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An Autoethnography on Film Composition Practice:

Integrating Virtual Instruments and the Live Performance

Realisation within the DAW

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Abstract

The research presented here is to establish realism and authenticity within my professional and creative practice in the recording studio and investigate how to create a sense of liveness and realism with the integration of virtual instruments and live performance through hyperorchestration. It represents an autoethnographic investigation into the challenges of composing the most naturalistic, emotionally compelling film scores, with liveness, realism and performance using computer technology and to examine how my process is mediated by ideas, intentions and technology. The commentary details how I brought realism to my scores, acknowledging the complexities of orchestration in conjunction with live and MIDI performance to produce natural sounding performances within the Digital Audio Workstation.

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An Autoethnography on Film Composition Practice: Integrating Virtual Instruments with the Live Performance Realisation Within the DAW

1. Introduction

Music technology has evolved due to technological developments and innovations that have brought a sense of realism to virtual instruments and the creation of new sounds (Harper, 2014). Composition for film is mediated by technology from Edison's phonograph to the Internet (Katz, 2010), and with this there are implications for how the composer has to work and the strategies for sound choices and performance realisation. Not only does a film composer need 'technical skills but emotional and psychological disciplines' (Katz, 2010, p. 11). Change is inevitable as a film evolves, and these changes from filming and recording through to the cutting room floor can affect the creative process of music making (ibid, 2010). There is an inter-relationship between technology and craft. This has evolved through the composer sitting at a piano scoring on manuscript paper, to the synthesizer in the late 1960s and to the digital audio workstation (DAW[1]) developments of the 1980s which have transformed how we create and listen to music. Film scoring in particular has evolved in relationship with technology, creating a set of technological conditions that influence the composer to create new music for a film. With technology 'composers can act like performers, working directly with sound and forgoing notation' (Katz, 2010, p. 212).

Composers have considerable access to virtual instruments, expressive tools for emulating performance realism in computer production. Key factors shaping realism include the use of dynamics, expression, phrasing, differing qualities of timbre and articulation, intensity and

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[1] 'A computer-controlled system' consists of a network of components, 'that allows all of the major digital recording, processing, editing and replay functions to be controlled from a central location' (Lambert, 2011, para. 10).

colour. These factors bring energy, excitement and realism to the mix (Chudy, 2016). When a musician performs a composer's music they 'convey the contents from a musical score to a listener' (Chudy, 2016, p.25) communicating their musical intentions through technique and variations of timbre that the instrument can produce. Timbre is dependent on a physical sound source such as acoustic instruments and electronic instruments which can be hardware or digital software instruments within the DAW (ibid, 2016).

The development of computer technology has moved very quickly over the last 40 years. Processing power and storage have increased and the DAW and virtual instruments have all become more affordable, enabling composers to achieve professional results at home in their studios (Allen, 2013). Due to the range of software, upgrades and new tools for expression and performance control such as Vienna strings and East West Symphonic strings, composers find themselves having to face technical challenges in addition to simply inputting notes. They have considerable choice in instrumental performance articulation that bring technical demands needed in the production and processing techniques in DAWs such as Pro Tools, Logic and Cubase. Examples of this range from the use of dynamic effects such as EQ and compression to mixing in the box[2] and inputting MIDI notes via the keyboard of the computer, and hardware equipment such as a Korg keyboard or Novation Launchpad Pro MIDI controller (ibid, 2013). Douek (2013) explains that the task of a film composer is to produce a sound track that brings different types of emotions consisting of many different characters that communicate instant involvement with 'the words and images, acting/performing as an underscore to our daily lives' (ibid, 2013, p.1).

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[2] The mixing process takes place inside the computer from start to finish 'without the help of a console' (Owsinski, 2006, p.104).

The aim of this research is to establish realism and authenticity within my professional and creative practice in the recording studio, and to understand the process challenges faced by composers working with virtual and real instruments. It also investigates how to create a sense of liveness and realism using each process independently or in combination, and reflects critically on my own personal and professional creative experiences throughout the compositional process. This thesis investigates how to achieve realism with the integration of virtual instruments and live performance within the DAW, where the boundaries are blurred between the two, to engage the listener emotionally with the musical score. This has been achieved by composing two original film soundtracks created for a commercial client, but also by composing an autoethnography of process, to examine how my process is mediated by ideas, intentions and technology. It represents an autoethnographic investigation into the challenges of composing the most naturalistic, emotionally compelling film scores, with liveness, realism and performance using computer technology, not just as a recording device, but also a compositional tool (Marrington, 2011). This autoethnographic study of my personal experience as a professional practitioner in composing music for film is more than a commentary on how experiences with technology for music shape creative and technical choices made with each composition. Autoethnography is a form of qualitative research that uses a reflective approach and gives the researcher a voice to present their findings in a more objective, scientific manner (Wall, 2006). This perspective seeks to describe and systematically analyse personal experience in order to understand cultural experience (Ellis, Adams & Bochner, 2011).

Film composition requires an understanding of the function of film and the role of technology in supporting that. The literature review puts the present research in the context of previous work that deals with the role that technology has in influencing the process of film composition, creating realism and expressive performance within the DAW, and the integration of live

performance with the MIDI performance. It investigates the practice of composing soundtracks with emotional impact, liveness simulation, music technology, technology in film music, MIDI and the studio as a compositional tool. The methodology section details the method used to produce compositions that demonstrate how I brought realism to my own musical scores. The Findings then analyse the process which resulted in the production and recording of the scores. The Discussion chapter explores live performance and realism in MIDI orchestration, the techniques I used in relation to previous research on realism, authenticity and liveness in composing with technology and the techniques used by other composers.

The conclusion acknowledges the complexity in producing authentic scores and emphasises the need for reflection and to develop a knowledge of orchestration in order to produce a realistic performance within the DAW.

In summary, this research seeks to identify the techniques that can be used to simulate liveness and to develop strategies that enable the mix of the recorded live performances and the virtual instruments to emulate the emotional engagement of natural performance. The stages in reaching this goal are:

- to consider how liveness and emotion and how they have evolved through my personal reflection and development of practice;

- to reflect on and instigate the strategies required to create what can be perceived as live within the DAW;

- to discover how the disciplines of studio production, composition and orchestration can be mixed to increase realism within the DAW

2. Literature Review

2.1. <u>Expressing emotion in music and film composition</u>

To understand the process of creating film music that is engaging and brings an emotional response from the audience, a composer needs to understand how to bring emotion to their music to have 'an inherent dramatic sense' through the musical elements of melody, harmony, tempo and dynamics (Karlin and Wright, 2014, p.11). The subject of music and emotions is one of the most researched in the field of music psychology (Koelsch, 2014). Many studies have shown that the emotions intended by a performer are recognised by listeners (Kim and Andre, 2008; Pereira et al, 2011). Studies of the neural correlates[3] of music-evoked emotions have shown that music activates areas of the brain that are known to be crucially involved in emotion. Arguably we listen to music for pleasure (Schäfer, et al, 2013). It has an impact on our daily lives through different types of media and as a therapeutic tool (MacDonald, Kreutz, & Mitchell, 2012). Its emotional effect evokes strong feelings and influences mood; listening to favourite songs can stimulate memories and take the listener back to a happy or sad moment in their lives (Koelsch, 2014; Kawakami et al, 2014).

Film composers concerned with expressing emotion with technology and in recorded performance need to consider the different factors that shape or influence emotional response, and how they control the technology in the various stages of composition and arrangement, from tonality, tonal progression, to performance techniques such as rhythm and tempo. Bovills (2012) looked at ways to evoke emotional response in film from ambient tracks, through the use of delay times and reverbs and sound manipulation to bring emotional content to samples.

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[3] 'Brain activity that corresponds with and is necessary to produce a particular experience. For example, the neural correlates of consciousness are the events that must occur in the brain for consciousness to become manifest' (Neuroscientifically Challenged, 2016).

Automation[4] brings added emotion through the use of dynamics within the mix (Hustwit, 2017). All these elements have an important role in creating music that is emotionally engaging. These elements would contribute to a serious of actions within the brain, a cognitive process that activates a pattern of thought and behaviour of preconceived ideas which interpret the visual framework of film (Boltz, 2001).

To express emotion in music is complex and composers can implement different ways to achieve this. Listeners are reliant on musical cues[5] that influence their judgement emotionally by creating tension and release with unexpected musical events that can lift emotional expression through the listener's perception and expectation of emotion; these 'expectations provide the basis for the perception of emotion and meaning in music' (Meyer, 1956 cited in Corrigall, and Schellenberg, 2013, p.301). This was developed further with Huron's (2006) Imagination-Tension-Prediction-Response-Appraisal (ITPRA) theory in conjunction with previous theories by Scherer (1985), Juslin and Laukka (2004), Juslin and Lindström (2010), (ibid, 2013).

One of the functions of film music is to support emotion (Lissa, 1959, p.115-256) such as a perspective of a character underscore, anticipation of subsequent action and all types of emotional signifiers. Perhaps of all the artistic tools at a filmmaker's disposal, it can be argued that music is among the most vital and certainly one of the most powerful (Porter, 2015). It is possible to change a scene's entire meaning just by the use of different music; it brings a controlling effect on the emotional responses in an audience and their expectations whilst

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[4] According to Cook (2013b), automation enables mixing and editing techniques of audio and MIDI in playback mode providing real-time control of volume, pan, EQ, and aux send controls within the DAW and plugins parameters (Cook, 2013b).
[5] Musical cues (Leitmotifs) these are timed to begin and end at specific points of a film in order to emphasise the drama and emotional content of a scene (Karlin, F, & Wright, R. 2004).

watching different scenes develop are 'influenced by the underlying film music' (Vitouch, 2001, p.80). This relationship between music and mood in film, or emotional context, has been documented scientifically in the medium of film music. Tannenbaum (1956) with Osgood and Suci (1957) originally developed 'the semantic differential[6] method' which studied 'the effects of background music in three different portrayals of drama' (Bullerjahn and Guldenring's, 1994, p.1). Researchers to use this technique were Berg and Infante (1979), Lipscomb (1990), and Schmidt (1976, 1982) and Pauli, (1976, 1981). Their results provided evidence of how music affected the emotional content of a film. From these studies Skelton, (2011) concluded that:

> Bullerjahn and Guldenring's (1994) *An Empirical investigation of the effects of film music using qualitative content analysis* found that "film music polarizes the emotional atmosphere and influences the understanding of the plot," 'confirming by scientific means the existence of a psychological connection between music and emotion' (Skelton, 2011, para.1).

The study concluded that the relationship between music and emotion demonstrated how filmmakers used music in connection with their films for both practical and aesthetic reasons.

Film music has to have an impact that can be memorable in places, but not detract from the images on the screen. It should support but not hinder the audience's enjoyment of the film's story, and not interfere with dialogue (Kassabian, 2013, 2016). Working with live and virtual instruments can highlight particular interest around relationships between process, emotional expression and musical function. The music serves various functions and that part of its role is to be discrete, not a distraction, but in the context of working with technology, there is additional challenge of realism and emotion which needs unpacking and addressing.

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[6] 'Semantic differential "is a very general way of getting at a certain type of information, a highly generalisable technique of measurement which must be adapted to the requirement of each research problem to which it is applied to' (Osgood, C.E., Suci, G., & Tannenbaum, p. 1957, p.76).

For something often barely noticed, music in films is usually highly effective and is undoubtedly one of the most important aspects of the cinematic experience. This aspect is important but we also need to understand the influence and implications for the composer. The contemporary film composer needs to prioritise this in any reproduction or creation, and consider how this impacts on the viewer in relation to the image. When paired together, the images and music take on a new, more complex life, that needs to be clear and direct as the story unfolds (Rona, 2009), which composers and music editors have to accommodate through the composition process (Saltzman, 2014).

Music and sound exerts a strong influence on our experience in bringing realism to a film. It has a manipulative function in commerce such as advertising and retail outlets; it also serves a range of functions in supporting narrative, empathy, mood, pace and memory (Brown and Volgsten, 2006). The use of memorable musical phrases, motifs and jingles, attract potential customers (Thompson, 2014). Film music also brings further emotional energy to the stories and characters that a film cannot do by itself (Rona, 2009). It 'elevates a film's sense of reality'; it can soften reality and places it into an almost opera-like level that amplifies the emotions we see on the screen, drawing the audience in and guiding them through the actions and emotions of a film without letting them know they are being directed' (Rona, 2009, p.13).

Music has had an impact and influence on the cultures around the world, from ceremonies to worship and its use as a manipulative tool is well documented for political gain and propaganda. In film, the influence of the film music score extends to the audience's senses, which are heightened from the visual auditory experience. This brings a semiotic and narrative function to the film score where the audience is drawn into the story line, characters, musical cues and motifs, and this has an 'aesthetic effect on the perception and understanding of the

screen content' leaving the viewer open to manipulation (Hoeckner, Wyatt, Decety and Nusbaum, 2011, p.146). Music brings attention and meaning to a scene, and a perceived emotion that can transfer to the images and narrative, adding an aesthetic effect to a film. Fischoff (2005), commentated that 'music adds something we might call heightened realism or supra-reality':

> It is a form of theatrical, filmic reality, different from our normal reality. That, of course, may be the point entirely. Because films are two-dimensional, extra-ordinary experiences, they may need help, as it were, from music. After all, in real life when you're scared you don't need scary music to tell you. Absent repressions your body, your nervous system, your cognitions, tell you that. So, perhaps heightened realism merely levels the playing field enabling films to draw us in and, as the saying goes, suspend disbelief (Fischoff 2005, p.3).

The emotion is mediated by a number of factors with performance and musical interpretation of a score as one of the significant mediators. In film, emotional manipulation happens in various ways through music; it can intensify or relax the pace of the film, create unspoken thoughts of a character and unseen implications within situations, parallel or underscore the action, create atmosphere of time and place, act as a link and bridge changes of scene (Fischoff, 2005). Many of these functions rely on technical skill such as mastery of tonal language and instrumentation. According to Karlin and Wright (2004) a 'film composer's technical skills need to be supported by emotional and psychological disciplines' (p.3). Emotion is engendered not simply through tonal language and instrumentation but also contained in the expression and performance. The musicians who perform the pieces of music in the orchestra interpret a score through the direction of the composer and conductor; but their mediation brings a significant dynamic contribution.

The 21st Century has seen the development of computer technology. Audio and MIDI sequencers have become more powerful and this includes the creation of realistic orchestral simulation through sound synthesis. The task for the composer is still a complex one that

requires them to learn and utilise the instruments, understanding the performance techniques of each within the orchestra so that they can apply them to music technology (Sundstrup, 2009). Lack of knowledge of the music technology, orchestration and understanding whilst composing can produce poor technique that disrupts emotional engagement and introduces elements such as artificiality, and it is therefore important to understand how performance, instrumentation and technical process such as composition, arrangement and orchestration inter-relate for the contemporary film composer focused on creating emotionally engaging scores. The soundtrack has become 'the communicating link between the screen and the audience' (cited in Thomas,1979, and Hoeckner et al, 2011, p.146), guiding and influencing their perception of what they are watching.

2.2. Composing soundtracks with emotional impact: Liveness Simulation

The concept of liveness is relatively ambiguous, but in the context of this research it does offer particular meanings. According to Suk-Young Kim (2017) 'the concept of liveness is relevant to various media formats while its precise articulation is pertinent to the specificity of the media being investigated' (2017, p.6). As she points out, the different media and type of performance will inevitably affect the way in which liveness is interpreted. Our ears and eyes gather information like transducers[7] interpreting the information they receive from air pressure and light transferred through nerve impulses to the brain from which we derive knowledge and meaning (Dobrian, 1992). Throughout this thesis, I refer to the idea of 'liveness'. These different interpretations of liveness can include live stage and television performances which are considered by most as actual liveness. In rock and pop music, however, live recorded performances are accepted as live (Auslander, 2008). As Auslander contends the concept of

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[7] 'A transducer is a device that converts one form of energy – typically a signal – into another… [for example]: Ears convert energy carried by sound waves ultimately into electrical energy which is transmitted by nerve cells into the brain for final processing…Eyes are transducers that convert light waves into electrical signals, which are then carried to the brain in order to create images' (Altunian, 2016, p.1).

