhere, but it's all gradually increasing in intensity.. I'll add some other effects soonish
04:08.000	Interaction	I am wondering how I can get my hands off the piano and turn some things on. but still keep the part going. I'm keen on the Kaoss pad.
04:16.700	Interaction	Cool infinite sustain note on the saxophone.. I'm liking this against my rhythmic part

04:32.300	Interface	the texture is building so I go to turn on the Kaoss pad.. there's only a fraction of a second though... and I don't really have enough time, plus I also decide, wrong sound!
04:36.500	Interface	this time I hit the Grain Shifter effect on the Kaoss Pad.. this should start to break up the sound in curious ways. The HOLD button is not engaged though, this is good.. I'll be able to touch the pad to trigger the effect when I want it.
04:39.800	Interaction	yep.. that's cool. I'll keep trying this.
04:44.200	Interaction	It's tricky though, to hold the pad for enough time to grab a sound, but also use 2 hands on the keyboard!
04:57.700	Interface	time for a change.. into the patch that reverses samples on the Kaoss pad.
04:59.900	Interface	and now I play a sample.. I can reverse this later
05:03.200	Material	But because I'm thinking so much about the Kaoss pad I mess up the harmony a bit.. I quickly rectify it
05:08.200	Interface	Cool, some time-stretching of the sample.. it's not particularly clear, but still adds some depth
05:16.100	Formal	Sample off.. it feels like the section is winding down now
05:19.500	Interface	Time to turn loops off.. I can't quite remember what's going... first I go for the foot controlled loop, then I remember it's on the iPad. So I turn that off.
05:27.800	Interface	and turning down the level of that channel to make sure that loop + effects on it are gone,
05:36.100	Material	Ha.. wrong note at the end of the phrase, so I try to change it in a way that sounds musical
05:56.000	Interface	I've noticed the PHASER is still on, so I get that off quickly
06:02.300	Interface	It's a good time to bring back the rhythmic distortion from the start on the Organelle, so I get ready for that and fade it in
06:21.400	Formal	...and fade it out for the section change.
06:52.300	Interface	I try to bring it back for the end but it's too late & too soft.

C. Saxophone

Time	Stream	Comment
00:04.0	Interface	I'm using a hold effect on this, creating a sustained note, which also crunches against the vocal note
00:12.9	Interface	and then I'm looping the hold, so I can then add more over it and build a chord, or something like that
00:15.3	Interface	Space Echo on
00:21.7	Interface	yep, adding another note with hold. This is all quite intentional, I'm building harmonic layers
00:26.3	Interface	now adding this to the loop
00:29.6	Material	This intro is just sax + voice, so I'm trying to create more harmony here, and have the space to do so
00:35.3	Interface	and another note. The hold function is tricky, so I'm trying to take a lot of care with it so it works as intended.
00:39.1	Interface	putting that in the loop... perhaps there's an easier way to do this whole thing, but for now this is the way I know how to do.. I just need to take care so they are all balanced
00:46.1	Interface	and another one, up higher this time
00:51.6	Interface	and into the loop.
01:03.7	Interface	adding a sweeping filter effect to the loop, this should add some movement to the chordal type sound. Plus a fade it a little to give appropriate balance in the music
01:18.6	Interface	fine tuning the level of the loop. I don't want it to distract from the next section... there's a little bit of urgency, I can feel that the melody is coming up and I'm playing that
01:21.5	Formal	yep, section change, main melody, with vocals
01:30.8	Material	I read the wrong harmony here, it didn't matter that much, I made it work, and the melody repeats anyway
01:39.4	Interface	I'm ready to stop the loop... not sure when I plan to.. probably in the second half of the B section where there is more rhythmic activity in the melody. I think the loop will get in the way of this
02:12.4	Interface	and loop off.. I can bring it back later if I want to
02:41.4	Interface	I'm wanting to bring out the decay of the last note in this section of the melody, so I'm getting prepped for that
02:44.0	Interface	yep, there it is..

03:00.0	Interaction	heaps of time to think about my next entry, in this section I have a textural role under the vocal solo, so I'm thinking about the best way to achieve that.
03:20.8	Interaction	just thinking whether I should be in now... and if so, what effects to use?
03:43.1	Interface	I'm figuring out whether I can bring in the loop from the beginning, and if there's an effect on it that could work, and also preparing the looper for the option of adding a new loop
04:03.5	Material	entry on the start of the solo form, subtle but hopefully adding some harmonic support to the music
04:08.1	Interface	I'm adding a hold on the note
04:11.8	Interface	checking to see that it's working... I'll probably put this through the looper
04:22.1	Interface	yep, added to looper
04:30.0	Interface	taking the hold off, I don't need it anymore
04:37.4	Interaction	I want to add a part that complements the long vocal note with similar duration and dynamic.
05:02.0	Material	gradually building the intensity of my part, keeping the pitch similar to the vocals to strengthen it, while implying the harmony
05:21.6	Formal	Fading the loop... I can feel that that solo is coming to an end, and we'll be back at the main melody shortly
05:27.7	Interface	I've put a slow echo on for the melody - just to add some more emphasis to this final melodic statement
05:29.6	Interface	and loop off
05:38.8	Material	I realise I missed the first melodic entry, but I'll come in on the second 4.
05:47.1	Interaction	yeah, I quite like that... it works well with the melody
06:08.1	Interface	I'm ready to turn off the Space Echo for the upcoming rhythmic part to the B section again
06:18.7	Interface	slow echo off
06:43.5	Material	getting ready for the final note
06:50.9	Interface	on for the final note to give it more presence

Appendix 6: Testing sessions

A. Testing Process

Rafael Karlen—saxophone
Background:
Rafael’s background is in jazz composition and performance. He has some experience using guitar effect pedals in situations where he performs with a percussionist or DJ. This experience does not share similar musical situations or aesthetics to the work of the Berardi/Foran/Karlen trio, but is useful for his general understanding of how to approach the use of electronic devices.
Setup reasoning:
Rafael’s setup uses three effect units, all foot controlled. Each selected device has a focus in Rafael’s setup – Looper, Delay and Reverb, tone modulation—assisting the reducing choice fatigue. These effect units feature a clear interface design, with easy to use control knobs.
Learning process:
<ol style="list-style-type: none"> 1.Explain and test functionality of the Boss ME-50 —focusing on finding effects that sound good with the saxophone tone. 2.Explain and test functionality of the Roland Space Echo—focus on finding selections in the MODE SELECTOR that work with the saxophone tone 3.Explain and test functionality of the Boss loop station—focus on layering loops and learning loop control skill 4.Explain and test overall signal flow through the pedals 5.Explain the Voco Loco preamp—overall gain control, mute button and FX/dry microphone mix capability 6.Free improvisation—using all pedals, experimenting with sound
John Parker - drums
Background
John is a drummer and percussionist, trained in jazz and classical music performance. Additionally John has a strong interest in electronic music and audio technology, he has

engineered, mixed and mastered previous recordings for Trichotomy.

