

Creative Music Production

Professional Project

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How has the evolution of music technology impacted the creative process,  
quality, and efficiency of film composition?

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## Abstract

Music technology is continuously evolving, solidifying its increasing value and recognition in film composition. Research has delved into these tools, highlighting their practical applications. The present study aims to address a gap in this research by discerning the implications these practices have on the various facets of film scoring. Semi-structured interviews allowed five current media composers to share their experience with digital audio workstations, virtual instruments and notation software. This was paired with a mixed-method experiment of scoring a short film with and without the use of music technology. The procedures were analysed through a documented report of the dual processes alongside client meeting notes and their numeric ratings of the cues. The combined analyses revealed improvements in time management with the technological approach, while the traditional manner of iterative handwritten sketches posed benefits to the quality and innovativeness of compositions. In addition, it was surmised that clients appear to value audio production over musical arrangement, conveying a shift between the importance of mixing skills and theory knowledge for the modern composer. The results indicate that proficiency in both practices is the optimal approach to scoring, gaining the compositional merits of a methodical handwritten process with the efficacy of technology necessary in today's fast-paced industry. Future research could expand on this with a larger database of composers and clients to supplement or challenge the conclusions made.

## Introduction

The following study establishes the influences that music technology has had in the realm of film scoring. With the current unprecedented accessibility of tools such as digital audio workstations (DAWs), virtual instruments (VIs), and notation software (NS), it is compelling to identify the implications for film composition. The three listed pieces of technology are the focus of this study, which investigates their direct impact on the creative process, quality and efficiency of film scoring. An evaluation of these aspects is imperative for this field of study in informing present practitioners and aspirants while also predicting the potential trajectory in this digital age. The scope of this research is narrowed to the revelations in music technology from the early 2000s to the present day.

The first chapter surveys the existing literature, building a foundation for a comparative analysis of film scoring with and without using DAWs, VIs, and NS. Gaps in the literature, such as the absence of the audio-to-video syncing features within a DAW, are addressed in the methods of the present study. The first method involves the interviewing of five established composers. The creative process of their composition and collaborations, the quality of their finished compositions, and the efficiency of their past productions are thematically analysed in relation to the significance of DAWs, VIs and NS. Two procedures for scoring a client film scene are adopted in the second method of research. This practical application targets the comparison of film scoring with and without DAWs, VIs, and NS, as illustrated in the reviewed literature. The qualitative analysis of composer interviews paired with the mixed method assessment of two composition approaches to a client brief provide expert insight along with practical applications on this topic. The analysis chapter displays the thematic analysis of the interviews and the comparative analysis of the client compositions utilised in gathering the data from the two methodologies. While limitations in sample size can prompt generalisation in this study, the combined resources of the literature

review and methodologies lay a groundwork for future research endeavours. The practice of this study also presents an opportunity to pursue new avenues for contrasting creative processes beneficial to sharpening a composer's skillset.

## Literature Review

### Introduction

This literature review showcases the body of research within the intersection of music technology and film scoring, aiming to leverage these insights for a comparative analysis of the art of film scoring preceding these technological advances. The three analytical themes centre around the creative process of film composition and the quality and efficiency thereof. In order to broach these areas of analysis in film music production, it is essential to regard the existing literature that mentions the three technological tools being examined in this study: DAWs, VIs, and NS.

### Digital Audio Workstations

With the current ease of access to a DAW, the diminishing demand for labour in recording studios as a result of digital music production can be brought into question. David Arditi addresses this topic in his journal article, discussing how the accessibility of the DAW has led to the combined roles of a producer working as a composer, musician and sound engineer all at once (Arditi). Through his review of the DAW's impact on the tracking and editing process in a recording studio, Arditi concluded that the role of machines replacing labour in the recording studio could not be determined. However, the shift from labour-intensive and costly studios to computer synthesis and affordable home studios is made apparent.

DAWs have changed the social relations of production in the recording industry by displacing labor from high-cost factory studio configurations to low-cost home studios as expensive equipment that used to fill large studios can be synthesized on computers. (Arditi, 516)

The discussion of the DAW's broad capabilities and the subsequent impact on producers may be applicable to the extended workload of the modern-day film composer. This could be of particular note in small-budget films where the music and sound production team are limited in numbers. Drawing from Arditi's conclusion, it can be said that the need for studio time on smaller-budget films may have depleted, posing potential benefits to the time efficiency in film music production. Additionally, this research can help address the developments in the creative process of film scoring that the composer/producer's newer responsibilities bring.

The drawbacks in efficiency are also present in the DAW, considering the multitude of software and the necessity of a composer and orchestrator's fluency across this range. Music lecturer Ian Sapiro highlights this in his book, "Scoring the Score: The Role of the Orchestrator in the Contemporary Film Industry" (Sapiro). He refers to an interview with composer Richard Gibbs wherein the director wished to hear cues before the recording sessions, resulting in him shifting from his usual hand-written approach.