'live' is a social one and audiences judge the 'liveness' as a positive element through historical associations with authenticity. What is judged to be live has altered with the onset of different media technologies (2012). Sanden discusses the authenticity of modern popular music which is constantly questioned. The reliance on technologies to enhance performance through production techniques used in the recording studios of today is often labelled inauthentic (2013, p.77).

Grossberg (2005) discusses the decline of ideology of authenticity in relation to the performer audience relationship. He suggests that authenticity refers to genres such as rock and folk music that have the capacity to communicate 'common desires, feelings and experiences into a shared public language' (2005, p.174). He also argues that the artificial construction of modern pop has seen the demise of rock music; this authenticity has different meaning to music fans over different generations. The ever-changing tastes of the consumer have become different over time, largely through media technologies, and authenticity is no longer as important as it was in the past (Grossberg, 2005). Sanden, however, suggests that as subgenres develop, each one brings 'a renewed wave of authenticity' (2013, p.77), suggesting that the debate of authenticity, so essential to rock music, 'depends on the constant threat of the inauthentic' in line with the debate on liveness and the implied threat of mediatisation (Sanden, 2013, p.77). This in turn can be linked to Baudrillard's concepts of 'hyperreality' and 'simulation' as applied to modern culture's consumption of technology where the lines of actual reality are blurred with simulated realities, and 'we live in a world dominated by simulated experiences and feelings' (1995, p.1-7).

Other related concepts might be used, but liveness is important because it also describes live musical performance incorporated with technology that has been recorded or sampled[8] in order to bring realism to performance within a MIDI composition.

The composer/sound engineer's goal is to produce 'a realistic reproduction' of their composition 'that is perceived as realistic', which implies realism (Lerch, 2018, p.903). When composing with virtual instruments, a composer needs to understand the working mechanisms of each one; this includes their sonic limitations through the sound and technical performance enabling them to be intuitive and experiment with what they hear, and what feels like a natural performance. This produces liveness that brings realism to the MIDI performance (Leman, 2008).

In the composing and performance process if liveness is lacking, the audience will feel less engaged with the performance, making it harder for them to understand what they hear and see on the screen (Nash and Blackwell, 2012). Tanimoto (1992) developed a concept of "liveness" in composing music with the DAW and the importance of the 'quality and availability of feedback'. This incorporates inputting MIDI data, sequencing, sampling and DAW recording, live performance and mixing (Nash and Blackwell, 2012, p.2). To incorporate the virtual orchestra with a live performance can be difficult to achieve and requires a different skill set in the mixing process such as EQ and compression. When listening to a soundtrack, the listener is drawn in and might struggle to distinguish what is live, or simulation within the music.

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[8] In music, sampling is the act of taking a section from an audio recording such as CD or vinyl recordings and reused in a different songs and remixes (Russ, 2012).

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The issue of liveness is complicated by performance technology and reality setting. Media technology has allowed audiences to experience live performance globally, participating without having to be physically present at music and stage events through mediating technologies such as the cinema, TV and online streaming (Auslander, 2008). It can be recorded and played back via loudspeakers. Logan explains that this in turn can constitute problems that blur the concept of live performance; layering, blending and acoustics are part of this challenge. He uses the term for instrumental performance simulation 'to describe the producer composer practice of fabricating' real-time performance with music technology (2013, p.6). As much as it is for music production, the composer has no influence over the performance situation or file compressions used. In an acoustic live performance such as an orchestra or rock band, composers can hear all the high frequencies and how they interact with the space, but as soon as it is recorded, elements of that natural space or realism are lost; it is those high frequencies that give it quality (Ma and Thompson, 2015). These imperfections and colour that humanise the frequency of a sound may be lost through the process of compression. This transient degradation can reduce the clarity and quality affecting the overall dynamic and bandwidth of the frequency range of the performance, more noticeably in the lower frequencies of a performance through a PA system (Katz, 2007). According to Sanden (2013) 'virtual liveness involves identifying traces of live performance in mediatised music' whereby we perceive live performance within a recording (p.113). This is usually associated with human performance, 'mediatised music can present a more complex scenario' (ibid, 2013, p.115) because human expression can be masked by technology, causing liveness to be an issue in mediatised sounds: 'Live music does not exist without its recorded other... until there was something to compare it with' (Sanden, 2009, p.7). Examples of this can be seen in modern performance whereby samples and loops are used in live performance and vice versa in the recording studio performances. On the issue of live natural performance, the late 1960s and

1970s introduced live recordings of albums; these albums could be overdubbed to correct performance mistakes. Today, live shows are recorded at different venues/locations; these performances are mixed together to create a perfect performance. Auslander (1999, p. 64) states that '[o]nly a few rock records foreground the artifice of their studio construction; most are made to sound like performances that could have taken place, even if they really didn't (and couldn't)'. Live performance is interlinked with media, as are recorded performances. Examples of this are bands that incorporate sample-based instruments with real time instruments into their live performance and recordings and vice versa (Auslander, 2008).

When recording different types of ensembles in popular music idioms, the producer/recording engineer's task is to 'construct a simulated live performance which although artificial, essentially creates the illusion of liveness' (Logan, 2013, p.23). This can be done by creating backing tracks from a band's original recordings, where they choose the stem files [9] for live performances. These stem files are panned hard right and the click track is panned hard left within the stereo field of the mix. The backing track is then incorporated into the live mix with the click routed to the drummers' headphone mix only. The stem files are routed to the front of house mix and fallback mix for the rest of the band members. Through this process, the band are enhancing their sound and they are performing live with the recorded technology. This has become common practice not just in rock music performance and electronic music but throughout film and television. Audiences have come to except this although some would argue and disagree with this assumption of mediatised live performance (Sanden, 2009).

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[9] A Stem file is an audio file taken from a recording session containing individual parts of a mix such as vocals, guitars, other instruments. It can also be a combination of different instrumentation. Stem files are used in many different Dance genres, remixes and used also in live performances (Cook, 2013b).

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Today, most contemporary recordings of rock/pop and orchestral ensembles have been recorded over several days and then edited (spliced, copied and pasted) together to 'create a continuous performance'. Arguably this process 'cancels out the performance authenticity of true liveness' (Logan, 2013, p.7). In recorded media, liveness is a constructed reality, it is rarely truly live. Liveness is usually focused on the performance, with the concept of virtual liveness as the virtual performance experienced by the listener (Sanden, 2013). Liveness through studio production has been more attainable through the development of the computer. The processing power has enabled the ability to incorporate real-time audio production software into MIDI compositions and live performance, incorporating this with real time interfaces and with real time interaction. Composers can then audition hardware controllers to specific processing parameters in creating a realistic performance within the DAW (Knowles and Hewitt, 2012). This is discussed in more detail in the next chapter.

Liveness links to interpretation and individuality, how we experience live music, human performance maintains a place of importance (Sanden, 2013). It is historically contingent not to define the word 'liveness' as intrinsic to the 'logical properties of performance that set it apart from other mediatised forms' (Auslander, 2008, p.60). So to conclude, I refer to Sanden's observation that liveness changes across performance practice, and across different cultural forms that have 'shared understandings of what makes a performance live or not live' (2013, p.159). Liveness continues to 'evolve, reshape and transform with surrounding media' (Irena, 2016, p.3). This can be seen from the influence of live performance on recording studio performance practice where electronic music genres sequenced music that has been adapted for live performance has been integrated back into the recording studio which makes liveness a versatile and dynamic concept. Music technology through popular music's ever evolving nature, has had a direct impact on liveness. Technologies which measure the concept of

liveness are now brought into 'performances once considered incompatible with technological mediation,' demonstrating that the interactions between performance and technology need to be considered with the connection between liveness and mediatisation (Sanden 2013, p.159). This includes the acoustics of a room and performance space, the interrelationships of timbres within an ensemble and use of technology for capturing sound.

Popular music genres have developed through technology from the 1980s dance scene. Electronic dance music has played an integral part in embracing new music technologies. Artists and music producers used these technologies in their creativity and productions. From the 1960s onwards examples of innovative artists and producers such as The Beatles, Brian Wilson (Beach Boys), Tangerine Dream, Giorgio Moroder, Trevor Horn (Frankie Goes to Hollywood), Moby and many more have pushed the boundaries in music technology and production.

2.3. Music Technology

The concept of liveness in this thesis has been the inclusion of musicians, orchestrating the MIDI scores for their recorded performances and to incorporate and emulate their performances within the DAW. The ever-evolving nature of music technology has brought new ways of how we listen, perform and produce music which has had an impact on how we engage with the different technologies from the DJ mixing on the turntable to the composer and producer incorporating the studio as a compositional tool (Bloustien, 2016). The impact of technology on music composition has not only been a 20th Century phenomenon (Pinch and Bijsterveld, 2015), as the early 18th Century saw the arrival of a new technology in the form of the pianoforte, which eventually replaced the harpsichord. Like many new technologies, it was not embraced straight away and was regarded as an 'unwanted intrusion by a mechanical

device' (DeNora,1995, pp.295-315). Pinch and Bijsterveld (2015) comment that it could be argued that 'music technologies are amendable to the same sorts of analytical insights as technologies in general; in particular, the influence of technology on music and the questions raised between the boundaries of instruments and machines and its place within musical culture'. Auslander (2008) argues that the relationship between media and sound technologies might be defined as one of mutual dependence.

Méndez (2015) comments that in the evolution of music technology, the DAW's development from the 1990s 'was the first step towards the establishment of computers as the primary tools of contemporary recording' (Théberge, 2012 cited in Mendez, 2015, p.57). The DAW has an important role to play in 'liveness' and various studies have explored this with particular emphasis on how we visualise sound in the virtual domain (Tremblay, 2012, Nash, Blackwell, 2012, 2014, Bray, Bown, 2014). In the mid-1970s, Thomas Stockham pioneered visual editing of digital waveforms using a computer which established the first graphical interface of the modern DAW, Soundstream (Fine, 2008, Bell et al, 2015). With the development of the DAW, scores could be created entirely within the computer, independent of live recordings. The DAW over the last 20 years has become the predominant technology for music creation and production. From contemporary popular music and classical music, most music produced today at some point will have come into contact with a DAW (Marrington, 2016). This development has brought music technology into the equation to reinforce sound (mock-ups) into film composition.

Technology enables composers to be more experimental and explore different timbres, rhythms and structures, creating and manipulating sounds through the use of technology into their compositions. Given the important emotional role that music plays, the mediating factors of

technology and evidence of how technology can alienate, this thesis specifically analyses the film score mock-up and how to replicate the intrinsic elements and detail of each instrument that a musician brings to their performance, using techniques such as intonation, articulation, dynamics, rhythm and emotion that connects with the images and the listeners. Arguably 'much of the appreciation of music is in its performance', how a musician interprets the written score from their use of dynamics, tempo and other techniques that impact the timbre and ornamentation, and most importantly their virtuosity and mastery of the instrument (Dobrian, 2001, p.1). The process of composing music with technology is constantly evolving; today composers have an additional amount of resources in their compositional toolkit compared with their predecessors. The development of computer technology, which has become more powerful and with increased data storage, has seen the development of new music technologies and this, combined with falling prices, has given rise to the domestic and independent studio of the 1980s. Prior to this, computer music was the domain of those lucky enough to have access to a recording studio (Rona, 2009).

Digital audio tool plug-ins were modelled on hardware devices; this development came about through Steinberg's Virtual Studio Technology (VST) (Johnson and Poyser, 1996). Music technologies such as analogue tape recorders, the Theremin and the Moog synthesiser became popular through avant garde and popular music genres. This exploration of electronic instruments and recording technologies has brought to fruition new ways of developing new 'musical ideas and materials' changing how we compose, perform and listen to music (Holmes, 2002, p.1). Technology is incorporated into live performance and other mediatised forms such as TV, theatre and film or a combination (Holmes, 2002).

2.4. <u>Film Music and Technology</u>

Hollywood's influence has cut across cultural boundaries. Kalinak's (1992) introduction to *Settling the Score: Music and the Classical Hollywood Film,* comments on 'Hollywood's influence over the musical accompaniment to films both inside and outside its traditions… and was defined by its structural conventions and practices' (Kalinak, 1992, p.14). Technology in film music, can be traced to the early 1930s through to the 1960s where it evolved in the placement of film music, and its influence on what audiences were listening to *(*Kalinak, 1992). The introduction of sound in film changed the way movies were made, opening up a new era in musical sound (Davies, 2010). What has become known as the classic Hollywood sound was part of the institutionalised Hollywood model of production and efficiency. This was based on an assembly line where everyone employed there was 'subject to the authority of the studio' (Kalinak, 1992, p.262). The studio recording sessions were usually conducted by the composer with the orchestral performance synchronised to the film (Kalinak, 1992). The music production team also included orchestrators, arrangers, and recording technicians. Electronic instruments' influence such as the Ondes Martinot[10] and Theremin[11] on the classic Hollywood era (1930-1960) was originally minimal and restricted to science fiction and horror films (Kalinak, 1992, Neale & Smith, 2008), yet still their impact was significant with composers searching for new soundscapes and emotional depth within their film composition.

Contemporary film soundtracks benefit from access to audio recording, sampling technologies and sophisticated virtual instruments and acoustics and mastering plugins. All contemporary scoring tends to present a blend of electronic/virtual and acoustic instruments, examples of

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[10] Invented in 1928, the Ondes martenot is an early electronic musical instrument that produces sound by changing the frequency of oscillation in vacuum tubes to create different timbres 'by filtering out the upper harmonics' (Encyclopaedia Britannica, 2017).

[11] Was invented in 1920 and is controlled without physical contact. It has two metal antennas that are controlled by the waving of the hand back and forth. One hand controls the oscillators, the other hand controls the amplitude (Encyclopaedia Britannica, 2017).

which can be heard in the works of prolific composers such as: Hans Zimmer's *Gladiator* (2000); *Interstellar* (2014); Howard Shore's *Lord of the Rings* Trilogy (2001, 2002, 2003); Michael Giacchino's *Star Trek Into Darkness* (2013) and *Dawn of the Planet of the Apes* (2014).

The auditory and visual components of cinema are 'both active and dynamic' evolving within scenes as the story develops (MacDonald and Hargreaves, 2005, p. 383). Like sound design, the sonic identity and textures of composition are associated with the emotional imagery and expression of film (Goydke, et al; Meyer, Baumann and Jancke, cited in Coëgnarts and Kravanja, 2015). Schaefer highlights Wolf's (1974) comment that a recording studio is an 'emotion factory' (Wolf 1974, cited in Schaefer, 1998) producing music that could enhance the presentation of drama on the screen (Huntley, 1957, cited in Schaefer, 1998). Creating emotion within the mock up composition involves tempo, manipulation, volume, filters, attack and release times; all these automated techniques are important skills required in producing realism in MIDI composition with virtual instruments and the DAW. Virtual instruments, just as their counterpart's real-time instruments, need to be mastered and require regular practice that will develop knowledge and understanding of the performance techniques sonically, including their limitations (Dobrian, 2001).

Synthetic music is now close to the forefront of film composition, as can be heard in trailer scores and the incorporation of MIDI orchestral instruments within the mix of orchestral recordings. As technology has developed, styles change and film budgets oscillate, but 'electronic music continues to be a significant part of film music' (Rona, 2009, p.79).

Sample libraries of live recorded instruments have improved greatly since their first inception, with the sample rate and bit depth significantly improving. The art of film scoring with virtual instruments is not only required, but particular attention needs to be paid to the craft of the mock up performance because it cannot be assumed that the choice of software and presentation of MIDI alone can produce a realistic performance that sounds live and engaging. This thesis recognises the challenges from previous studies of integrating technology with live performance and while previous studies have examined liveness and emotion with music technology, this thesis consists of both computer based genres and the mock-up of acoustic instruments.

The development of virtual instruments has seen the use of different types of synthesis in the creation of these virtual instruments such as Additive, Subtractive and Frequency Modulation Synthesis for creating new sounds. Synthesised sound has a particular role to play in providing impact and alien landscapes in film composition. Howard Shore's sound track for the film *The Cell* (2000) is a good example of the breakdown of 'boundaries among noise, sound and music' (Kassabian, 2008, p.35) blending soundscapes into musical cues which are 'layered with traditional music and traditional sound effects material which blurs the boundaries of the two' (Kassabian, 2008, p.37). This texture of sounds communicates meaning that brings different emotional engagement throughout the film (ibid, 2008).