Setup reasoning:

Adding technology to John's setup was something that he was keen to implement, and John is particularly interested in the ability to live loop drum parts. This would enable him to create dense textural drum parts, far beyond the standard live parts he would perform. Hand controls were important for him, and the ability to use microphones on various parts of the drum kit.

Learning process:

John's experience with audio technology enabled me to skip lengthy discussions on signal flow, the testing sessions took a more device orientated process

1. Test functionality of RC-505 and appropriateness of effects on the drum and cymbal sounds
2. Test functionality of 'The Karman Line' pedal—focus on controlling the joystick modulator.
3. Test functionality of Kaoss Pad Quad—focus on the tolerance of the touchpad and working through the extensive patch list saving favourites into the numbered shortcut buttons.
4. Free exploration—John improvised with all devices in a chain.

Samuel Vincent - bass

Background:

Samuel is a trained double bassist in jazz and classical styles, and has limited experience in using pedals and electronics in his performances. He has experience performing in a variety of styles including theatre shows and audio-visual productions

Setup reasoning:

Similar to Rafael, the setup constructed for Samuel needed to focus on foot-controlled devices.

In the initial selection process Samuel and I discussed how the ability to create loops and delay sounds would be a priority, but also finding devices with a simple user interface and large controls that would be easy to use with the feet.

Learning process:

1. Explain and test functionality of Zoom B3—working through the patch list and saving combinations that sounded interesting
2. Explain and test functionality of the Space Echo—trying each setting in the ‘Mode Selector’ to find favourites
3. Explain and test functionality of the Ditto X4—recording multiple loops and engaging each effect preset on the loops/
4. Explain signal flow through the chain of devices and trying varying order combinations
5. Free exploration—Samuel improvised with effects, samples and loops

Sean Foran - piano

Background

Piano is the common instrument across the two ensembles, and I’ve had some experience performing with a small one device electronic setup in previous performances (prior to this research project). I have also produced some solo piano concerts incorporating technology prior to this research.

Setup reasoning

The setup comprised various devices—hardware and software. I wanted to develop performer skill using both and also use controllers that had hand or foot control. Noise level of the parameter controllers—i.e. buttons and knobs—was important. The proximity of these to the piano microphones required them to be near silent.

Learning process:

1. Test functionality of Ableton Live—the program is extensive, so I found a selection of patches that I enjoyed using. Focus on mapping Ableton to the MIDI foot controller and iPad enabling hand and foot control away from the computer.
2. Test functionality of Kaoss Pad 3—focus on finding patches that worked with the piano sound, saving these to the button shortcuts
3. Test functionality of the Organelle—focus on finding patches that worked with the piano sound and experimenting with the parameter controls including the foot pedal.
4. Test overall signal flow and ability to control Live Electronic volume for each device.

B. Video footage of individual testing sessions and ensemble rehearsal:

https://www.dropbox.com/sh/uu5wpgd3ktnl2lp/AAQIW9UqYYL4vVJhTXLT_ra?dl=0

Appendix 7: Ensemble biographies

Trichotomy

Sean Foran – piano

John Parker – drums

Samuel Vincent – double bass

Brisbane based piano trio Trichotomy have crafted an international reputation as a group that combines a dense rhythmic focus with a refined melodic clarity. Blending influences across modern jazz, contemporary classical and electronic music this group, over their 20-year career, have collaborated with jazz artists, classical chamber groups, video artists, string quartets, dance companies and symphony orchestras, creating music that continues to push contemporary jazz into new areas.

They have toured around the world to the UK, Europe, Japan, China, Canada, South America and throughout Australia, and with 6 albums released, an extensive catalogue of work. In 2013 the group was a finalist in the APRA Art Music Award for Excellence in Jazz (Australia) and have been previous winners of the QLD Music Award for Jazz and finalists for the Australian AIR and BELL awards for contemporary jazz album of the year. Their recent album “*KNOWN-UNKNOWN*” (2017) features electronic sounds merging with their acoustic improvisations, while the complexity of their compositions and group improvisations are balanced by graceful melodies and rich harmonies. This bold work puts them firmly forward as a group with vision, depth and intensity. In 2019 they release a new album “*Between the Lines*”, a collaboration with alt-country songwriter *Danny Widdicombe*, launching it at the QLD Music Festival during July.

Sean Foran

Award winning pianist and composer Sean Foran is a musician with a clear sense of individual aesthetic, his music is melodic, engaging, and manages to draw stylistic influences together in a vibrant manner.

He has received the prestigious Brisbane City Council's Lord Mayors Emerging Artist Fellowship, APRA Professional Development Award (Jazz), the QLD Music Award for Jazz (7 times) and the APRA/AMC State Award for Excellence in Jazz. A member of the acclaimed improvising trios TRICHOTOMY & Berardi/Foran/Karlen he has collaborated with the QLD Symphony Orchestra, Expressions Dance company, international jazz artists Julian Arguelles, Froy Aagre & Pascal Schumacher plus a range of classical groups, Topology, Southern Cross Soloists, Lunaire & Collusion.

His performance experience is extensive, with performances at the Tokyo Jazz Festival, Jazzahead Bremen, Manchester Jazz Festival and tours in the UK, China, Europe, Canada, South America and Korea. His recorded music features on labels internationally in the UK, Holland and Japan, and he has been commissioned to write for the QLD Theatre Company, Expressions Dance Company, Bangalow Chamber Music Festival, DeClassified Music Festival and the Brisbane International Jazz Festival.

Sean is a graduate of the Queensland Conservatorium with a Major in Jazz Piano. He also holds a graduate certificate in Arts Administration from Queensland University of Technology and a Masters of Arts in Jazz Performance with Distinction from the Leeds

College of Music UK. He has studied at the prestigious Banff Centre Jazz & Creative Music Workshop and privately in Australia, Canada, Norway, Sweden, France & the UK with leading musicians including John Taylor, Tord Gustavsen, Baptiste Trotignon, Matthew Bourne and Lars Jansson.

He is currently Head of Music at JMC Academy Brisbane & co-director of the specialist publishing company Prepared Sounds. He is an associate artist of the Australian Music Centre, Board Member at the Wangaratta Jazz Festival and Jazz Councillor for Music Australia.