The aim of this thesis throughout is to understand how technology mediates emotion and liveness in film scores through the use of the Musical Instrument Digital Interface (MIDI) which has had a 'wide-reaching impact'; it has enabled computers to be applied to the music-making process incorporating hardware and plug-ins required for record production' (Hanssen and Danielsen, 2016, p.50). After the MIDI standard was accepted in 1982, new possibilities

for both common instruments and customised applications quickly emerged. Marrington (2011) discussed Brown's (1964) theories that incorporate the ideas of Canadian communications theorist Marshall McLuhan. McLuhan puts forward the idea that, 'any given medium functions as a kind of prosthetic which 'extends' the individual, acting as a bridge between the him/her and the particular activity it is being used for' (Brown, 2007, p.6). Brown's (2007, p.6) understanding is of 'the 'computer as a musical tool' that facilitates music making in relation to a musical instrument to produce sounds. The use of the virtual instrument encompasses this, enabling more choice for the composer to incorporate, create new timbres, manipulate sampled sound, dynamics and tempo. Combining MIDI protocol and digital audio technology with computer based management systems, sets the foundation for the development of MIDI sequencing with digital audio recorders (Méndez, 2015). These developed gradually 'to become complete computer-based music production systems integrating composing, score editing, recording, sound editing, mixing and mastering' (Méndez, 2015, p.57). The DAW, has made the composing and recording process quicker, 'often in the service of realising music that has been already been conceived in the real world' (Marrington, 2011, para. 5). From the placement (spotting) of music within the film to editing tasks, the process is much quicker than its analogue tape predecessor. An example is the film *Black Hawk Down* (2001), Hans Zimmer used over 250 tracks in the editing process and placement of the tracks and the 'last-minute film edits and potential music changes' (Karlin & Wright, 2004, p.347). The analogue system is not as flexible as a DAW for track count and editing techniques.

The development of music technologies has encouraged and developed new practices in music production and composition with the two roles of composer and producer merging into one

(Logan, 2013). In 1979 Brian Eno[12], delivered a lecture on the studio as a compositional tool at The Kitchen in New York, where he presented his ideas about recording, composing and producing in the studio multi tracking, looping tape, filtering and experimenting with sound to create sonic landscapes with recorded sounds (Moorefield, 2010). For composers and musicians these are exciting times for artistic freedom and expression, such as producing music from home and publishing and releasing their music online (Manning 2004). Many composers now score in the DAW, enabling them to listen to their composition as it develops, creating new sounds, experimenting with different timbres and blending the mock-up into the live recording to reinforce the overall sound of their compositions.

Orchestral works using virtual instruments and MIDI based technologies are often critiqued for sounding weak, flat and mechanical, and are still frowned upon by some art music aficionados who have in the past been criticised for this (Rona, 2009, Karlin & Wright, 2004). This has improved as virtual instruments have become more acceptable but it is still a concern. According to Morgan (2014), screen composers who employ virtual instruments in their orchestral works still encounter prejudice when they acknowledge their use in their compositions. The synthesizer is often seen as lacking the qualities necessary to produce proper musical art (Pinch and Bijsterveld, 2015), which could also be said of software plug-ins, as synthesis is very much part of the spectrum.

With the many changes that have gone on in the film scoring and recording process, there has been an impact of sophisticated digital technologies at every stage. This can be seen in the way that the recording studio itself has been used. These changes particularly are at a rudimentary

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[12] 'Brian Eno, "Pro Session: The Studio as Compositional Tool – Part I," lecture delivered at New Music New York, the first New Music America Festival sponsored in 1979 by the Kitchen, excerpted by Howard Mandel, Down Beat 50 (July 1983), 56. "Part II" of this lecture appeared in the next issue of Down Beat (Aug. 1983)' (Tamm, 1995, p.41).

and technical level (Love, 2013). The development of 'digital micro circuitry… [and] sound control devices' (Sanden, 2013, p. 24), where articulations can be simulated and mapped from a MIDI keyboard and a control surface with sliders and knobs that are assigned to the virtual instrument, or plugins parameters using MIDI CC[13] messages, allows a composer to improvise in real time. Creating mock-ups of an orchestral arrangement is an important craft in the presentation of realism; this gives a composer a realistic as possible listening experience, whilst creating their compositions in real-time.

2.5. <u>Performance Technique in the Studio Environment</u>

Replicating a live performance in the studio is complex and many different techniques need to be employed. The composer has to create a performance that brings realism, creating a live performance that emulates the nuance and natural organic detail of the instrumentalist. For example, particular difficult sounds to emulate are the natural vibrato, alternating bowing and dynamics shaped by phrase and ergonomics of the instrument (Gilreath, 2015). While this thesis focuses on the integration of virtual and live instruments and the performance realisation within the DAW, all of this compositional and programming process must be considered as it influences the final realisation and production (Dobrian, 2001; Holmes, 2002, 2008; Knowles and Hewitt, 2012; Logan, 2013, Nash and Blackwell, 2014). Some of the main techniques that have enhanced performance are: samplers, sound synthesis, and composing through a 'building block' structure (Miranda, 2001).

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[13] 'Continuous controllers are controllers that relay a full range of variable control settings (often ranging in value from 0 to 127)' (Huber, 2007. p.29)

The advances in technology offer more, and while original technologies such as the software sampler Nemesys Technologies' GigaSampler[14] has enabled producers and composers to create a virtual performance that can go beyond the limits of time, space and even their own limitations, in the creative process of developing new sounds, performance techniques and genres, the introduction of magnetic tape and digital recording in the 20th Century has made it possible to create performances 'that could never have existed' (Katz, 2010, p.41). Katz uses the term "Sonic Stage" to describe audio's stereo field 'in which sounds occupy and move through space in a recording' (ibid, 2010, p. 42). Creating space, mood and colour are important factors that need to be considered in the final mix.

The development of the virtual instrument plugin has brought a profusion of realistic orchestral simulations that use powerful audio/MIDI sequencers that produce detailed instrument reproduction through sound synthesis and performance modelling using data acquisition and expressive performance rules. Sound synthesis is the process of producing sound: 'It can reuse existing sounds by processing them, or it can generate sound electronically or mechanically' (Russ 2004, p.4). There are many types of digital sound synthesis that use different types of 'sound creation and sound processing methods, such as subtractive synthesis, wavetable synthesis, sample replay and physical modelling' (Sundstrup, 2009, p.11). This technology gives composers the ability to be more experimental and explore different timbres, rhythms and structures, create and manipulate sounds through the use of technology and incorporate these into the building blocks of compositions. This takes into consideration Miranda's Abstraction Boundaries for computer based compositions.

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[14] This was the first software that 'played or to streamed samples directly off the hard drive… This could be done by preloading a small amount of sample data into the computers RAM. Which gives the instantaneous "beginning" to the sound' (Gilreath, 2010, p.176).

Miranda (2001, p.2) suggests that 'the notion that musical compositions carry abstract structures which implies the notion of abstraction boundaries' are of importance when working with computers as this 'determines the building blocks, or components, that form the musical structures of a composition' (ibid, 2001, p.2). The three main levels we work with are: 'microscopic level, the note level and the building block level' (ibid, 2001, p.2). The microscopic level is when a composer is using frequencies (EQ) and amplitude (volume) and manipulates samples and recorded sound. The note level is when we use notation where the written note within a score provides information for the musician on pitch, note lengths, dynamics and timbre. Tempo changes are also considered as they bring further expression to the notes, bringing a 'higher-level structure containing various notes for example motif, phrase, track' (Miranda, 2001, p.2). The building block level we can associate with sample based music, incorporating rhythmic patterns and loops that can be used to develop riffs and motifs that can create new melodic themes. The computer with sample based technology with synthesis allows us to improvise and modify our work in real-time (ibid, 2001).

Hans Zimmer's Remote Control Production,[15] with his use of synthesizers and sample based software incorporated into live orchestral recordings, changed the working practices of composers giving a distinct house style that has been instrumental in reorganising the form and function of contemporary film music practices (Wright, 2015, p.319). A good example of Zimmer's integration of virtual, electronic and live instruments can be heard in the film *Interstellar* (2014) with his use of the Zebra and Hauptwerk plug-ins, Jonte Knifonium a vacuum tube based synth and acoustic instruments the organ and orchestra (Fortner, 2015).

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[15] 'The music production facility formed in 1989 with his production partner Jay Rifkin' (Wright, 2015, p.319).

2.6. <u>Compositional Practice Mixing as a Hyperorchestration Tool</u>

Music for film has changed dramatically through the use of computer-aided-technology, and has expanded the possibilities and changed the working practices of many composers through the use of acoustic and virtual instruments. The combination of the virtual instruments '(sampled or synthetic)' with recorded acoustic instruments is referred to as Hyperorchestration (Casanelles, 2016, p.58). This type of music creation has many possibilities and goes beyond the restrictions and boundaries 'of the physical world' (p.58). Baudrillard (1994) described this as 'hyperreality'. Recording live instruments becomes part of this process, through the manipulation and production techniques of recorded acoustic instruments. These new timbres would not be possible in the 'physical world' and would therefore 'involve a certain degree of bringing sound into hyperreality' (Casanelles, 2016, p.58). This combination of virtual and live instruments to produce music expands the performance and compositional practice of Western music, enabling the composer to exceed the restrictions 'imposed by the score' (p.58). Hyperorchestration expands these principles of traditional orchestration because of its relevance to the film scoring process (2016). Casanelles describes this as a 'series of sound combinations of music' as a form of sound design; this integration with the soundtrack has given the composer tools that focus on the manipulation of sound. This in turn has led to the expansion of new sounds in audiovisual media which can support acoustic instruments of similar timbres and then incorporate the other sounds 'in the soundtrack' (2016, p.70). The possibilities for the composer have grown in film composition through computer technology. Composers have become more autonomous in the mixing process from the early stages of recording instruments using different microphone placements to create harmonic colour or spatial positioning within the mix. The hyperorchestra produces music that moves beyond the traditions of classical and film music practice through this integration 'of virtual instruments, live recording and sound processing' (Casanelles, 2016, p.58). This can be heard in the film

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compositions of Elliot Goldenthal *Across the Universe* (2007), Marc Jovani *The Perfect Student* (2011) and Andrew Stamp *A Dozen Summers* (2015). In composing film music, hyperorchestration allows me to work in my own studio, combining and manipulating live and virtual instruments to create music which reflects the imagery in the film and engages the audience.

3. Methodology

3.1. <u>Introduction</u>

As a practice based researcher I have chosen to adopt an autoethnographic approach that prioritises a systematic observation of my own process, in relationship with technology and practice, which enables me to bring my own narrative and to reflect on my experiences as I see and hear them (Méndez, 2013). This could apply to approaches such as phenomenological (Lester, 1999), me-search and re-search (Nash and Bradley, 2011), or a qualitative case study (Baxter and Jack, 2008). As my output is not only music but the reflection process, I decided I needed a methodology that would prioritise my personal experience and practice as a critically reflective professional. Autoethnography has become a popular methodology for researchers in the creative and performing arts (Pace, 2012, p.1). According to Chang (2016) 'Personal experience methods can offer a new and unique vantage point from which to make a contribution to social science' (p.1). As autoethnography is about discovering the individual in research and making sense of individual experience, thoughtful writing tactics are required, involving 'techniques for releasing creativity and stimulating the imagination' (Muncey, 2010, p.14). Brown (2014) makes the point that as a research tool, it provides the opportunity to reflect on the creative process and 'present data in a range of creative ways with autoethnographers presenting their data in poetry (de Vries, 2007), music (de Vries, 2006) or art (Jones, 2005)' (Brown, 2014, p.2).

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While incorporating live and virtual instruments into my process, my research methodology focuses on specific moments that highlight the techniques and approaches that support or diminish liveness. Realism is the goal, so my methodology is an exploration of it through practice. This experience prioritises a reflective analysis (Forber-Pratt, 2015) as I develop the skills required to bring realism to my recorded scores within the digital audio workstation (DAW). Wall describes this as to, 'extend understanding from all behaviour, influences and technological issues as they happen' (2006, p.146). In this thesis, I reflect on actions and decisions in relation to liveness within the process of my quest for realism within my compositions. Liveness and realism is the perception of live performance through technology as experienced between audience and performer (Sanden, 2013).

As composers, we explore structure and musical sound, experimenting with harmony, melody, rhythm and timbre. This manipulation of sound through technology, has a great role in the compositional process of creating emotional and engaging music for film (Rona, 2009). Conveying emotion within our compositions comes from within and is personal and instinctive; this is 'where empathy or psychology' (Douek, 2013, p.2) becomes part of the creative process, immersing ourselves into the landscape or character of the film, building elements intuitively, improvising with melody, chordal or modal structures to create different moods (Douek, 2013).

Many composers have used different approaches to their composition practice; Crichton's (2013) research combined an improvisatory approach to his compositions using acoustic instruments with studio as a compositional tool. Logan (2013) used production as composition to simulate real-performance by artificial means, using 'sample based synthesis instrument modelling' to create 'realistic musical performance' (Sundstrup, 2009, p.9). Logan used improvisation with the DAW as part of his compositional process, and incorporated musicians,

recording them and editing the live performance to create the illusion of liveness (Logan, 2013). I approached composers Andrew Stamp and Marc Jovani and asked how they approached their compositions. They both used live and virtual instruments and both used sampled instruments to enhance a live instrument. As Stamp explained, 'I like to think of it almost as another plugin, like a reverb, and therefore start adding it little by little increasing until it sounds right' (A. Stamp, personal communication, May 18, 2018). His perception of what 'sounds right' is based on the balance between liveness and simulation. Jovani explained that it always depended on the budget; 'A big budget, samples would be used to enhance/elevate the live orchestral recordings. Low budget, the live orchestra will be smaller and the final sound will be mostly samples and an orchestral sweetening session to add some life to the samples' (M, Jovani, personal communication, May 22, 2018). Whatever the budget, Jovani uses hyperorchestration to 'enhance' or 'sweeten' the musical performance.

My approach has been the use of both improvisation and the changes to the written score in conjunction with the musicians and the integration of live performances with the virtual instruments. Combining these different approaches brings different ways of thinking into my compositional process. The exploration of liveness has been investigated, as the process involves musicians performing along with the virtual instruments providing an opportunity to reflect on the process of creating realism from within the DAW. This includes the notation and orchestration of the parts that have been performed, the realisation and musical intention of realism from the scores, achieved in both the virtual instruments and the musicians' performances.

3.2. Personal Background

On completing my BA (Hons) degree in Popular Music in 2008, I started composing music for student films and gaming. Looking for other avenues of work within the music industry, I began composing music for film, computer games and theatre. I regard myself as a versatile composer used to working across genres from film, stage and popular music. Appendix B shows the catalogue, including genres, links and clients on completed projects so far. I am a self-taught multi-instrumentalist and I play the piano, guitar, bass, percussion and drums and sing.

I built my own studio in 2005; Appendix C provides the full studio specification as my technical production context of film music composition. Since then the climate for recording studios has changed dramatically due to diminishing budgets and the affordability of developing technologies for home recording equipment (Karlin & Wright, 2004). Many who own studios similar to mine, to some extent, are constrained financially and make careful choices due to the cost and range of hardware and software, for example the Vienna Symphonic Library offer a standard package for just under £8,000.

The scores selected for this thesis are genuine commissions (see 3.3/4); the scores so far have varied from modern, traditional Irish and medieval themes. I have been commissioned to write two more pieces by the client and have been asked to include real instruments such as the violin, viola, cello and double bass to create a more realistic sound that is emotionally engaging. The client feels that this would take the music to another level of engagement supporting the emotional content of the scenes in which they will be placed. It is a process he would like me to incorporate for future projects and this has led to the current research. This is the first time I have included musicians from the orchestra to perform on my compositions and provide them

with the written score. I am not a classically trained composer/musician as my background is from popular music genres, so the whole process has been an educational experience.

3.3. <u>Score One: The Battle of Everlasting Fame</u> (Time signature 6/8 Tempo 85 bpm Length 03.37)

This score was written for a battle scene and scored in Sibelius and Pro Tools. It has been the most problematic of the two compositions for the musicians to perform. The piece is in the key of D minor which has four different sections. Section A has an anthemic melody, a call to battle with the textures building through its development; this was to create a sense of excitement as the pirates and soldiers prepared for battle. Section B comes in at bar 34, violins 1 playing the top A and violins 2 playing the top G#, which are tied for thirteen bars to create tension; the viola, cello and double bass are introduced at bar 42 and build into a crescendo. Bar 47 introduces section C; this section creates the theme for marching into battle. The time signature changes to 3/4 at bars 47-53 then back to 6/8, changing to 5/4 at bar 56 moving into 4/4 time at bar 57 until the end of the composition. Section D is the finale to the composition and as the battle rages on, the tempo moves to 100 bpm. Techniques used are legato, slurs, staccato, variation in dynamics in volume and tempo techniques such as vibrato rallentando[16]and rubato[17].

3.4. <u>Score Two: My Immortal Soul</u> (Time signature 4/4 Tempo 100 bpm Length 05.39)

This score was composed on piano and then inputted into Pro Tools. Composed for a death scene, it is a sad and reflective theme. This piece is in D minor and was composed just for strings. The theme and motif reoccurs throughout as the music develops. Techniques used in

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[16] 'A gradual decrease in speed' (English Oxford Dictionaries, 2017).
[17] 'The temporary disregarding of strict tempo to allow an expressive quickening or slackening, usually without altering the overall pace' (English Oxford Dictionaries, 2017).

the MIDI score are Harmonic notes, legato, vibrato, slurs and various dynamics in volume and tempo techniques such as poco rit and A tempo.

3.5. <u>Primary Research</u>

A small scale primary research of fourteen respondents was undertaken to investigate their reaction and perception of the music I have composed for this thesis (see Appendix A for questionnaire). The main focus of the questionnaire was to gather information on how others perceived the virtual performances, including the integration of live instruments, in order to evaluate what changes I would have to make to improve the overall performances within the final mixes. I used two versions of each demo mix. For 'My Immortal Soul', version A was with Eastwest strings, and version B was the combination of virtual and live instruments. For 'The Battle of Everlasting Fame', version A was with Vienna strings, and version B was a combination of virtual and live instruments. Although there were three versions of each mix, I decided it was necessary to use only two versions with the virtual instruments from the feedback provided from the trial run of the questionnaire. The table below (Fig. 1) shows examples of the comments made:

My Immortal Soul Version A Key Comments	My Immortal Soul Version B Key Comments
Pinched sound in upper strings Compression Attack and release quite hard and sudden Synth quality	Smoother lighter less compressed. Strings more natural brighter more detail. Warmer. More human. Definite variance. Cleaner sound. Organic sounding. More realistic. Gut feeling.
The Battle of Everlasting Fame Version A Key Comments	The Battle of Everlasting Fame Version B Key Comments
Robotic. More clarity. Sounds quantised. Less realistic	Notes smoother lighter less bass. Sounds muddy. Articulation. More presence/definition Strings brighter more definition. More natural. More authentic

Figure 1. Key Comments.

I wanted to measure the respondents' perception of live performance in the recording of each composition without incorporating the visuals for the film scenes that the music was written for. The questionnaire incorporated open and closed questions (Denscombe, 2003), that provided a more in-depth response. I used the data collected to inform my problem solving, whilst modifying the mix through automation adapting dynamic, tempo and articulation

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changes for a more natural performance within the virtual instrument mixes (Becker, 1998). Audio examples provided two excerpts for each composition, one with virtual instruments the other with a combination of live and virtual instruments. This information was not given to them so as not to influence the outcome of their answers (Neuman, 1994). All the information was collated and was treated in confidence.

I used a random systematic approach (Becker, 1998, Gee, 1999), to sample different groups ranging from professional, semi-professional musicians, teachers, audio technicians, multi-media corporate videographer and technical sound creatives, theatre and dance and music, shop owner and live sound enthusiast. Three respondents were female and two respondents were from Sweden and Norway.

The questionnaire was originally trialled on two colleagues to make sure it was unambiguous and easy to complete; they were not involved in the final process of the survey for data. The questionnaire was an important process and informed my work in progress and the changes I had to make in the final mixes of the scores to create a natural sounding performance.

3.6. <u>Composition Process and Technology</u>

Mindful of the priority of supporting emotion, my process involves 'spotting': the placement of music and what it is going to do (Karlin, & Wright, 2004). For this film, however, I was not given that opportunity as the film director insisted on total autonomy. Normally a composer would find they have quite a lot of autonomy or a particular kind of autonomy which is a typical working practice between composer and producer, however, as the process of spotting to the images was taken away from me, I had to go by the director's description for each scene that required music. He would email the information and describe what he wanted:

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> I am working on a scene at the moment, the precursor to the final death scene. It's a very sad scene, where she collapses on the ship and has to be helped away to her sick bed. It's slow, dramatic and a real tear jerker, as she realises that her body has given up on her, she is too old to sail. The men look on with worry, sadness in their eyes. She is taken away. She is frightened and sad, knowing that death is approaching and that she can no longer sail, the sea was always the thing she loved most (C, Davies, personal communication, January 28, 2016).

This did affect the process of how I worked and I had to adapt to meet the director's instructions. The length of the piece of music would vary for each scene. 'My Immortal Soul', the piece depicted above, was five minutes and thirty-nine seconds long and this was created so that the film producer could loop sections if needed. This did cause some problems and if the music timbres were not quite right for him, I would change them accordingly. When I asked if it would be possible to spot scenes, Davies' reply was 'I like to work very hands on with both visualisation and sound in the edit, so give musicians very precise briefs of sounds and thematic variations on score required, and then mix the visuals, score and soundscape in an organic faction, simultaneously from early stages of edit till conclusion.' Creating emotion could have been a problematic process as I was not able to spot the film. In order to overcome this, I took inspiration from the battle and emotional death scenes in Hans Zimmer's score for the film *Gladiator.*

The two compositions I have written have very different emotional subjects; Score 1 is for a battle scene which includes four different themes within the score. Score 2 is a sad reflective piece with lighter moments as it progresses. The scores have been composed in Pro Tools and orchestrated in Sibelius. There are many different types of instrument that are highly expressive in the orchestra, for instance, wind instruments bring technical challenges in tone production within the low and high registers such as dynamics, articulation (piano, forte, tenuto), 'or special effects such as flutter-tonguing or muted notes' (Meier, 2009, p.10). I decided that the live instruments I would use would be the string orchestra; this was an important decision

because of their 'wide dynamic range, the richness of tonal quality and its versatility' (Adler, 2002, p.7). As Meier suggests, 'Strings players…do not have the problems of tone production in the lower registers or difficulties with extreme dynamics' (2009, p.10). Strings are the constant in most soundtracks and they are likely to be heard over other instruments. The scores were composed in my studio in Flixborough and various edit adjustments to the score were made on location at Huddersfield University. Rehearsals and the recorded performances were conducted over a ten-month period at the university's rehearsal and recording studios. This process was helpful in making changes and adapting the score for the musicians as I began to recognise the major differences between the live and virtual performance and techniques.

Post production and mixing was spread over nine months in anticipation of any performance and technical issues, so they could be dealt with in a timely manner. The virtual instruments I used for each composition are East West Quantum Leap Symphonic Orchestra (strings) and Vienna Strings. I use East West Quantum Leap Symphonic Orchestra in conjunction with orchestral instruments in my own practice. Vienna Strings was a software I was not familiar with and was only available at the university. In my first year, therefore, I designated time in learning how to use the software. For the final mixes, I included Spitfire Symphonic Strings, and Kontakt's String Ensemble. The reason for this is that both are played and controlled in Kontakt, and I have previous experience of using them in past projects. I included them to embellish the overall sound of each instrument, focussing on articulations such as staccato and vibrato and they were mixed to sit under the original performances as a support mechanism. Like Vienna Strings and Eastwest Symphonic Strings, they both have a considerable sound and are ideal for cinematic composition. The articulations they have bring the characteristic attributes of liveness for composing music that I want from a software. A good example is the performance legato patches in Spitfire Symphonic Strings; they include true legato transition

and an adapting legato style script that adds distinctive attacks to the notes depending on velocity (Krause, 2017). All four sample libraries are similar in articulations, timbre and EQ. The reverb on East West Quantum Leap Symphonic Orchestra is always present as the samples were recorded in a concert hall using three microphone positions: close, stage and surround. I used the settings close and stage microphone and altered the panning position for close miking and adjusted the envelope parameters of attack, decay, sustain and release for each instrument performance until I was satisfied with the end result (Fig. 2).

Figure 2. Panning, Attack, Decay, Release and Sensitivity Parameters for String Run Simulator.

For Vienna Strings, I used the modulation wheel and keyswitch for the matrix to move between samples for legato and staccato phrases, and altered the parameters of expression, velocity curve and velocity X-fade and so forth (Fig. 3). Examples of this can be heard in tracks two and five. I did not use the reverb or pan the instruments as they would happen in the DAW after converting all the MIDI performances into audio.
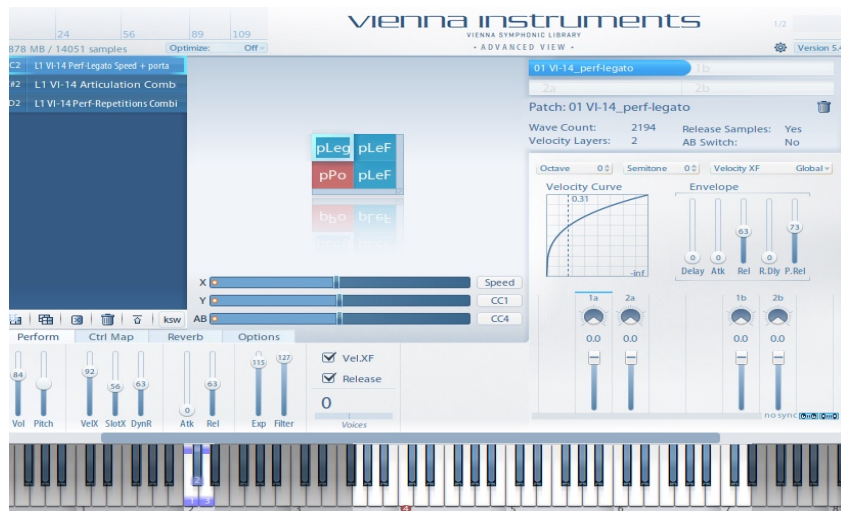
Figure 3. Parameter Settings.

3.7. The Role of the DAW (Pro Tools)

The MIDI control of the plug-in parameters such as articulation, envelopes, dynamic crossfade, volume and timbre are used to add, enhance and improve musicality, expression and realism in order to open and expand the capabilities of the sampler plugins, so that I could manipulate the samples to achieve a more realistic sound. This can be heard in bars 35 – 42 of 'My Immortal Soul' in conjunction with the velocity and phrasing of the MIDI notes overlapping slightly and varying the MIDI note length such as the quaver notes, which gives the legato phrase more attack at the front of the note, keeping the legato smooth and flowing throughout as it descends (Fig. 4).
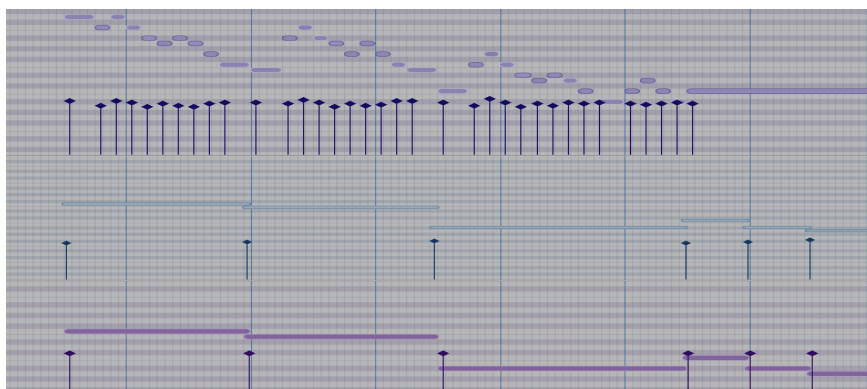
Figure 4. Velocity and Note Lengths.

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To move through the different articulation phrases (Fig. 5 and 6) the modulation wheel was used in conjunction with keyswitching; these techniques were used in both compositions. This can be heard between bars 59 – 61 in 'The Battle of Everlasting Fame' tracks 1 and 2, where violin 2 moves from staccato to tremolo phrasing and back. Keyswitching was performed in the score editor window whilst recording the MIDI (Fig. 7), and drawn in with the pencil tool.

Figure 5. Eastwest Keyswitch Articulations for Violin 1.
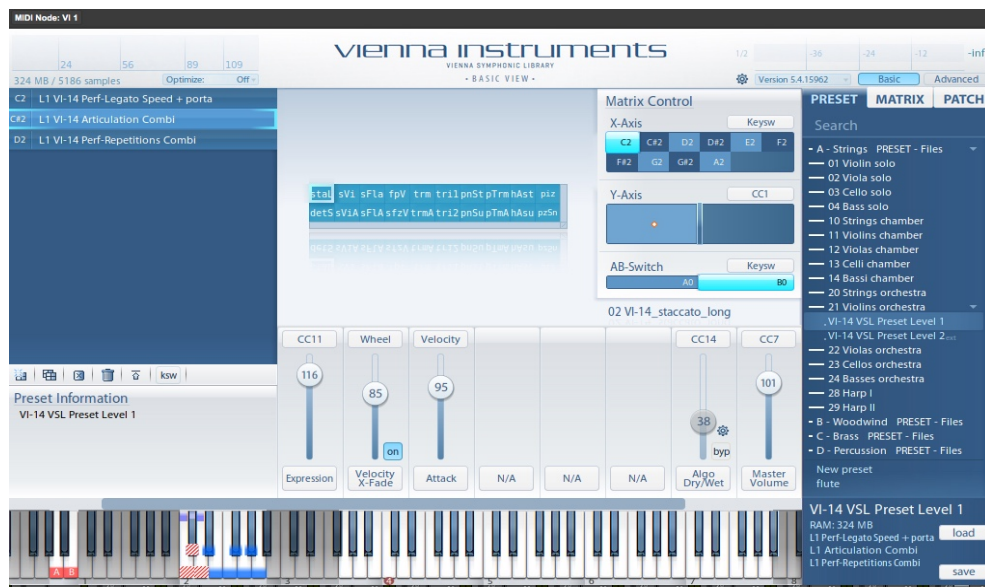
Figure 6. Matrix Control with Key Switch Articulations for Violin 2.
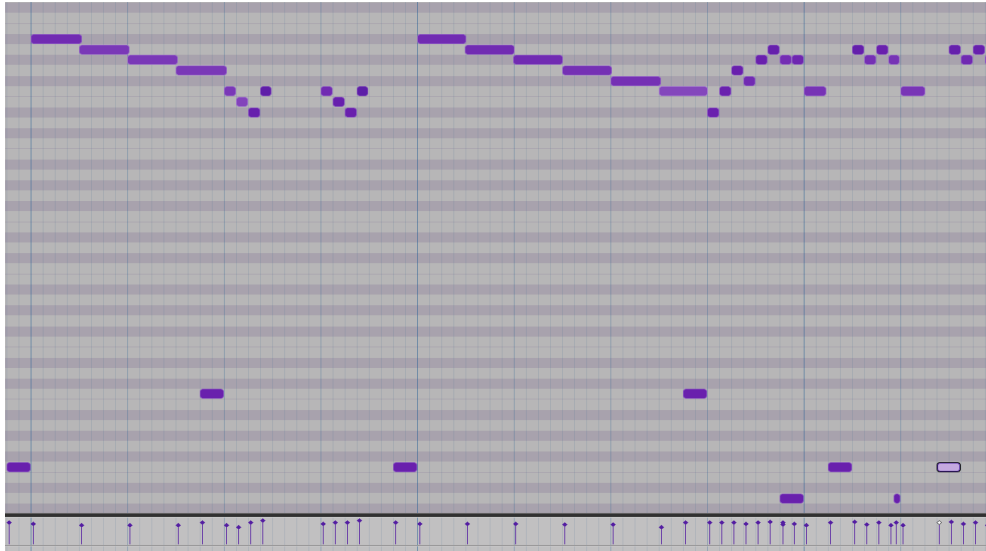
Figure 7. MIDI Notes Key Switch Articulations for Violin 2 Staccato and Tremolo.