John Parker

An award-winning Brisbane based musician and composer, John is becoming well known for his eclectic performance and writing style. His composition work traverses diverse genres and instrumentations drawing from jazz, classical, funk, electro/acoustic, cabaret and the murky spaces between. He is a founding member of the group Trichotomy. During the group's 15 year history they have recorded six internationally acclaimed albums and continue to tour and collaborate interstate and globally. John recently received 3rd place Audio Technology Remix Competition (2014), 3rd place Percussive Arts Society (PAS) Solo Marimba Composition Contest (2012). Finalist "Freedman Jazz Fellowship" (2011). Performed on, recorded and mixed Sean Foran and Megan Washington's "Bell Award" winning jazz Album "Night light" (2008) and currently lectures in Jazz Drums at the Queensland Conservatorium of Music Griffith University and teaches Percussion and Drum kit at Marist College in Brisbane. The co-founder of the online music publisher "Prepared Sounds", John has received several commissions for percussion works and his pieces have been performed around the world.

Samuel Vincent

Samuel Vincent is a bassist and educator and has been performing music for the last 20 years. He graduated from QUT in 1997 with a BMus in classical Double Bass studying under Robert Davidson. In 1998, he was the musical director of Belvoir Street Theatres' "After China" and he co-devised and performed in children's show "Ukelele Mekulele" which found a home at the Sydney Opera House. In 2005 he joined gypsy ensemble Doch with whom he has toured both nationally and internationally and has appeared on their critically acclaimed albums: 'This Drink This Moon' and 'Bride in A Red Dress'. Sam has worked as arranger and composer on the theatre show, David Megarrity's "Bear With Me", which appeared at the 'Awesome Festival' in Perth. Samuel is much in demand as a freelance musician and has appeared with such acts as Miguel, Topology, Scat, Australian Girls Choir, and the Queensland Philharmonic Orchestra as well as performers such as Tommy Emanuel, Marina Pryor, Don Burrows, Tom Burlinson, James Morrison.

Berardi/Foran/Karlen

Kristin Berardi – voice
Sean Foran - piano
Rafael Karlen - saxophone

A true collaborative trio BERARDI/FORAN/KARLEN features the talents of three distinctive Australian jazz artists.

Featuring Kristin Berardi, winner of the Montreux Jazz Vocal competition, APRA Jazz Award Winner Sean Foran and Churchill Fellowship recipient Rafael Karlen, are three are strongly creative musicians, known for their clear personal aesthetic and artistic voice. Highly awarded nationally and internationally as performers and composers, their combined experience is formidable.

The music of this group is unlike anything they have each produced before and draws on sounds from modern jazz, European folk music and classical music. You may hear influences from jazz masters such as Kenny Wheeler, Bobo Stenson and Norma Winstone alongside the sounds of Debussy and Joni Mitchell. Intensely intimate, textural and emotional, the music of Berardi/Foran/Karlen draws you close, at times a whisper, the lush piano harmonies merging with Berardi's sublime vocal lines and Karlen's engaging melodic interplay.

The debut album from the trio "Hope in My Pocket" features a range of material developed to explore the powerful experiences and emotions contained in the correspondence of men & women involved in our military past. The songs explore themes of hope, fear, separation, loss, love, and conditions of war, in a stunningly original way. Their 2015 tour took the group to major jazz festivals around Australia including the Wangarratta, Canberra, Sydney, Noosa, and Brisbane Jazz Festivals. "Hope in My Pocket" was the winner of the QLD Music Award for Jazz in 2016 and the APRA/Australian Music Centre QLD State Award for Excellence in Jazz at the Art Music Awards.

In 2017 they collaborated with the acclaimed vibraphonist Pascal Schumacher (Luxembourg) with performances at the Melbourne and Brisbane Jazz Festivals, and a recording of new music. In 2018 they toured to New Zealand and their first single from the upcoming album HAVEN is released September 2019 through Earshift Records. This new quartet blends the vibraphone with the subtle nuances of the trio creating textural music blurring genres and captivating audiences.

Kristin Berardi

Kristin Berardi, originally from the country town of Koumala in North Queensland, is a one of Australia's first calls when it comes to Jazz Singing. Her accolades include winning the Montreux Jazz Festival's International Vocal Competition in 2006, supporting Al Jarreau and George Benson at Montreux Jazz Festival 2007, winning the National Freedman Fellowship 2007, receiving two National Australian Bell Award for the Best Jazz Vocal Album for 2010 and 2012 and. Most recently winning the 2012 National Jazz Vocal Award at the Wangarratta Jazz Festival.

She studied in Brisbane, at the Conservatorium of Music with Irene Bartlett. She has released numerous albums, including her two Bell Award winning albums – the duo album with the incredible Australian/NZ guitarist James Sherlock "If you were There" and "Kristin Berardi meets the Jazzgroove Mothership Orchestra. Kristin also has her self-titled band album on the Jazzhead label featuring all Berardi original works. She has successfully completed tours in Europe and has performed locally, nationally and internationally at Jazz Festivals and Jazz Clubs, such as New York and Germany and Indonesia.

She also teaches at the Queensland Conservatorium of as well as guest lectures around the country.

Rafael Karlen

Rafael Karlen graduated from Griffith University, Queensland Conservatorium of Music in 2004, with a Bachelor in Contemporary Music Performance in Saxophone. He received the Lord Mayor's Fellowship for Young and Emerging Artists from the Brisbane City Council in 2011 to undertake study in Europe and has recently returned following the completion of his Masters of Music Degree at the University of York in England.

His debut album with the 10-piece Brisbane-based ensemble, the West End Composers Collective, received critical acclaim and featured Rafael as a composer, saxophonist and flautist. In 2010, Rafael received a Jump Mentoring Grant to work with internationally renowned composer and pianist Mike Nock. Prior to this, he was a finalist in the 2009 Bell Awards for both Young Australian Jazz Artist of the Year and Best Jazz Composition of the Year categories, received a Q150 Composer Commission, and was the 2009 Composer-in-residence with the West Australia Youth Jazz Orchestra. Rafael also attended the 2009 International Jazz and Creative Music Workshop at the Banff Centre in Canada. In 2008, Rafael was a finalist in the APRA/JMO National Big Band Composition Competition in Sydney. More recently, Rafael was nominated for the Freedman Fellowship from the Music Council of Australia in 2013.