The modulation wheel was also used to create and enhance the vibrato subtly; this can be heard in 'My Immortal Soul' track 4 between bars 109 – 113 (Fig. 8).
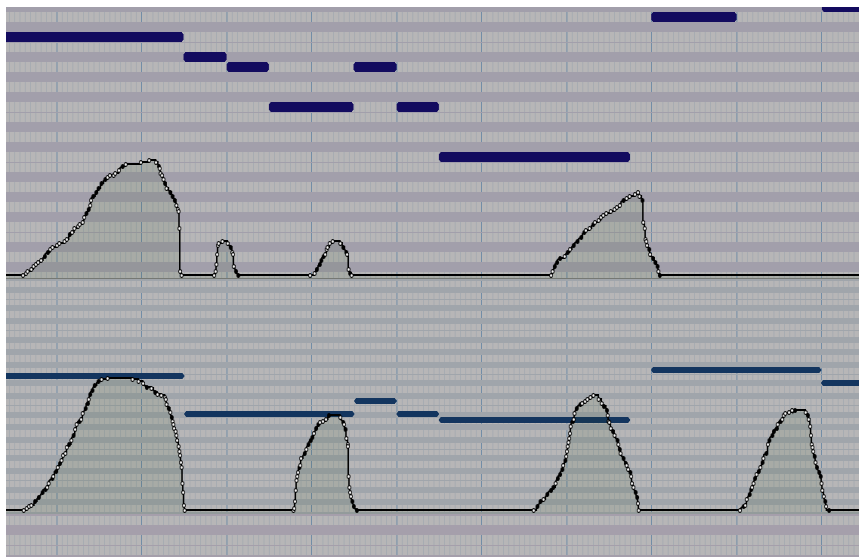
Figure 8. Modulation Automation.

All the MIDI recordings were converted to stereo samples ready for the final mix. Once converted they were panned into their position as they would be in an orchestra setting (Fig. 9). Light compression was used throughout on each instrument track so as not to lose the

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dynamic quality of each performance (Fig. 10). EQ was used to enhance and prevent the masking of each instrument (Fig. 11).

Figure 9. Panning of Converted MIDI Instruments to Stereo Audio Tracks.
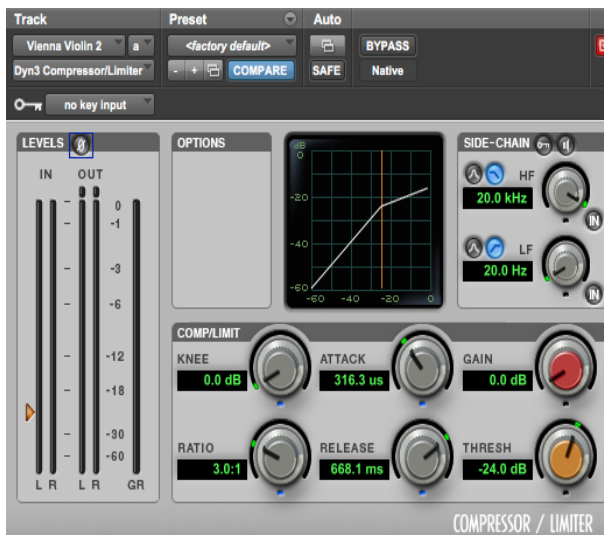
Figure 10. Compression Parameters.   *Figure 11. EQ Parameters.*
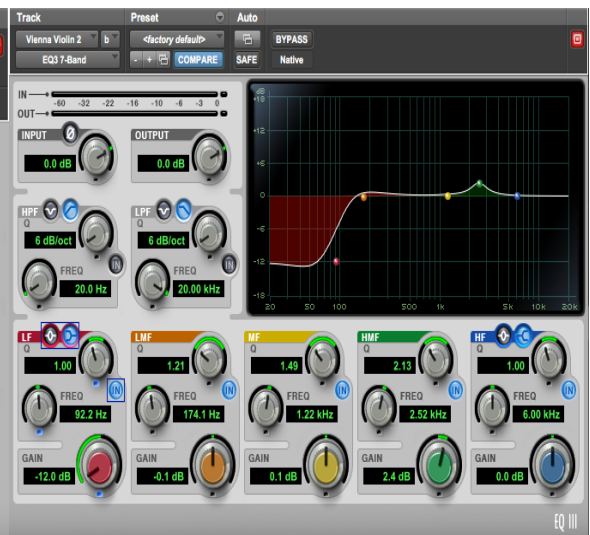
Tempo changes were placed in each composition throughout the score to create a more natural and realistic sounding performance and for a guide for the musicians when recording (Fig. 12).
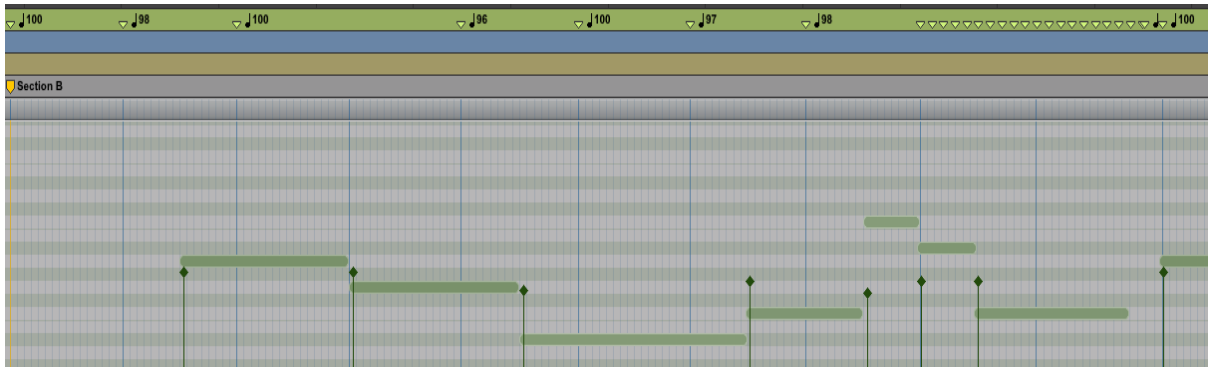
Figure 12. Tempo changes.

The placement of instruments was done in two ways to create space and depth in the final mixes. Panning and reverb were used to create space, not just left and right in the stereo field but also front and back for depth. This was done by altering the level of the buss channel that was routed to the auxiliary track with the Quantum Leap Spaces reverb (Fig. 13).

Figure 13. Quantum Leap Spaces Reverb with Auxiliary Channel and Instrument Busses.

MIDI editing tasks to modify sound parameters such as attack and release were performed with a M-Audio Keyboard controller with wheels, sliders, switches and drawn in with the MIDI pencil tool to make corrections. Dynamic phrase shaping was achieved in the MIDI

performance and with the audio mixdown. The Korg Nano Kontrol 2 and Arturia Mini Brute Synthesiser were used for articulation switching and other similar tasks within the DAW. Melodyne and Mauto pitch were used to correct pitching issues in the live performances.

3.8. Rehearsal and Recording the Musicians

Rehearsal and recording the musicians was a process that allowed me to listen to the instruments, to hear how my compositions are played. This enabled me to gain a deeper understanding 'about tonal characteristics' (Meyer, 2009, p. 26) of each instrument, the phrasing and techniques they bring to their performance individually, and as an ensemble, so that I could replicate and mimic them in the DAW to enhance the realism I required from the MIDI score performances. It also gave the opportunity for the musicians to give feedback on improvements to notation, and on what was possible or not. I have included the recorded performances in the final mixes. To capture the recorded performances, I experimented with different microphone placements around the recording room with a combination of condenser microphones such as the Neuman U87, AKG C414 stereo matched pair, DPA surround kit, and DPA Omni directional stereo matched pair to capture the room ambience and close mic each performance. See images below (Figs. 14 and 15).

Figure 14. Microphone placement of Double Bass, Viola and Violins, University Recording Studio April 12, 2017.

Figure 15. Microphone Room Placement and Cello Room Placement, University Recording Studio May 31,

Some of the placements were a little unconventional; this was done mainly to capture the recorded sound in different areas of the room. I mixed these together to add width (panning), height (creating contrast in the frequency spectrum) and depth (reverberation, volume) to create contrast in the mixes. Adding or taking away each microphone position, I have been able to alter the timbre and manipulate each instrument. I was very much aware of the distance between each microphone and the relationship in capturing sound, and not to cause too many phasing issues within the recording. These phasing issues were corrected in two different ways; nudging the audio tracks out of phase in line with the rest of the tracks (Fig. 16), and using the
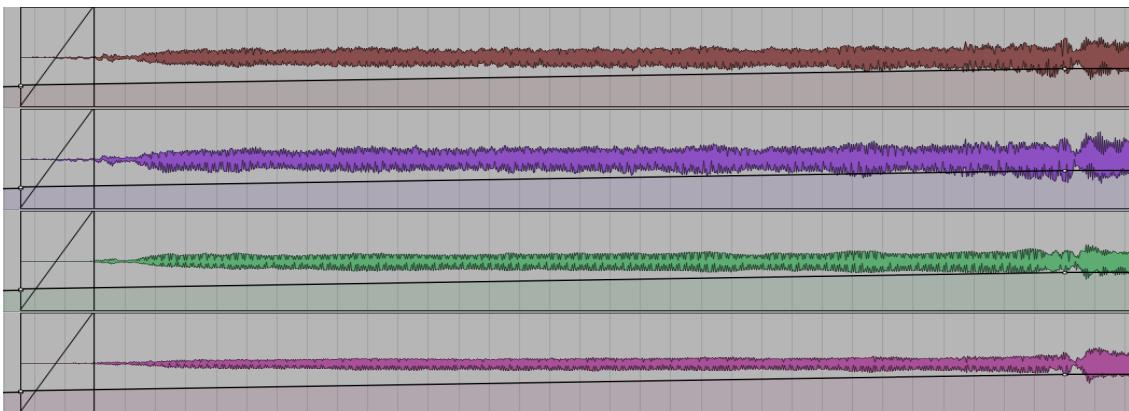
Figure 16. Nudged Audio.

phase invert button on the compressors of troublesome tracks (Fig. 17). Having captured the

sound of each instrument with several microphones, I kept them in the stereo field they would

Figure 17. Compressor with Phase Inverter Enabled. Figure 18. Double Bass Audio Panning Positions

be positioned in the orchestra, then panned them to create space and depth in the stereo field

(Fig. 178. Close microphone technique allowed me to capture the dry sound of each instrument;

this was done in conjunction with different stereo microphone techniques such as spaced pair

technique[18] and ORTF[19] (Huber, Williams, & Gibson, 1998). Placing microphones in different

parts of the room allowed me to capture the ambience of the room; this gave me the option of

mixing the dry performance with the ambient. These techniques I felt were an important part

of realism in capturing live sound.

3.9. Levels of Liveness in Programming Music

Table 1, below (Fig. 19) provides a description of four levels of Liveness:

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[18] 'Typically uses two, and sometimes three, spaced omnidirectional mics. Common spacings are from 2 to 10 feet on either side of the centre line' (Huber, Williams, & Gibson, 1998, p.102).

[19] Two small directional condenser microphones 'with a spacing of 17 cm (6.7 in) between the microphone diaphragms and with an 110° angle between the capsules… provides the recording with a wider stereo image' (DPA Microphones, 2016, para. 2).

level	informative	significant	responsive	live	description	in programming	in music
1	●				**"ancillary"** in which a visual representation is used as an aid to design, providing a basic graphical representation that is continuously visible, but not executable.	flow chart, UML diagram	composer shorthand, arrange window
2	●	●			**"executable"** in which the system uses a visual representation as an executable specification; offering input to a compiler, but not continuously interpreted.	code editor, script, compiler	score, data list, piano roll, CSound, OpenMusic
3	●	●	●		**"edit-triggered"** in which edits to the representation instantly trigger feedback, allowing users to make rapid actions and (after system response) a chance to correct mistakes.	auto complete, syntax highlights, edit & continue	soundtracking, live coding,
4	●	●	●	●	**"stream-driven"** in which the program is continually active, and where edits directly affect program execution, providing high visibility of the effect of actions.	macro recording	sequencer/DAW recording, live performance, mixing

Table 1. Levels of liveness in programming and music.

Figure 19. Levels of Liveness in Programming and Music (Nash and Blackwell, 2012, p.2).

The table also incorporates 'Tanimoto's concept of 'liveness' through the inputting of data (MIDI, notation) and playback (sound, music) and how it feeds back to the composer visually and audibly as they manage complex ideas and editing tasks (Leman, 2008, Nash and Blackwell, 2012). This perception of liveness is influenced through the composer's interaction and ability with the DAW and the 'UI[20], system performance' (Nash and Blackwell, 2012, p.2). These four levels of liveness in programming and music demonstrate the process commonly used in composing music that are used in my workflow. This includes composing from manuscript paper/computer screen to programming in the DAW, the feedback it provides throughout the various stages of composing, from notating and inputting MIDI date and live performance, tracking, recording and mixing through the speaker monitors and screen monitors with the DAW 'to the end product' (Nash and Blackwell, 2012, p.2).

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[20] 'User interface (UI) an information device with which a person may interact. This can include display screens, keyboards, a mouse and the appearance of a desktop' (Rouse, 2012, para.1).

3.10. <u>MIDI, Score Editor and Sibelius</u>

All alteration and simulation tasks have been performed in Pro Tools. The MIDI editor[21] window is used for MIDI composition tasks; the Score[22] editor has been used to set the page layout and staff spacing, in preparation for importation into Sibelius in order to format the score appropriately for the musicians to review and correct any notation and performance errors before recording. Once the musicians had finalised and all errors had been corrected in Sibelius, I exported the score as a MIDI file and imported into Pro Tools for editing and fine tuning.

3.11. <u>Mixing and Post Production</u>

The live and virtual orchestral instruments were panned and positioned as they would be on the stage to provide realism in the stereo field of a live orchestral performance. Automation was used to manipulate and enhance the overall performance and replicate the live instruments' use of dynamic changes, phrasing, articulation and timbre, including tempo changes. Compression and EQ was used to add impact to enhance the overall sound and give each instrument section its own space in the mix. Reverb was incorporated into the mix to add presence to the performances. The final mix was mastered to CD quality 16 bit, 44.1 kHz. The increase of volume throughout this process required slight adjustments to maintain the sound of the original mixes.

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[21] 'MIDI editor windows let you edit MIDI data… also display automation and controller lanes for velocity stalks, volume automation playlists, and other continuous controller and automation data' (Cook, 2013b, p.43).
[22] 'Score editor is to 'view, edit, arrange and print MIDI data from… as music notation' (ibid, 2013b, p.44).

3.12. Screen Capture

The Macintosh operating system has the option for screen capture, the Grab[23] tool has been used to capture images of the manipulation process in Pro Tools Score and MIDI editor windows and demonstrate techniques used in Sibelius.

3.13. Introduction Timeline

All of this methodology is illustrated in the Timeline below (Fig.20).
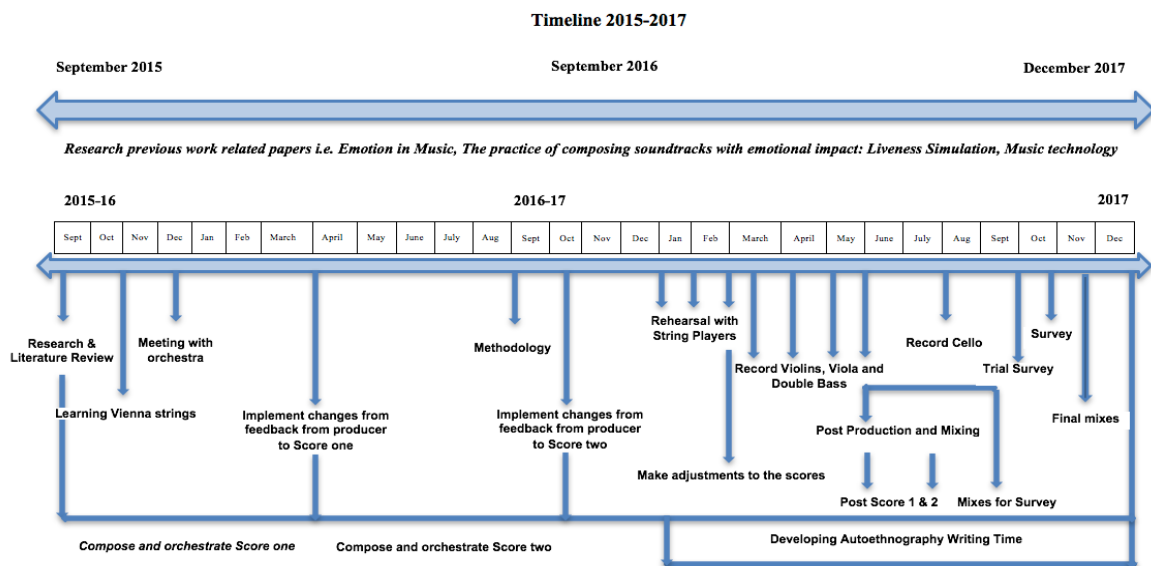
Figure 20. Timeline.