Appendix 8: Post performance performer interviews**A) Performer interview - Kristin Berardi (vocals) - Interview 27th Nov 2018
Discussing performance at QLD Conservatorium on 14th Nov 2018**

KB: It's definitely getting... well I'm getting more comfortable with it. I'm finding now that when I'm not using it in other situations it's coming more into my thought... I wish I had it. That's a thing I've never really had before, and I think 'oh that'd be great with delay'. Yeah, it's cool.

I like your tune, it's a good vehicle for the effects, and we can see how far we can push it. I had some feedback from some people after the gig.... They thought the effects really added to the music, didn't distract from it. That's the thing I really worry about I guess,... am I doing too little, too much.. yeah?

SF: Yeah, it's a hard thing. I don't to overpower the natural sound. This is a band with a long history of playing acoustically, I don't want to take away from that. So, does the music facilitate a blend between the acoustic and electronic sounds? Is there a kind of writing that works for that?

KB: I guess.. um... Your new song, is it in sections? Yeah, I think that's helpful. The sections to move through are cool. That being said, we did some older tunes of ours, and added the effects and it felt right and natural and normal.

SF: When you hear Rafael and myself adding the electronics does that influence how you respond?

KB: Well, I'm not sure. My main thing is, I'm trying to do it more every time, but I'm worried about doing too much. But then when we're all doing it... well... I think when I hear you guys I really consider what I can add to it, and if it's then too much.

Ah.. I nearly did a loop, but for some reason I went ahh,,, nup.

SF: So is that fear preventing you sometimes?

KB: I've got to put in more work

**B) - Performance interview - Rafael Karlen (saxophone) – November 23rd 2018
Discussing performance at QLD Conservatorium on 14th Nov 2018**

RF: I thought the performance was more successful, as we played as a trio. I felt more comfortable getting my way around pedals in a tasteful way. I also felt more confident in knowing what would happen. I think my heads getting more into it, confident

SF: Confidence creating two layers of sound- is there a way you're becoming more confident

RK: I guess my approach is quite exploratory, often very close to the gig I'm trying things out, play around abit. That process of discovery is cool, it's all very fresh, and it's quite exciting as none of it is really automatic. Some of it I know, some of it I don't.

SF: Do you find that you're needed to split your brain into two ways of thinking? Your normal ways of playing and the buttons, dials ?

RK: There's definitely that, and I think the repertoire also gives licence to that.. allowing you to use that extended soundworld. Bringing in some subtle colours that shift or complement the sound can be cool

SF: What about responding to the others players? Do you use their sound as a prompt for a response?

RK: Absolutely, often I think, 'ok, the vocals have some delay, I should at least recognize that that, and think about how I will respond to that. And you're doing that in improvising all the time... how much do you jump on that train, how far to go. That decision is made very quickly, how directly do you jump on board. If someone's doing some kind of reverse patch it's nice to use that same kind of 'effect language', I think it broadens the pallete of responses possible

SF: yeah, and we've been playing together for quite a while as a band, but these electronics are realtively new. But these sounds... do

RK: Definitley there's some surprises, there always is. There's the technical sound of the room which is always something you don't know, that's tricky, but theres' also how thigns overlap... there's just so many options and variables, there's just always a surprise as to what direction it can go... ofcourse, on top of that, we're improvising!

SF: And I think the material is often quite open, from a compositional perspective. Is that helpful?

RK: More freedom is useful... but the danger of having too much openness is for it to get too muddy, and it can end up in a similar space. People can just reply with things they know, or

know how to do. The benefit is that if you're really listening you can push it forward, into a new section, or bring in new sounds, shapes.

C) Performer interview – Samuel Vincent – 30 August 2017

Discussing performance - "Reassemble" –QLD Conservatorium, Griffith University

SV: When you start off a piece and it's very free and there's quite a lot going on in your (piano) playing and there's a lot going on in your effects, I don't want to trample on that because I want the audience to hear that the piano's doing something, not only is he doing something, but there's another dimension with this other stuff. I treat it as a piano centerpiece and I'm just going to add a background to that, a little atmosphere around the edges.

So this is thing where I'll use the loopstation, and it's got two separate loops that you can do, so I set up two separate notes to create a chord, and then I bring the notes in and out. This is perhaps one of the only times where I might stop playing and do some knob twiddling... it's fun to be chordal on the bass, layering up parts.

Once it's set, then I can do some other things.. so you'll hear me getting right up on the bridge....on the one note you can bring out so many overtones. It's fun to blend that against the looped parts.

The fade out button is fantastic, I can fade the loops out easily, so it sounds more natural alongside the acoustic sound of the bass.

Sometimes it's hard to hear if the loop is still going... depending on where I'm standing and what's going on in the music... and the halfway through the section I go, 'OH!'.. It's a lesson to learn. Sometimes things are difficult to control, or hear, or you're just not sure where sounds are coming from.

I think I often want to create contrast between ethereal and airy fairy and then sharp. I can use the effects to do this, but it's hard to get the effects to work consistently on the double bass, so many of the effects are not really designed for the instrument.

These songs that we have, sometimes I worry that we're not doing enough, and I think that I can freak out that there's not enough structure in comparison to our acoustic only tracks. But on the other hand, I feel more free and I can try this, and this and this. I don't need to do everything, but there's a lot of choice. There's options in the density of what I can play, and the density of the group..

I think sometimes I want to put structure in there, you know like bookending it... a structural thing. The loops can do that, plus they give it a little bit of sheen, and something in the background that I can work with.

Sometimes I have in the back of my head this thought that if I'm not playing the bass part, then perhaps I'm neglecting my duty... but I think once I add these loops and other sounds I get to be something else. I love that. It's so liberating, things like the reverb and crazy delays can really change the way I play.

D) Performer interview – John Parker – 29 August 2017
Discussing performance - “Reassemble” –QLD Conservatorium, Griffith University

JP: I start by prepping the Kaoss pad and looper... then I get the mic in position, getting it setup on the cymbal to get the proximity effect. It's so I can setup a drone essentially, and manipulate it. This is probably in response to Sam's bowing. I'm using some pitch manipulation and control on the loop pedal.. changing the pitch of the cymbal rolls. I'm getting a gain structure going that I can work with. By having the mic setup on the hi-hat cymbal and it's almost like I can create a drone. I can play pitch through the pedal and become a melodic instrument... which I really like.

Right... that idea is over! Turn the mic off, move it.. Now it's above the snare drum, the snare is muted.

Now I'm creating some short loops, on the snare drum and layering them. After a while I'm not playing the drums at all.. just trying to feed the loops back through the Kaoss pad to create some digital distortion and then I loop that. I also start using the Kaoss pad rhythmically which is fun.. you can get some crazy sounds.

After a while the digital distortion get too much so I get rid of it... then I grab the sticks and incorporate the acoustic drums in with the loop.

Once we hit the new section I completely get rid of the loops... just live drumming. I probably do this in a response to you and Sam, it's nice to have a section without the electronics as a balance, and you know, just following musicians dynamically.

Ah... decisions to go trashy with coin bucket on the tom and the tambourine on the snare. It's definitely a response to the interesting sounds I hear from you and Sam...I think I want the percussion items to match your electronics somehow.

In the new section I'm not sure what's going on here.. ah hang on, yep I'm bringing some of the loops back, but I've brought the whole tempo down, so the sound is really changed, kinda gone into this granular sound. I've changed the pitch and tempo of everything.. it's just a pulse type thing now. I'm not playing the drums anymore now and I'm just feeding it back through the Kaoss pad again. It's cool... the sounds are nothing like the acoustic drums.

These sections are kinda open... you know, if you're locked into a form of a tune, um, yeah, it just doesn't feel like there's time to develop these ideas... just as it would be if I'm developing an improvisation on the drums normally.

Also, there's the thing of knowing how your instrument reacts to a certain acoustic... There's a lot of new variables with the electronics, as you're sampling the instrument, there's feedback, monitoring, all these things to think about... some things work, some things don't. I think having these freely improvised and open sections gives you space to try these things out.

When I listen back to this I can hear how we're really able to augment how we play... I can play time and play free over the top. The real trick though is hearing everything...in ears may be and option, but that's a scary thing... I want to hear the acoustic sounds. We've got to be careful with the dynamic level. With my loop pedal, it's the penultimate part of the loop chain and I tell the sound guy that if it's no loud enough, I'll adjust it myself. I don't want him changing it, I need to have that ability myself to adjust the level, especially when I'm playing rhythmic loops.

References

Ase, T. (2009). *Tone Åse & Thomas Strønen, live at Dokkhuset sept.09* [Video]. Vimeo.

<https://vimeo.com/18423184>

Ase, T. (2012). *The voice and the machine– now you see me, now you don't*, [Norwegian Artistic Fellowship Programme, Norwegian University of Science and Technology].

<http://www.toneaase.no/wp-content/uploads/2012/08/Artistic-Research-Tone-%C3%85se-.pdf>

Ableton. (n.d.). *What is Live?* Retrieved April 20, 2016 from

<https://www.ableton.com/en/live/>

Anderson, V. (2013). The beginning of happiness: Approaching scores in graphic and text notation. In P. De Assis, W. Brooks, and K. Cossens (Eds.), *Sound and score essays on sound, score and notation*, (pp. 130–142). Leuven University Press.

Bailey, D. (1993). *Improvisation: its nature and practice in music*. Da Capo Press.

Belet, B. (2003). Live performance interaction for humans and machines in the early twenty-first century: one composer's aesthetics for composition and performance practice, *Organised Sound* 8/3, 305-12. <https://doi:10.1017/S1355771803000281>

Bergsland, A. (2010). *Experiencing Voices in Electroacoustic Music*. [PhD thesis, Norwegian University of Science and Technology]. Retrieved from

http://folk.ntnu.no/andbe/PhD/PhD_Thesis_Bergsland_WEB

- Belgrad, D. (1998). *The Culture of Spontaneity: Improvisation and the Arts in Post-war America*. University of Chicago Press.
- Berendt, J., & Huesmann, G., & ProQuest Ebooks. (2009). *The jazz book: From ragtime to the 21st century* (7th, rev. and expand ed.). Lawrence Hill Books.
- Berliner, P. (1994). *Thinking in Jazz: The Infinite Art of Improvisation*. University of Chicago Press
- Bhagwati, S. (2013). Notational Perspective and Comprovisation. In P. de Assis, W. Brooks, & K. Cossens (Eds.), *Sound and score essays on sound, score and notation*, (pp.165-177). Leuven University Press.
- Blumenfeld-Jones, D. S. (2016;2015;). The artistic process and arts-based research: A phenomenological account of the practice. *Qualitative Inquiry*, 22(5), 322-333.
<https://doi:10.1177/1077800415620212>
- Boiler Room. (2014) *Hauschka – Boiler Room in Stereo*. [Video]. YouTube.
<https://www.youtube.com/watch?v=HYsvlJgtAgY>
- Borgo, D. (2002). Negotiating Freedom: Values and Practices in Contemporary Improvised Music. *Black Music Research Journal*. 22(2), 165-188
- Borgo, D. (2005). *Sync or swarm: Improvising music in a complex age*. Continuum

International Publishing Group.

Borgo, D. (2010, Nov 6). *The Ghost in the Music: Improvisers, Technology, and the Extended Mind*. [Keynote presentation]. Two Thousand + Ten Symposium on Improvisation, Queens University Belfast Sonic Arts Research Center

Borgo, D. (2016). Openness from closure: The Puzzle of Interagency in improvised music and a neocybernetic solution. *Negotiated Moments: Improvisation, Sound, and Subjectivity*. 03/2016. Duke University Press.

Borgo, D. & Kaiser, J. (2010, July 1-3). *Configurin(g) KaiBorg: Ideology, Identity and Agency in Electro-Acoustic Improvised Music*. [Conference proceedings]. International Conference Beyond the Centres: Musical Avant-Gardes Since 1950 Thessaloniki, Greece

Boss. (n.d). *RC-505 Loopstation*. Retrieved May 25, 2020 from <https://www.boss.info/au/products/rc-505/>

Bourne, M. (2007). *The Molde Concert* [Album; CD]. Foghorn.

Boutard, G. (2016). Solo works of mixed music with live electronics: A qualitative enquiry in timbre and gesture from the performer's perspective. *Musicae Scientiae*, 20(3), 361-391. <https://doi:10.1177/1029864916634421>

Bowers, John (2002). *Improvising Machines: Ethnographically Informed Design*

For Improvised Electro-Acoustic Music. [M.A. Thesis, University of East Anglia, Norwich, UK]. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.219.1699&rep=rep1&type=pdf>

Bjorn, K. (2017). *Push Turn Move: Interface design in electronic music*. Bjooks Media, Frederiksberg

Cerchiari, L., Cugny, L., & Kerschbaumer, F. (Eds.). (2012). *Eurojazzland: jazz and European sources, dynamics, and contexts*. Northeastern University Press.