4. Findings

This section of the thesis provides details on the insights, and through reflection breaks down each score from the rehearsal stages to the recording process, outlining the technical challenges including the performance and orchestrating issue that ensued.

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[23] Allows you 'to select an area for a screenshot... You can choose to copy the screenshot to the clipboard, save it to a file… and discard it' (Frakes, 2003, p.267).

4.1. <u>Technical, Performance and Orchestrating Issues</u>

The challenge of creating orchestral music with virtual instruments is not just reliant on musical skills. Technical knowledge is just as important and challenging when bringing MIDI performance (virtual instruments) to life. Eastwest and Vienna strings are very powerful tools, yet still require extensive learning to create realistic performances. One of the main challenges of this integration has been the recording process of the live performers with MIDI compositions. I have spent many hours programming in order to emulate the reality of their performance whilst allowing for minor imperfection in technique. There have been other challenges but this has been the dominant and most frustrating one.

In developing realism within my compositions, I have found that the use of dynamics from each instrument has to be considered and implemented when using samples, meaning careful key grouping and multi-sampling for layers that reflect timbre in accordance with velocity. I had never considered this when using orchestral samples in the past. I am now more aware that when an instrument is played louder dynamically, its timbre becomes brighter and, vice versa, the timbre becomes duller when played softer. The samples have a limited timbre variation when responding to a variation of velocity values that are used. Velocity has no impact on crescendo samples. Between the different software, velocity is implemented in different ways and is more noticeable on staccato/pizzicato notes which give a wider tonal variation and dynamic range.

The rehearsal and recording process with the string orchestra raised many issues with MIDI tempo and performance for the musicians, more so with Score One. This became very obvious quickly in the first rehearsal for the violins 1 and 2. Sections C and D, the demisemiquaver section with chromatic pitch changes, the violinists found technically challenging and difficult

to play at the speed designated at bar 47 (85 bpm) and bar 71 (100 bpm). See Fig.21 example below.
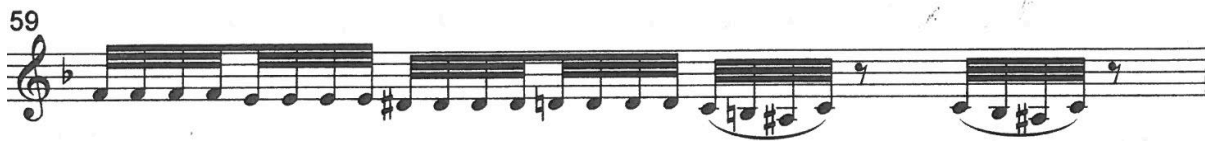
Figure 21. Demi semi quaver.

To overcome this problem in the descending chromatic sections, I replaced the demi semi quaver notes reducing them to quavers and played with the tremolo technique.[24] Other issues that came to the forefront were intonation and tempo changes. I had written these pieces as demos for the film; my lack of knowledge and understanding of the instruments and orchestration, more so my expectations of the musicians' ability to perform these parts of Score One had now come to the forefront in my quest for realism. I had made far too many assumptions within the scores. In the first rehearsals, the musicians brought to my attention that some of the bowing techniques were not possible, such as the length of phrases in Score Two and they were incorrectly placed as can be seen in Fig. 22 example below.

Figure 22. Incorrect Phrasing.

At the time of composing the score, however, I had used the phrase markings mainly to stipulate legato, and not anticipated the problems this would cause. Reflecting back, at times I felt a little out of my depth and thought maybe I should bring someone into orchestrate the MIDI scores. I decided not to, as this process was about trial and error and progression.

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[24] 'A wavering effect in a musical tone, produced by rapid reiteration of a note, by the rapid repeated slight variation in the pitches of the note' (English Oxford Dictionaries, 2017).

Tempo and unison performance was problematic in the early stages of recording, especially as an ensemble, with intonation issues between each player. This was frustrating for the musicians who lacked experience performing with headphones alongside the click with the MIDI composition; usually the conductor has the click and the orchestra follows them (Karlin and Wright, 2004). As this process did not appear to be working, I abandoned this form of performance and concentrated on recording solo performances so that I could analyse the individual performance techniques of each musician, concentrating on key parts and retuning intonation and timing issues and fix within the DAW.

The instruments I have recorded in the studio are very raw and lack depth; I have found that it is quite difficult to replicate the timbre dynamically in the virtual instruments, mainly Eastwest strings. Using the close mic technique setting, reverb can still be heard from the room in which it was originally sampled. I have tried shortening the release and decay time, but it is still noticeable if minimal. Vienna strings also had its limitations on lengths of solo violin. The sampled notes that were drier were overall more realistic which gave more control on the amount of reverb used in the mix. The inclusion of Spitfire Symphonic Strings and Kontakt's String Ensemble supported the overall mix, and bouncing the MIDI tracks to audio for manipulation tasks such as intonation and vibrato has worked very well. They are a good example of how sampler software has developed in the last five years. String ensembles interface in Kontakt is straightforward in its structure and use (Fig. 23).
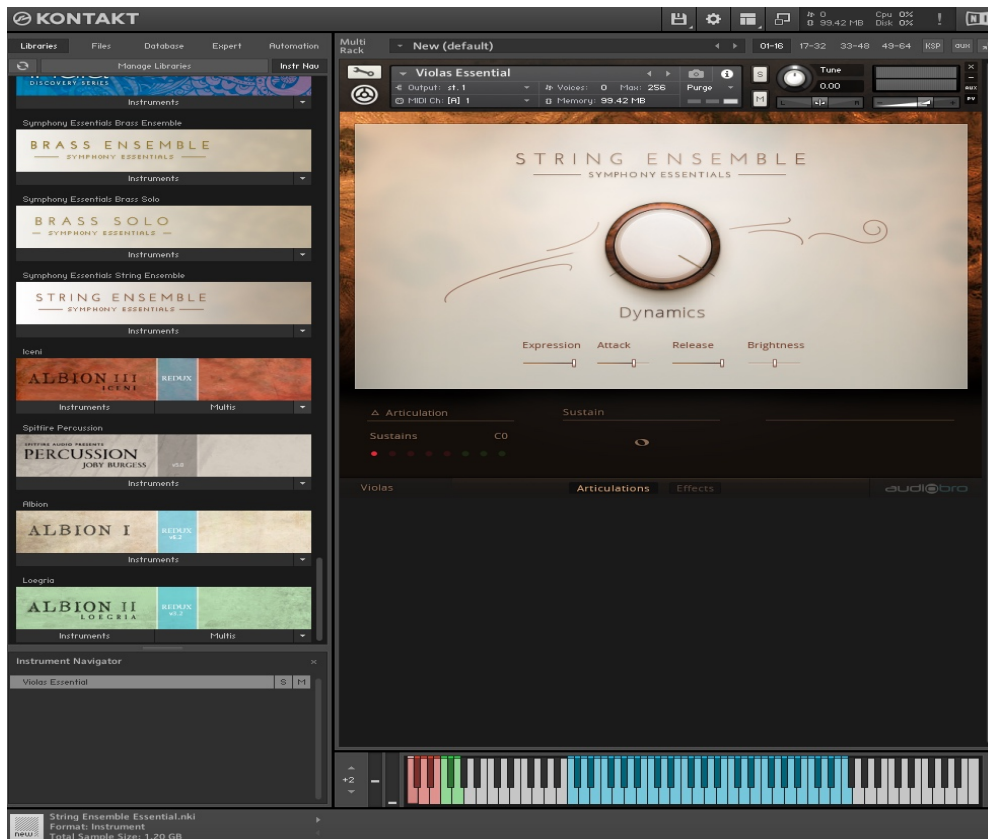
Figure 23. String Ensemble Dynamic Page

The strings in Eastwest and Vienna software both have advanced scoring features for professional performance control such as dynamic control. On the original tracks, I used slight volume rides to enhance the crescendo dynamics. I also found that layering different samples, duplicating tracks and creating velocity layers, then fading them in and out to create brightness in crescendos and decrescendos achieved a more realistic sound. Not all the samples used from each software have switch/Xfade.[25] To overcome this I bounced the MIDI tracks to audio and altered the volume of the track, crossfading sections to create the illusion of attack and decay with automated EQ. An example of this can be heard from bar 33 – 36 (Fig.24).

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[25] As with crossfading, it 'is the process of overlapping two audio sources and fading out the first source while simultaneously fading in the second source' (Cook, 2013b, p.189).
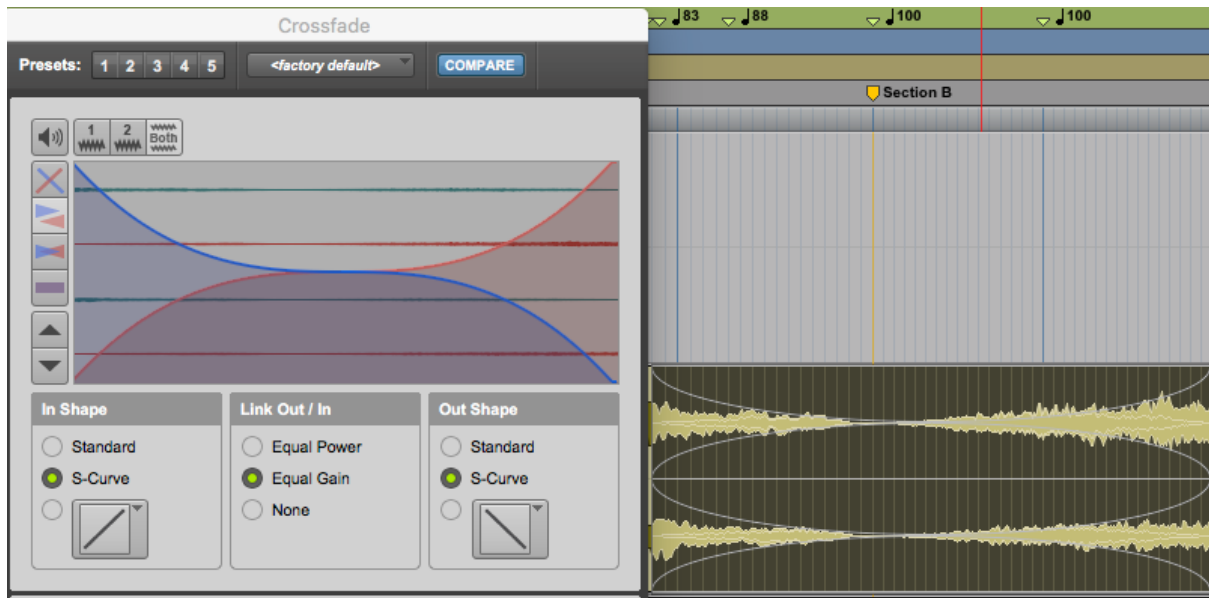
Figure 24. Crossfade Window and Audio Example.

Velocity variation was used in line with the performances of the musicians; each musician's approach and bowing techniques varied according to their skill level and confidence on the instruments. Although all of these issues were frustrating, it was important to work through them to create a realistic sounding performance.

4.2. <u>Questionnaire Findings</u> (see Appendix B Figs. 25 to 31)

The questionnaire provided me with extra data for analysis and modification for each composition. The survey showed a mixed reception in terms of how important liveness was to the 14 listeners. 71.3% listeners said it was important (Fig. 25). Emotion was unanimously 100% perceived as very important (Fig. 26). In response, to the two excerpts of 'My Immortal Soul,' version B was overwhelmingly perceived by 85.7% listeners as the most natural sounding performance. 7.1% perceived version A, and 7.1% perceived both versions A and B (Fig. 27). In response to the two excerpts of 'The Battle of Everlasting Fame,' version B was perceived by 50% as the most natural sounding performance, Version A 21.4%, and A and B 28.6% (Fig.28). In the response regarding emotion, the two compositions prompted emotion in

85.7% (Fig. 29). In response to their natural preference, version B was the preferred option for both compositions. 50% for composition one and 57.1% composition two (Fig. 30, Fig. 31).

Version A of each composition lacked a natural performance and comments from the sampled participants. As version B was considered the more natural sounding performance, I used the data to update version A in both compositions and also reprogrammed certain sections of the version B compositions. This enhanced the articulation, dynamics and timbres to create a more realistic sounding performance from all the composition versions.

4.3. <u>Final Mixes</u>

In the final mixes of 'The Battle of Everlasting Fame' I incorporated subtle changes suggested by the questionnaire respondents. In the sampled mixes, I had over compressed each instrument. To remedy this I reduced the ratio, attack and release of the compressor, which brought more headroom dynamically to the instrument performance overall. Usually, I only use compression in the mastering stage of the final mixes, when using sample based instruments. Incorporating the live recordings into the MIDI mixes, brought dynamic and frequency issues, which is why I used compression to control the dynamics of the instruments in conjunction with the EQ.

The EQ was altered with cuts to the low to mid-range of the mix to reduce muddiness. Some described the performance of 'The Battle of Everlasting Fame' version A as robotic and felt it had been quantised creating a less realistic performance. I originally had played the notes in real-time on the keyboard alongside a click track, although at times when I played out of time I moved the notes back in time by hand slightly, either behind or in front of the tempo grid lines. Going back to the mix, I realised that I had left absolute grid mode on whilst I was experimenting with tempo and contemplating whether to quantise sections of the MIDI

performance, because of this the notes had snapped to the beat on the timeline at some point; this would have given the notion that quantise was used. I went back through the sessions altering each note to vary the tempo throughout the performance of both 'The Battle of Everlasting Fame' and 'My Immortal Soul' creating slight variations throughout the score. I reanalysed the performances of the recordings of each string player and noticed I had overlooked the accents at the end of the sustained notes. Each player, although varied, would decrescendo slightly on each concluding note; this was more applicable to 'My Immortal Soul'. See Figure 32 below for tempo variation with dynamic changes.
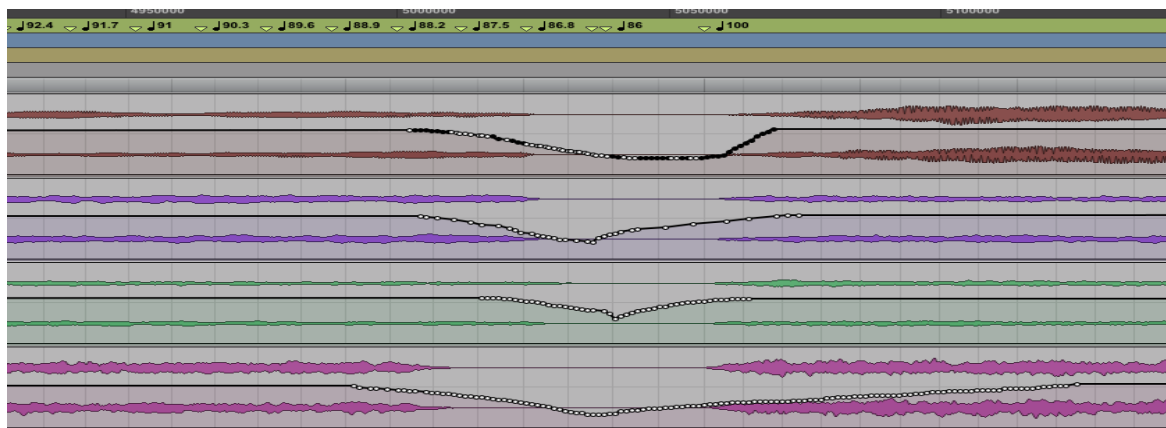
Figure 32. Tempo variation with dynamic changes.