Clarke, E. (2002). Understanding the psychology of performance. In J. Rink (Ed.), *Musical performance: A guide to understanding*, (pp.(59–72). Cambridge University Press

Clarke, Michael, Dufeu, Frédéric & Manning, Peter (2013) *TIAALS: A new generic set of tools for the interactive aural analysis of electroacoustic music*. [Proceedings]. Electroacoustic Music Studies Network EMS13, Electroacoustic Music in the Context of Interactive Approaches and Networks, EMS 2013, 17-21 June, Lisbon, Portugal.

Coker, J. (1986). *Improvising Jazz*. Simon and Schuster

Collins, G. (2014). *Solo drumset: Revering the drumset as a solo instrument with expansions for the instrument, notation, physical expression and compositional works* [Professional doctorate, Griffith University]. Retrieved from

<http://hdl.handle.net/10072/366322>

Collins, N. (2009). The Evolution of ‘Trombone-Propelled Electronics’. Retrieved Oct 25, 2020 from <http://www.nicolascollins.com/texts/TrombonePropelledElectronics.pdf>

Constanzo, R. (n.d). Composition, Performance, Improvisation, and Making Things, sitting in a tree : Me-Me-Me-Me-Me-Me-Me, [Doctoral Dissertation]. Retrieved October 13, 2017 from <http://www.rodriigoconstanzo.com/thesis/>

Cook, P. R. (2020). Principles for designing computer music controllers.
doi:10.5281/zenodo.1176358

Couprie, P. (2004). Graphical representation: An analytical and publication tool for electroacoustic music. *Organised Sound : An International Journal of Music Technology*, 9(1), 109-113. <https://doi:10.1017/S1355771804000147>

Cox, J. (2013). What I Say and What I Do: The role of composers’ own performances of their scores in answering our research questions about their works and how we should interpret them. In P. de Assis, W. Brooks, & K. Cossens (Eds.). *Sound and score essays on sound, score and notation*, (pp. 12-32). Leuven University Press.

Crispin, D. (2013). From Territories to Transformations: Anton Webern’s piano Variations Op. 27 as a Case Study for Research in-and-through Musical Practice. In P. de Assis, W. Brooks, and K. Cossens (Eds.), *Sound and score essays on sound, score and notation*, (pp. 47–142). Leuven University Press

- Crispin, D. (2015). Artistic Research and Music Scholarship: Musings and Models from a Continental European Perspective. In M Dogantan-Dack (Ed.), *Artistic Practice As Research in Music: Theory, Criticism, Practice*. (pp.53-72). Routledge
- Croft, J. (2007). Theses on liveness. *Organised Sound*, 12(1), 59-66.
<https://doi:10.1017/S1355771807001604>
- Crooks, J (2012), Recreating an Unreal Reality: Performance Practice, Recording, and the Jazz Rhythm Section, *Journal on the Art of Record Production*, 6, viewed on 21 April 2020, <https://www.arpjournal.com/asarpwp/recreating-an-unreal-reality-performance-practice-recording-and-the-jazz-rhythm-section/>.
- Csikszentmihalyi, M. (1990) *Flow: The Psychology of Optimal Experience*.
HarperCollins
- Cycling 74. (n.d.). *Cycling '74 Max*. Retrieved June 15, 2020 from <https://cycling74.com>
- Cycling 74. (n.d.). *An interview with Christian Fennesz*. Retrieved November 10, 2020 from <https://cycling74.com/articles/an-interview-with-christian-fennesz>
- Dahlen, C. (2003). *Supersilent 6*. Pitchfork. Retrieved March 10, 2020 from <http://pitchfork.com/reviews/albums/7628-6/>
- Davies, P. (2018) *The Secret History of Guitar Effects Pedals*. Retrieved November 10, 2020

from <https://www.soundaffects.com/blog/2018/04/the-secret-history-of-guitar-effects-pedals/>

Dean, R. T. (2002). *Hyperimprovisation: computer-interactive sound improvisations*. A-R Editions, Inc.

ECM Records. (n.d.) *Artist page Norma Winstone*, Retrieved 17th August, 2017 from <https://www.ecmrecords.com/artists/1435045922/norma-winstone>

Elsea, P. (2013). *Art and technique of electroacoustic music*. A-R Editions, Inc.

Emmerson, S. (1998). Acoustic/electroacoustic: The relationship with instruments. *Journal of New Music Research*, 27(1–2), 146-164.

Emmerson, S. (2000). Losing Touch: The Human Performer and Electronics. In Simon Emmerson (Ed.), *Music, electronic media, and culture*. (pp. 194-216). Aldershot

Emmerson, S. (2007). *Living electronic music*. ProQuest Ebook Central, Retrieved from <https://ebookcentral-proquest-com.libraryproxy.griffith.edu.au>

Emmerson, S., & Landy, L. (Eds.). (2016). *Expanding the Horizon of Electroacoustic Music Analysis*. Cambridge University Press. <https://doi:10.1017/CBO9781316339633>

Feist, J. (n.d). *Why Lead Sheets?* Berklee. <https://www.berklee.edu/berklee-today/summer-2018/lead-sheet>

Ferguson, J. R. (2013). Imagined agency: Technology, unpredictability, and ambiguity.

Contemporary Music Review, 32(2-3), 135-149.

Fielding, N. G. (2012). Triangulation and mixed methods designs: Data integration with new research technologies. *Journal of Mixed Methods Research*, 6(2), 124-136.

<https://doi:10.1177/1558689812437101>

Food. (2010). *Quiet Inlet*. [Album; CD]. ECM 2163.

McNamee, D. (2011). *Hey, what's that sound: Kaoss Pad*. The Guardian.

<https://www.theguardian.com/music/2011/mar/09/whats-that-sound-kaoss-pad>

Goodman, E. (2002). Ensemble Performance. In J Rink (Ed.), *Musical performance: A guide to understanding* (pp.153-167) Cambridge University Press.

<https://doi:10.1017/CBO9780511811739>

Gray, C & Malins J. (2004). *Visualising Research: A guide to the research process in art and design*. Ashgate.

Green, O. (2011). Agility and Playfulness: Technology and skill in the performance

ecosystem, *Organised Sound*, 16(2): 134–144

Hannan, M.F. (2006). *Interrogating improvisation as practice-led research* [Conference presentation]. Speculation and innovation: applying practice led research in the

creative industries, Queensland University of Technology. Brisbane, Australia.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.126.9853&rep=rep1&context=pdf>

Haseman, B. (2006). *A Manifesto for performative research*. Media International Australia
Incorporating Culture & Policy, (118), 98-106.

Hassell, J. (2009). *Last night the moon came dropping its clothes in the street*. [Album; CD].
ECM 2077.

Hassell, J. (1980). *Possible Musics*. [Album; CD]. Editions EEGCD-7.

Hauschka. (2017). *What if*. [Album; CD]. Temporary Residence.

Holmes, T. (2018): The Roots of Electronic Jazz, 1950–1970. *Jazz Perspectives*, 10(2-3),
207-242. <https://doi:10.1080/17494060.2017.1408480>

Holmes, T., & Pender, T. M. (2012). *Electronic and Experimental Music : Technology, Music,
and Culture*. Routledge.

Hope, C. (2017). Wording New Paths: Text-Based Notation in New Solo Percussion Works
by Natasha Anderson, Erik Griswold, and Vanessa Tomlinson. *Contemporary Music
Review: Contemporary Percussion Explorations in Twenty-First-Century Australia*,
36(1-2), 36-47. <https://doi:10.1080/07494467.2017.1370793>

Hugill, A. (2019). *The digital musician* (3rd Ed.). Routledge.

Hungry Robot Pedals (n.d). *The Karman Line*. Retrieved 11th March 2016 from

<https://www.hungryrobotpedals.com/the-krmn-line>

Hungry Robot Pedals (n.d). *The Stargazer*. Retrieved 12th September 2016 from

<https://www.hungryrobotpedals.com/the-stargazer>

Iyer, V. (2014). *Mutations*. [Album; CD]. ECM 2372

Jackson, T. A., & Jackson T. (2012). *Blowin' the blues away: Performance and Meaning on the New York Jazz scene music of the African Diaspora*. University Of California Press.

Jago, M. (2013). What is a jazz record anyway? Lennie Tristano and the use of extended studio techniques in jazz. *Journal on the Art of Record Production*, (8)

Keller, A. (2013). *Fern Tree – from the album Family Portraits*. [Video]. YouTube.

<https://www.youtube.com/watch?v=vkAdMXB-FXY&feature=youtu.be>

Keller, A. (2013). *Family Portraits*. [Album; CD]. Jazzhead HEAD188

Klein, J. (2008). Voice and Live Electronics: An historical perspective. *eContact!*, 10.4.

Retrieved from http://cec.sonus.ca/econtact/10_4/klein_livevoice.html

Klein, J. (2010). Interview with Franziska Baumann. *eContact! 12.2 — Interviews (2)*.

Available at https://econtact.ca/12_2/BaumannFr_Klein.html

Knight, P. (2012). *Allotrope*. [Album]. Listen Hear Collective

Lähdeoja, O., Navarret, B., Quintans, S., Sedes, A. (2010). The Electric Guitar: An Augmented Instrument and a Tool for Musical Composition. *Journal of interdisciplinary music studies*, 4(2), 37-54.

Lake, S. (2004). *Evan Parker Electro-Acoustic Ensemble*. Lawrence Casserley. Retrieved 15th June , 2016 from <http://www.lcasserley.co.uk/EP-EAE-SL.html>

Lewis, G. (1996). Improvised music after 1950: Afrological and Eurological perspectives. *Black Music Research Journal*, 16, (1), 91–122.

Lexer, S. (2012). Live Electronics in Live Performance: A performance practice emerging from the piano+ used in free improvisation. [Doctoral thesis, Goldsmiths, University of London].

Liine. (n.d) *Lemur*. Liine. Retrieved March 20, 2016 from <https://liine.net/en/products/lemur/>

Liine Community. (n.d). *Rheynelooper*. Liine. Retrieved December 11, 2015 from <https://liine.net/en/products/lemur/>

Linnenbank, D. (2015). *Organelle User Manual*. Critter & Guitari Musical Instruments.

Retrieved November 12, 2020 from

https://www.critterandguitari.com/manual?m=Organelle_Manual

Mirando, E. R., & Wanderley, M. M. (2006). *New digital musical instruments : control and interactions beyond the keyboard*. A-R Editions Inc.

MIT Media Lab. (n.d.). *Hyperinstruments*. Retrieved June 15, 2017 from

<https://www.media.mit.edu/projects/hyperinstruments/overview/>

Mixdown Magazine, (n.d). *Musicology: A History of the Guitar Effect Pedal*. Retrieved

November 10, 2020 from <https://mixdownmag.com.au/features/columns/5-reasons-to-catch-the-contortionist-on-tour-this-month/>

Molvær, N.P. (1997). *Khmer*. [Album; CD]. ECM 1560

Molvær, N.P. (2005). *Er*. [Album; CD]. Thirsty Ear

Nasjonal jazzscene. (2015, March 12). *Food - live at Nasjonal Jazzscene 12.03.15* [Video].

YouTube. <https://www.youtube.com/watch?v=4yL9bn-quTo>

Nelson, R. (2006). Practice-as-research and the problem of knowledge. *Performance*

Research, 11 (4): 105–116. doi:10.1080/13528160701363556

- Nelson, R. (2013). *Practice as Research in the Arts : Principles, Protocols, Pedagogies, Resistances*, Palgrave Macmillan UK.
- Nicolls, S. (2010). *Interacting with the piano: Absorbing technology into piano technique and collaborative composition: the creation of 'performance environments', pieces and a piano* [Doctoral Dissertation, Brunel University]. Retrieved from <http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.535928>
- Nicolls, S. (2010). Seeking out the spaces between: Using improvisation in collaborative composition with interactive technology. *Leonardo Music Journal*, 20, 47–55.
- Nicolls, S. (2011). Brief thoughts on using Live Electronics: The inside out piano and touring. *eContact!*, 13.2. Available at http://cec.sonus.ca/econtact/13_2/nicolls_electronics.html
- Nicholson, S. (2003). Jazztronica: A brief history of the future of jazz. *Jazztimes*. Retrieved from <http://jazztimes.com/articles/14149-jazztronica-a-brief-history-of-the-future-of-jazz>
- Oliveros, P. (2004). Tripping On Wires: The Wireless Body: Who Is Improvising? *Critical Studies in Improvisation* 1, (1), <https://doi.org/10.21083/csieci.v1i1.9>
- Pareles, J. (2014). *When Guitars Sound Like Orchestras or Brawling Geese*. Retrieved November 10, 2020 from <https://www.nytimes.com/2014/01/20/arts/music/fred-frith-and-nels-cline-create-new-soundscapes.html>

Parker, E. (1999). *Drawn Inward*. [Album; CD]. Munich: ECM 1693

Pelz-Sherman, M. (1998). *A Framework for the Analysis of Performer Interactions in Western Improvised Music* [Doctoral Dissertation, University of California]. Retrieved from <http://www.pelz-sherman.net/mpsdiss.pdf>

Pestova, X. (2009). Models of interaction: Performance strategies in works for piano and live electronics. *Journal of Music, Technology and Education*, 2(2-3), 113-126.