In the live performances of both compositions the quiet sections of the strings are more exposed and I replicated this through the dynamic changes in the virtual instruments which works well in conjunction with the live instruments and makes the whole performance more realistic. In the performance of crescendos on each virtual instrument I automated the EQ plugin alongside the volume changes to create a more realistic timbre performance of each instrument. I found raising the high middle frequency by a few decibels worked across all the string instrument parts. See example in Figure 33 below.
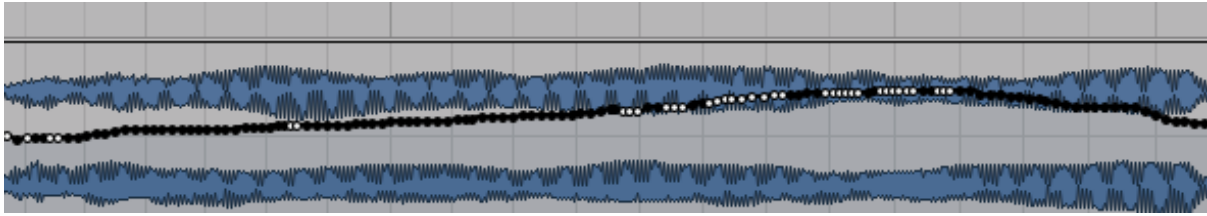
Figure 33. Automated EQ.

I created slight intonation changes with subtle use of chorus and tremolo plugin to emulate vibrato and pitching variations that the live performance had. The live performances have flaws within them but these have not been negative in the final outcome of the musical performance of the scores. Each performer has brought different approaches and techniques to the composition. This integration of the virtual and live instruments has brought a more realistic sounding performance that brings emotion and excitement. Live instruments will always sound more realistic; this can be heard in the quiet sections of both compositions where the strings are predominant. This can be heard in 'The Battle of Everlasting Fame sections' B, C and D with the performance technique used for the drone in section B and the phrasing of sustained notes and legato passages in 'My Immortal Soul'. It was difficult at times in the layering of the string parts as the combination could boost the frequency in the mid-range of the strings.

5. Discussion

This chapter discusses my use of automation and the ways in which computer technology has mediated the simulation of live performance and realism in MIDI orchestration. It examines my workflow and how my techniques have changed in relation to previous research on realism, authenticity, liveness in music composition, hyperorchestration and techniques used by other composers.

This work has shown that the computer, in conjunction with the DAW, sampler and VI, is an essential part of the process to bring levels of liveness as the composer has access to

programming and immediate feedback (Church, Nash and Blackwell, 2010). Though realism and sophistication of the timbres in virtual orchestras has become incredibly nuanced and versatile, prior research emphasises that it still requires a composer not to just input the notes but to have a good understanding and working knowledge of the DAW and the virtual instruments they use (Gilreath, 2010). In this thesis, the findings showed that I do not just rely on my ears for information, I rely on a visual representation of my work in progress, that aids me not just in my compositional process but also in the final mixdown of each score (Nash and Blackwell, 2012). Many of the techniques I have used are not new to me, but I have approached them in different ways by adapting techniques more associated with the EDM genres. The application of music technology requires the same learning practices as an acoustic instrument such as the piano and violin to create a realistic performance from virtual instruments (Dobrian, 2001; Klein, 2016). As Gilreath (2010) has explained:

> MIDI orchestration, is more than composing and assigning different parts to various instruments. It the process of employing MIDI, samples and samplers, sound modules, processing hardware and software and recording gear to achieve maximum realism, ultimately creating a wonderful experience and sound of having a true, living orchestra within your own working studio (Gilreath, 2010, p. V-xi).

In my practice and in this research I have found that MIDI orchestration requires knowledge about the range of notes available in the register of acoustic instruments, the maximum and minimum tempo they can be played, dynamic range, phrasing techniques, the placement (panning) and balance (level)s of these instruments in the orchestra. These are all important elements, that emulated together, they can simulate live performance (Casanelles, 2016).

One of the most important factors for creating a realistic performance within the DAW, is around developing versatility with automation, as it is only one element of MIDI orchestration (Gilreath, 2010). Automation has enabled me to be really precise in altering the parameters of each sampler, compressor, EQ and reverb, and write (record) the automation whilst inputting

the MIDI notes on a keyboard, in conjunction with the faders and potentiometers to write the automation data as I recorded my performance. Subtle alterations were drawn in for minor alterations to create an authentic performance. Automation was used to automate parameters I did not anticipate; automating the compressor was incorporated to control the dynamics of each instrument, by altering the ADSR to exaggerate and reduce their transients when required, enabling me to do some really precise work for each live and virtual instrument and the final mixes. I used the threshold of the compressor to alter levels in conjunction with volume. These same techniques are also applied to the recordings of the musicians and bounced MIDI recordings.

In seeking to support 'liveness' Logan recorded the live performance of the instruments of an orchestra and turned them into samples. He suggested that virtual instruments 'should remain only supplementary to, or be used in conjunction with, live musicians for the best results' (Logan, 2011, p.51), however, my work also shows that it is an issue of quality in both cases of live musicians and virtual instruments. It is not just a simple case of virtual supporting live, but them supporting each other. This has been achieved through my use of automation with the plug-ins, virtual instruments and the DAW for each composition. Specific developments in DAW GUI, have meant that the quality of sample libraries has been enhanced by the innovations introduced by the manufacturers.

My own practice has developed in particular ways over the duration of this MAR; unfortunately, the availability of these virtual orchestras is still limited to those who have significant economic capital, or access via a college or university course. This project has allowed me to use high end resources but has also developed my ingenuity in making the best of the other resources available to me by converting everything into samples to reduce the

pressure on the CPU (Central Processing Unit), preserve complex automated parameters, and enable me to complete all the mixes at my recording studio.

Improvisation is very much part of a composer's practice; music technology has taken this a step further from what was previously achievable. Using MIDI editing techniques from the virtual instruments and the DAW, it has become possible to simulate live performance (Klein, 2016). Crichton's (2013) approach to composition has improvisation at the forefront of his creative process and, in a similar way to Logan, he recorded his ideas then edited segments to create realistic performances in the DAW. In my own practice I would use the whole of the recorded live performances and then improvise by making changes to the intonations and dynamics of the recordings.

Previous research of realism, authenticity and liveness in music composition has shown that it is how we communicate with the audience's perception of what they hear and see. A live performance today involves music technology that is pre-recorded with the use of sampling technology that is triggered through MIDI messages with computer technology (Marrington, 2011). I find that hyperreality plays an important role in music composition because what was not achievable in the past is now part of music composition and there is the ability to create new timbres through sampling and synthesis. Today, in film and trailer music the hyperorchestra techniques are important, particularly in the use of automation in producing and mastering virtual instruments. In the same way as Logan (2011), Crichton (2013), Douek (2013) and many other composers, I have developed ideas through improvisation, from motifs, melodic lines and built the harmony and rhythmic structure inputting notes in the DAW, automating parameters to develop, blend, enhance timbres and create space for each instrument in the mixes. Composing this way is very instinctive which draws from our 'empathy' and

conscious and unconscious thoughts (Douek, 2013). Having not been given the opportunity to spot the images for this film, I have had to approach the composition process through the words of the director and find stimulus elsewhere for inspiration.

Moving forward with this research, as a composer I would be interested to see if it is possible to create more realism with less expensive virtual instruments. This could be beneficial to education and could make music composition courses more viable and cost effective to run. Given that GUIs influence practice, it would be interesting to see further research that comments on whether there should be more emphasis on automation in the default settings, and whether this would be beneficial or have a negative impact to the workflow in the studio. The recording studio over the decades has become the compositional tool for composers and songwriters alike. In the end these innovations are still dependant on how we develop and update our knowledge, skills and practice as music technology advances.

6. Conclusion

Throughout this process there has been a personal narrative, documented around the moments where I was seeking to create realism. I needed to understand my thoughts on previous papers that considered emotion, realism, liveness and recordings of music composed with digital technology. This autoethnographic approach has allowed me to reflect on my professional practice and develop new knowledge, understanding and technical skills that will be beneficial to my present and future professional practice. Our perception of liveness and realism within the MIDI performances is subjective; we all have different ideas of what sounds realistic (Sanden, 2013) and this can be seen in the questionnaire data findings. I had to rethink my approach to the version A mixes as the live instruments had made such an impact. This integration of both live and virtual instruments has brought a more realistic mix that brings the

emotional impact the client wanted from my compositions. It has been problematic and frustrating at times but the outcome has been extremely valuable.

My journey to bring realism to my compositions has been practically complex rather than theoretically and at times I have found it quite challenging. The process of incorporating real-time instruments into the mix was not difficult overall, but what I believed to sound like a real instrument performance was challenged by some of the respondents and did not appear to be as realistic as I originally perceived. Following the feedback, I experimented and consequently decided to place the original live instruments low in the mix to support the overall timbre and performance of the virtual instruments. There were minor pitching and timing errors in the live performances. Although this was time consuming to correct, it was not insurmountable as I was able to get the detail required to create a more realistic performance with the software. Using semi-professional musicians highlighted certain technical performance skills and demonstrated my lack of knowledge of the multiple various techniques of each instrument.

The feedback from the questionnaire has been invaluable in the completion of my scores and demonstrated that not only do I need to develop my skills with the techniques to bring the MIDI score to life, but also my working practice as a composer in the studio. In engineering or scientific terms, this could be compared to a closed-loop system; it is quite common in a manufacturing plant to be faced with equipment that needs to be further modified in the field or factory so that the equipment can be maintained whilst in operation. In my case, the output is the composed music. It is only when the musician is faced with playing the music that it becomes obvious that the music needs to be modified for the musician to be able to play the piece (Åström, K, J. & Murray, R, M., 2008).

Orchestrating and recording was an integral part of my learning process in gaining new knowledge and understanding of each instrument. It has taken time to turn the raw sound of the recorded string instruments into the finished product. I have listened to different recordings and used them as a point of reference. Working with the musicians I have come to realise that in manipulating sound, timbre does not bring realism without acknowledging the essence of the real instruments. The findings have shown that the study of orchestration is just as important for composers and music technologists as it is for classical composers and musicians. Bringing realism to a MIDI performance is not just about what the music technology can do, but the composers and music technologists' knowledge of performance and orchestration of each instrument to communicate their musical intentions to other musicians and within the DAW. New technologies are continuously developing and being introduced into the cauldron of music creativity. Dealing with complacency in my working practice has been at the forefront of my thinking in this thesis. In future work live performance will always be integrated into my compositions wherever possible, in order to produce a natural sounding performance within the DAW. This study has become a reference point in my continuous professional development as a freelance composer. It has impacted on my reflective thought process and problem solving and improved my working practice to be able to compete within this creative industry of film.

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Appendix A (Blank Questionnaire)

Survey; An Autoethnography on Film Composition Practice: Integrating Virtual Instruments and the Live Performance Realisation within the DAW

As part of my research An Autoethnography on Film Composition Practice: Integrating Virtual Instruments and the Live Performance Realisation within the DAW I kindly request 10 minutes of your time to listen to the two extracts of two compositions and answer the following questions.

Both pieces of music were written by myself and recorded with the assistance of fellow students at Huddersfield University and fellow professional musicians.

Your responses will not be submitted as part of my final research paper but will be anonymised prior to submission.

* Required

1. **Email address** *

    _____

2. **How important is it to your listening experience to know if a piece of music has been recorded live, or is generated by computer software?** *
    Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Not Important	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very Important

3. **When watching a film are you aware of the music score and how it influences your emotions and viewing experience?** *
    Check all that apply.

    ☐ A. Yes
    ☐ B. No

Please listen to the two excerpt versions of each composition by clicking on the links below:

Composition 1 Version A https://drive.google.com/open?id=16Gb66R2eL4ol21MbgGhjQBNDewZ2GVZc

Composition 1 Version B https://drive.google.com/open?id=15qr0h-_77L8UvC02BmggZK2wuaucPceO

Composition 2 Version A https://drive.google.com/open?id=1VgLTRpuqu3TYPVcYTm5NWfDq96cSN5g4

Composition 2 Version B https://drive.google.com/open?id=1-5p48it7G4iLzgnfyyN9WhhNqX_fpMry

4. **Composition 1: of the excerpts which you have just listened to, which in your opinion, has the most realistic sound of performance?** *

   Mark only one oval.

   - ( ) Version A
   - ( ) Version B
   - ( ) Both version A and B

5. **Please explain why?** *

   _____

   _____

   _____

   _____

   _____

6. **Composition 2: of the excerpts which you have just listened to, which in your opinion, has the most realistic sound of performance?** *

   Mark only one oval.

   - ( ) Version A
   - ( ) Version B
   - ( ) Both version A and B

7. **Please explain why?** *

   _____

   _____

   _____

   _____

   _____

8. **Did any of the excerpts prompt any type of emotion?** *

   Mark only one oval.

   - ( ) Yes
   - ( ) No

9. **Can you explain what type of emotion the music is trying to portray? ***

_____

_____

_____

_____

_____

10. **Of the excerpts of composition 1, do you have a natural preference for a particular piece of music? ***
Mark only one oval.

◯ Version A

◯ Version B

◯ Neither

11. **Of the excerpts of composition 2, do you have a natural preference for a particular piece of music? ***
Mark only one oval.

◯ Version A

◯ Version B

◯ Neither

12. **Any comments as to why? ***

_____

_____

_____

_____

_____

13. **Any further comments you would like to add? ***

_____

_____

_____

_____

_____

Thank you very much for your time taken to listen and comment on the compositions and completing this survey.

Geoff Wilson November 2017

☐ Send me a copy of my responses.

Appendix B (Questionnaire Responses Summary)

Question 1: Email address Responses 14 = 100%

Question 2:

How important is it to your listening experience to know if a piece of music has been recorded live, or is generated by computer software?
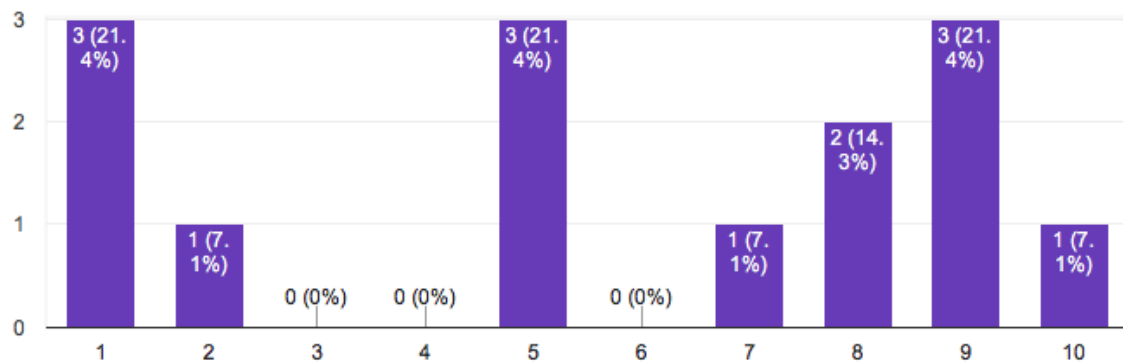14 responses

Figure 25. Chart One.