Polar Bear. (2015). *Same as you*. [Album; CD]. Leaf Bay 98CD

Prepared Guitar. (2013). *Eivind Aarset: Guitar Anti-Hero*. Retrieved November 10, 2020 from <http://preparedguitar.blogspot.com/2013/04/eivind-aarset-guitar-anti-hero.html>

Pressing, J. (1988). Improvisation: Methods and models. In J. A. Sloboda (Ed.), *Generative processes in music: The psychology of performance, improvisation and composition* (pp. 129–179). Oxford University Press.

Pure Data. (n.d). *Pure Data*. Retrieved August 11, 2017 from <http://puredata.info/>

Qvenild, M. (2015). *Personal piano*. [Album; CD]. Hubro HUBROCD2563

Qvenild, M. (2016). *The Hyper(sonal) piano Project: Towards a (per)sonal topography of grand piano and electronics*. Retrieved June 15, 2016 from <http://www.mortyq.com/hpp/>

Rebelo, P. (2010). Notating the unpredictable. *Contemporary Music Review*, 29(1), 17-27.

Reynolds, D. (2017). *Jazz and recording in the digital age: Technology, new media, and performance in New York and online* [Doctoral thesis, City University of New York Graduate Centre]. Retrieved from https://academicworks.cuny.edu/gc_etds/2404/

Rink, J. (2002). *Musical performance: A guide to understanding*. Cambridge University Press. doi:10.1017/CBO9780511811739

Robson, C. (2011). *Real World Research*. Wiley.

Rothenberg, D., & Neill, B. (2010). Playing into the machine: Improvising across the electronic abyss. *Leonardo Music Journal*, 20, 19-20.

Rowe, R. (1993). *Interactive Music Systems: Machine Listening and Composing*. MIT Press.

Sawyer, R.K. (2003). *Group Creativity: Music, Theater, Collaboration*. Taylor & Francis

Sawyer, K. (2014). Group Creativity: Musical Performance and Collaboration. In Caines, R., & Heble, A. (Eds), *The improvisation studies reader: Spontaneous acts*, 87-100. Routledge.

Schloss, A. (2003). Using Contemporary Technology in Live Performance: The Dilemma of the Performer, *Journal of New Music Research*, (32:3), 239-24

Schuiling, F. (2018). 'Jazz and the Material Turn', *The Routledge Companion to Jazz Studies*, (pp. 87-96). Routledge.

Seddon, F. (2005). Modes of communication during jazz improvisation. *British Journal of Music Education*, 22, 47-61

Sound on Sound. (2007). *Boss RE-20 Pedal*. Retrieved April 13, 2018 from <https://www.soundonsound.com/reviews/guitar-technology-9>

Space Monkey. (2014). *The Karmen Line*. [Album; CD]. Hubro CD2543

Stascheit, A. (2013). Artistic Practice, Methodology, and Subjectivity: The "I Can" as Practical Possibility and Original Consciousness. In P. de Assis, W. Brooks, & K. Cossens (Eds.), *Sound and score : essays on sound, score and notation* (pp.39-46). Leuven University Press.

Supersilent. (2003). *Supersilent 6*. [Album; CD]. Rune Grammofon

Stroppa, M (1999) Live Electronics or...live music? Towards a critique of interaction, *Contemporary Music Review*, 18(3), 41–77.

Thelle, N. (2010). *Making Sensors Make Sense: Challenges in the Development of Digital Musical Instruments*. [Master of Arts Thesis, University of Oslo]. Retrieved from <https://www.semanticscholar.org/paper/Making-sensors-make-sense-%3A-challenges->

in-the-of-Thelle/d9162a1df26837c3179a770e1af160c9bab50f11

Torn, D. (2007). *Prezens*. [Album; CD]. ECM 1877

Tremblay, P A (2012). *Mixing the Immiscible: Improvisation within Fixed-Media*

Composition. [Conference proceedings]. Electroacoustic Music Studies Conference,

Meaning and Meaningfulness in Electroacoustic Music. 11-15th June, Stockholm.

Retrieved from <http://www.ems-network.org/spip.php?article350>

Van Der Schyff, D. (2019). Improvisation Enaction and Self-Assessment. In Elliott, David J., Silverman, M., McPherson, G., & Oxford University Press. (Eds.), *The oxford handbook of philosophical and qualitative assessment in music education*, 319-337, Oxford University Press.

Vella, R. (2004). *Artistic Practice as Research*. In Hartwig, K. (Ed.). *Artistic Practice as Research: Proceedings of the XXVth Annual Conference*. Melbourne: Australian Association for Research in Music Education, 2004: 1-10. Retrieved from <https://search.informit.com.au/documentSummary;dn=441259746359723;res=IELHSS>

Waters, S. (2007). *Performance Ecosystems: Ecological Approaches to Musical Interaction*. *EMS: Electroacoustic Music Studies Network*. Retrieved from www.ems-network.org/spip.php?article278

Wesseltoft, B. (2009). *IM*. [Album; CD]. Jazzland

Wesseltoft, B. (2009). *Playing* [Album; CD]. Oslo: Jazzland

Wesseltoft, B. (2012). *Live at the Kansi Auki piano Jazz Festival 2011*. [Video]. YouTube.

Available at https://www.youtube.com/watch?v=H0_Wf31qV9o

Wesseltoft, B, Schwartz, H, Berglund, D. (2014) *Triologue*. [Album; CD]. Jazzland

Williams, R. (2005). *Norwegian Blues*. The Guardian. Retrieved from

<https://www.theguardian.com/music/2005/dec/06/popandrock1>

Wilson, G. B., & MacDonald, R. A. R. (2016). Musical choices during group free

improvisation: A qualitative psychological investigation. *Psychology of Music*, 44(5),

1029-1043. <https://doi:10.1177/0305735615606527>

Young, J. (2015). Imaginary Workscapes: Creative Practice and Research through

Electroacoustic Composition. In M Dogantan-Dack (Ed.), *Artistic Practice As*

Research in Music: Theory, Criticism, Practice. (pp. 150-168). Routledge.

Zagorski-Thomas, S. (2007). The musicology of record production. *Twentieth-Century*

Music, 4(2), 189-207. <https://doi:10.1017/S1478572208000509>