Question 3:

When watching a film are you aware of the music score and how it influences your emotions and viewing experience?
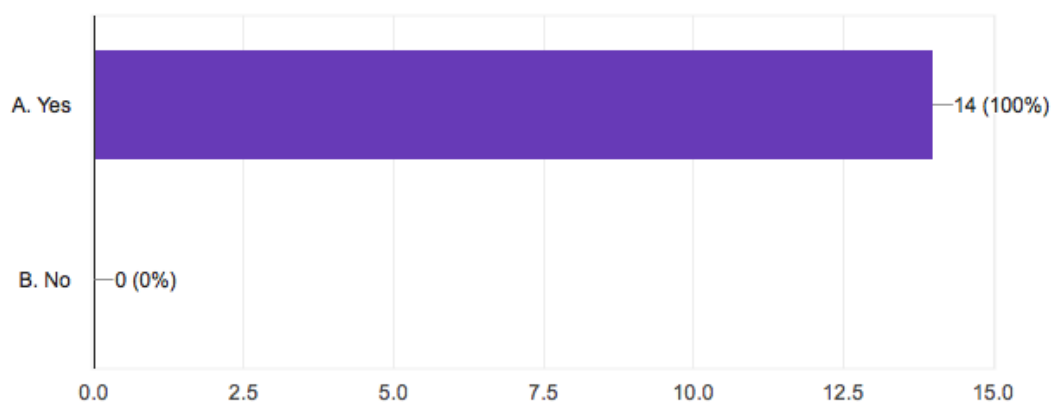14 responses

Figure 26. Chart Two.

82

Question 4:

Composition 1: of the excerpts which you have just listened to, which in your opinion, has the most realistic sound of performance?
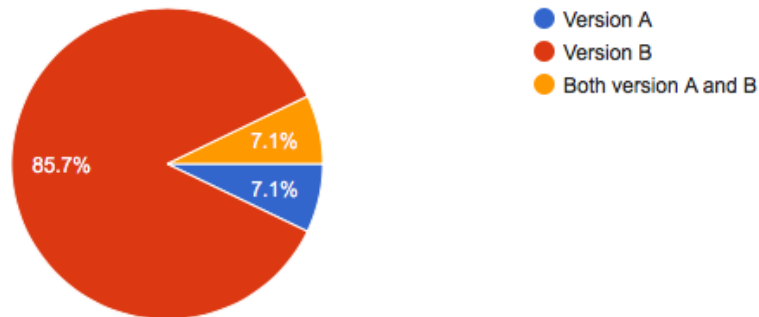
14 responses

Figure 27. Chart Three.

Question 5:

Please explain why? Responses:

Notes blend into each other more smoothly. The sound is 'lighter' with less apparent bass. Also this version seems quieter which gives it a less compressed sound

The strings seemed more natural in version B

It sounds warmer. Version A has a 'pinched' sound in the upper strings.

Has slightly more human articulation of the strings

Version B sounds brighter and has more detail, more life

version B, it had a clearer sound and definite variance as you would get in performance

More space in the strings

To be honest I couldn't tell a massive difference between the two, but gut feeling was version B.

B is less synthetic and more organic sounding. The sustain in particular on certain notes sounds like a more realistic performance

Gives more realistic experience.

Can't really explain, but version B gave me the impression of people playing the instruments.

The attack and release of the notes in Version A was quite hard and sudden giving it more of a piano or synth quality which, to my ears, didn't quite fit the composition. Version B, on the other hand, I felt was more dynamic with crescendos, diminuendos and longer phrasing giving it a bit more life. This together with the fact that the attacks of the notes wasn't as harsh as in the first version gave it a more fluent feeling which I experienced as more realistic.

See below.

The way the instruments are played sounds more authentic, and in the way they move.

I could not tell the difference between the two compositions.

Orchestral sounds may be programmed, but sound sampled rather than synthesized

Question 6:

Composition 2: of the excerpts which you have just listened to, which in your opinion, has the most realistic sound of performance?
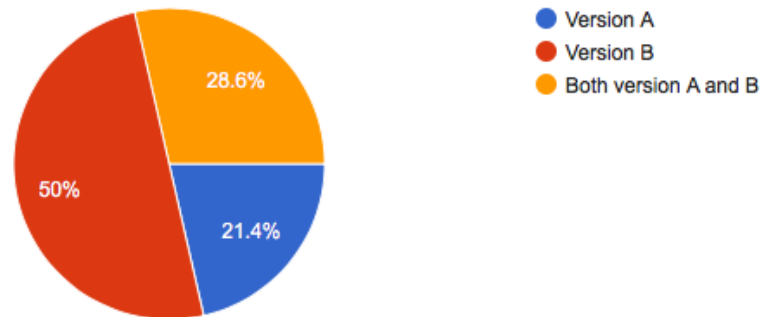
14 responses

Figure 28. Chart four.

Question 7:

Please explain why? Responses:

Notes blend into each other more smoothly. The sound is 'lighter' with less apparent bass. Also, this version seems quieter which gives it a less compressed sound. Not repeated from previous answer but same reasons

The cymbals had the edge in B over the A version.

Much more clarity in version A; version B sounds quite muddy, especially at the beginning.

Again articulation, and the drums somehow sound more human

Found it difficult to find any differences between the 2 tracks

version B made me feel as though I was expecting something to happen

It has more presence and definition

85

Again, very close and to be honest to my ear there wasn't a lot of difference.

B- percussion sounds less programmed and robotic. I suspect more attention to velocity and other dynamics was given to help create a more realistic sounding percussion section. A-strings and horns seem a lot brighter and more realistic

Both gives the same realistic natural experience.

Appears to portray greater emotion to me.

Both of the version have some instruments panned hard to one side of the mix which I always have a hard time experience as natural or realistic. That said, these two versions were more like but noticed the woodwinds which sounded a bit thinner, and more realistic, in Version B. I also thought that the overall mix and room sounded more natural in that version.

The sound felt more authentic to me.

Again, I could not tell the difference between the two compositions

The sound sets are more similar than the first but the midi seems more quantised in the less realistic one

Question 8:

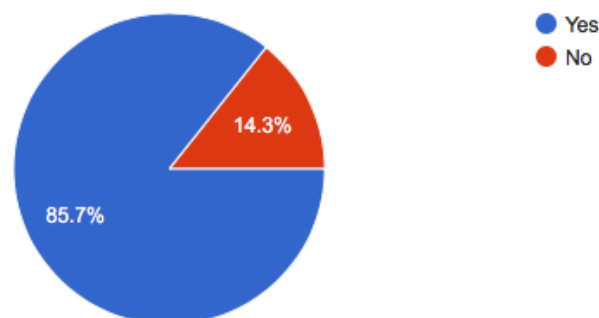Did any of the excerpts prompt any type of emotion?
14 responses

- Yes
- No

14.3%

85.7%

Figure 29. Chart five.

86

Question 9:

Can you explain what type of emotion the music is trying to portray? Responses:

Militaristic ' Epic' Theme. Grandeur, pride, honour and perhaps loss

1 A reflective mood. 2. A film of a marching army going to war or a sea voyage into battle with the sound of the cymbals representing crashing waves.

A science fiction fantasy scene with wild animals running and exotic birds flying

1. Feels like an emotional reunion 2. Medieval battle

Composition 1 - sorrow and longing Composition 2 - purpose, achievement

anxiety

Awe and hope

Part A was very sombre, kind of like the aftermath of something, a battle perhaps. Part B was much more interesting, it felt very Lord of The Rings, epic, a feeling of being united in something offering hope. The end section was a bit of a cliff hanger, like something important visually was about to happen.

A- tension, B- euphoria

Happiness, joy, positive, hopeful feeling.

Composition 2 gave conjured up the image of battle, triumph, epic, success.

The first composition gave me a feeling of being thrown between despair and calm - an unsettling feeling not knowing if something's done and then accepting it. Second composition I instantly relate to films like Braveheart and Pirates of the Caribbean as it gives portraits a

87

strong determination, moving forward/a journey, and pride. It's hopeful. an ending Suspense

Pride Tension

Question 10:

Of the excerpts of composition 1, do you have a natural preference for a particular piece of music?
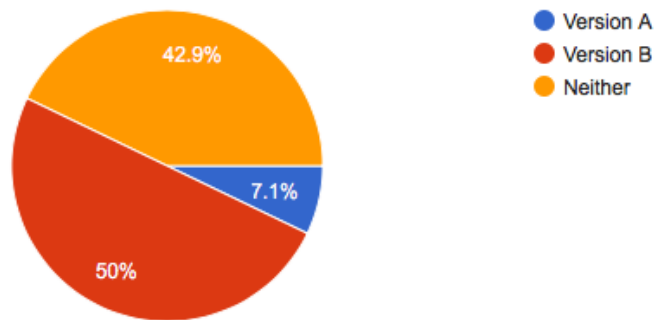
14 responses

Figure 30. Chart Six.

Question 11:

Of the excerpts of composition 2, do you have a natural preference for a particular piece of music?
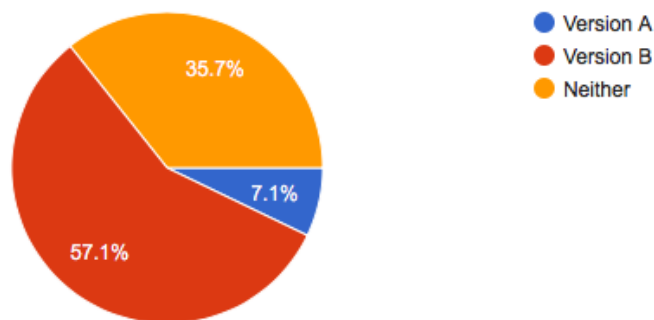
14 responses

Figure 31. Chart Seven.

Question 12:

Any comments as to why? Responses:

Those versions felt like more effort had been put into the mix. Better programming with a more natural, less forced feel

I believe if I was watching a film with any of the versions would be acceptable, it is the mood of the music that is important rather than the technicalities.

Concerning both excerpts: The differences weren't all that different as far as the piece as a whole is concerned. The tune and the rhythmic beat are still in my head, even though I've switched off the recording some minutes ago. So not an unpleasant musical experience, but I didn't feel any emotion. I need Mahler Symphony no 2 for some emotion!

A better sounding overall mix

NA

on both compositions, B was the strongest music forming more emotion

It speaks to me more

Composition 1 didn't really excite me, it sounded like it was rolling through the sequence over and over, there were also fewer instrument to hold my attention.

The percussion is more pleasing to my ears. Eason ad above. Basically, I feel more detail has been given to the programming to make them sound more realistic.

Appears and gives realistic experience.

Version B gave a warmer emotion.

In both cases I think it's a lot about the dynamics of the pieces. I perceive both first versions of the compositions as dense and a bit harsh or static/mechanical. Not as fluent as I would think is fitting for the music, especially Composition A. It's not as obvious in the second composition where I think both versions are quite similar.

Just prefer them.

They're just my initial feelings.

My hearing is not developed well enough to tell the difference between the two pieces of music.

The quantising loses some emotion

Question 13:

Any further comments you would like to add? Responses:

Programmed music can be brilliant but strings, brass and woodwind always seem to fall short of the real thing.

Enjoyed both Compositions.

"Any further comments you would like to add" is inviting me to add them if I wish, yet when I decided to move to the next page, a message flashed up saying the question was obligatory. I have no further comments to add!

Good stuff. Had to listen intensely to decide which I thought were real instruments

NA

the music made me feel anxious then relief at the end as though I had travelled a journey especially composition 2 version B

Nice compositions

There was much more going on in the second composition, I liked the different percussion sounds towards the end. I can normally tell a triggered drum compared to a live one, and it just depends on what the end game is. I think that's true of all instruments/sounds on recordings. If you're looking for perfect sound then in my opinion using samples and triggers are the way to go but I think that compromises the feel and can sound robotic. If you're after something that creates feeling and emotion then using musicians with real instruments is the way to go, I think it allows more creativity and 'mistakes', mistakes that can often add to the song/project.

Nice work

Wonderful music composition, very soothing, gives immense happiness.

Very difficult to separate the versions when played through a laptop speaker.

Thank you for including me! Feel free to reach out if you would like to discuss the answers or get more details on any one of the questions.

Like versions of each, just personal preference No further comments

Appendix C

<u>Studio Equipment and Software</u>

Tascam US-2400

Focusrite Liquid Saffire 56

Focusrite Platinum Octopre

Genelec 8040A X2

Lexicon MX400 reverb Unit

Warm AudioWA76 Mono FET Compressor/Limiter

Warm Audio EQP-WA Tube EQ

Arturia MiniBrute

Korg MicroKorg Mini Synth and Vocoder

M-Audio Keystation 61 es

Korg Concert EC350 Electric Piano

Korg Nano Kontrol 2

AKG C414 X 2

AKG C12 X 2

AKG D112 Microphone x 1

Audio Technique AT4050 Microphone x 2

DPA surround kit, x1

DPA Omni directional stereo matched pair x 1

Mojave MA-200 Tube Microphone x 1

Neumann U87 Ai Studio Set Microphone x 1

Rode NT5 Matched Pair Microphones x 2

SE Electronics shotgun Microphones Matched Pair x 4

Sennheiser E902 Microphone x 1

Shure SM 57 Microphones x 8

Shure SM 58 Microphones x 8

DAW Pro Tools 12.8.2

Sibelius 8.1.

AIR Instrument Bundle

Arturia Instrument Bundle

Brainworx Digital V3

East West Symphonic Orchestra Strings Platinum

East West Symphonic Orchestra Brass Platinum

East West Symphonic Orchestra Woodwinds Platinum

East West Symphonic Orchestra Percussion Platinum

East West Symphonic Choir Platinum & Expansion

East West Symphonic Composer Cloud

Komplete Action Strings

Komplete Session Strings Pro

Vienna Strings (Huddersfield University)

Melodyne4 studio

Mauto pitch

Sonnox Elite Bundle

Appendix D

Grainne Uaile Film Compositions- Loose Gripp Films (Films Release date 2018)

All Hands Down	(Action)
Dark Angel	(Suspense/Fear)
Emotional Bitterness	(Bitterness/Repugnant)
Grainne Uaile Part 1	(Intro Irish/Medieval/ Spanish/Orchestral)
Grainne Uaile Part 2	(Intro Irish/Medieval/Orchestral/ Spanish)
Grainne Uaile Savage Soul	(Ethnic Mystical)
Hell Amongst Us	(Fear/Tension)
Hope Within the Chase	(Chase/Battle)
My Immortal soul	(Sad/Reflective)
Lullaby of Fear	(Fear)
Medusa's Cave	(Tension/Fear)
My Gypsy Soul	(Fusion of Jazz/Gypsy/Bossa Nova/Modern)
Pirate Theme	(Orchestral/Irish/Spanish/Medieval)
Oceans Lamont	(Sad/Reflective)
Elizabeth 1 Dark Theme	(Orchestral/Medieval/Threatening)
Strings of Emotion	(Reflective/Sad/Thoughtful)
Symphony of Despair	(Orchestral/Danger/Jurassic)
Tension Cue	(Orchestral/Tension)
The Battle of Everlasting Fame	(Epic/Battle)
The fallen (Morti Domini)	(Ethnic/Chant/Modern Rock Fusion)
The sadness of Loneliness	(Reflective/Sadness/Loneliness)
You're Not Alone	(Threatening/Tension)

Links to music demos can accessed at www.wilsonsoundstudio.com

Cu Chulainn Film Compositions (In Production, Films Release date 2019)

Loose Gripp Films	loosegrippfilms@gmail.com Director Ciaron Davies
Cathbad Theme	(Irish/caricature)
Cu Chulainn Theme	(Irish/Medieval/Caricature)
Conchobar Theme	(Irish/caricature)
Emer Theme	(Irish/caricature)
Falling In Darkness	(Mystical/Threatening/Orchestral)
Forgalls Fortress	(Anthemic/Discriptive)
The Evil I Do	(Irish/Medieval/Danger/Anthemic)

Links to music demos can accessed at www.wilsonsoundstudio.com Music still in production tracks added regularly as approved.

Demonic Playground Film Compositions (2012)

M.M.M. Productions demonicplayground@yahoo.co.uk   Director Oskar Jon

A Winters Day	(Reflective)
Death of The Titans	(Orchestral/Tension/Aggressive)
Demonic Playground	(Horror/Creepy/Threatening/Danger)
Into the Abyss	(Tension/Threatening)
Journey of Hope	(Orchestral/Relief/Happiness)
Look At Me (Dancing Doll Theme)	(Electronica/Pop Song)
My Apocalypse	(Piano/Apocalyptic)
Morte Aeterna Birth and Death Scene	YouTube link: https://youtu.be/tUqrZC8kZvk
Now You're Gone	(Pop/Rock/ Radio Track)
The Fear	(Tension/Fear/Threatening)
You Are Not Alone	(Tension/Fear/Threatening)
When All Is Said	(Reflective/Thoughtful)

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