. . . everything took twice as long because as well as the sequenced cue he also had to prepare a sketch for the orchestrator. (Sapiro, 91)

The layout of a DAW and its availability of functions, such as dragging and dropping, cutting and pasting, and the undo command, all while having instantaneous playback, can influence the creative approach of a composer. This is explored in the third chapter of Robert Strachan's book, "Sonic Technologies: Popular Music, Digital Culture and the Creative Process" (Strachan). In this chapter titled "Digital technology and technique in the creative process," he suggests that the myriad editing and rearranging tools prompt the composer to experiment and work off a trial-and-error creative process. This is contested in Furduj's doctoral dissertation on the creative use of the DAW in film scoring (Furduj). Employing the



primary research of ten composers, Furduj identifies their technical approaches to gauge an understanding of their methods of composing with technology. The conclusion is reached that the compositional process with a DAW entails effective organisation and meticulous preparation as foundational steps as opposed to the trial-and-error proposed by Strachan (Strachan).

Engagement with composers of today allows for a comparative analysis of their techniques in composition with music technology, juxtaposed against the findings derived from Furduj's conclusions. The present research's examination of two approaches to a client project – with and without the use of a DAW in the creative process – likewise provides the opportunity to support or challenge these ideas. In addition, this client production will document the ability to sync audio to video, a feature of DAWs absent from the mentioned literature.

### Virtual Instruments

Determining a composer's proficiency in employing VIs can be surmised by discerning the purpose behind their usage. This can be divided into three categories: recreating acoustic sounds, generating unnatural synthetic sounds, and combining elements of each to create a hybrid of synthetic and virtual acoustic. This study, however, will concentrate on the first category.

Composer and associate professor in music technology Eve Klein explores the act of recreating acoustic sounds and human performance with virtual instruments in her journal article titled, "Feigning Humanity: Virtual Instruments, Simulation and Performativity" (Klein). The piece delves specifically into the application of virtual orchestral instruments and virtual singing instruments, critically analysing the accuracy of their realism and how it is achieved through their design and user interaction. The article's in-depth search into both the

macro and micro features of virtual acoustic instruments (VAIs), such as room acoustics, player articulations, and dynamic and expressive nuances, demonstrate the sound manipulation capabilities that work towards producing the resemblance of human performance. This can guide the present study in researching the parameters within virtual instruments and how they are used by composers to replicate the respective acoustic sounds. Further conversations with composers will refine this body of research, possibly revealing additional inventive applications of virtual instruments and their parameters.

An idiomatic approach to writing for VAIs is adopted by the composer when producing a realistic sound, as discussed in Sundstrup's dissertation (Sundstrup). Through comparison of acoustic instruments and VAIs, the idea that the limitations of each should be considered is presented in this study. One of the potential issues Sundstrup brings attention to is the repetitive nature of certain sample-based instruments as a result of the same dynamics and attack being triggered with repeated notes. Absent of the varying dynamics and tone of acoustic sounds, the VAI is notably artificial. Minor adjustments to dynamic and timbral parameters available to the VAI help to combat this limitation.

While the importance of idiomatic writing with VIs is expressed in the mentioned resources, further discussions with composers of today could grant a fresh examination into the unique applications of technology for producing realistic-sounding instruments. Combined with the focus on the application of synthesized sounds and the intricate interplay of synthetic and virtual acoustic elements, further analysis will enhance the existing body of research on VIs in film music.

The act of fusing VAIs and acoustic instruments is often used to enhance the sound quality of a film score. Composers Fred Karlin and Rayburn Wright review this method in Chapter Twenty of their book "On The Track: A Guide to Contemporary Film" (Wright).

Case studies of James Newton Howard and Harry Gregson-Williams illustrate how the prominence of the virtual and acoustic in an orchestra is interchangeable. In certain cues, a virtual orchestra can support the live recorded orchestra; in others, the VI sounds are at the forefront. Karlin and Wright refer to a quote from James Newton Howard on doubling the orchestral hits on specific sections with VIs from orchestral sample libraries.

Sometimes I will take sampled orchestral hits and double my orchestra hits and sample marcato strings from my library and double the orchestral marcato strings because people always expect the strings to be louder than they are.

(Wright, 371)

The composer interviews in the present study may provide a deeper understanding of these applications in virtual and acoustic blending.

### Music Notation Software

The collaboration between departments within a production and its effectiveness can be crucial to reaching a deadline efficiently. Technology's impact on this cooperation is investigated in Chapter Four of Ian Sapiro's book (Sapiro). This chapter, titled 'Impact of Technology,' the relationship between the orchestrator and the composer is considered with regard to the handover of MIDI mock-ups or audio stems as opposed to the traditional handwritten composer's sketch. While these alternative handover mediums can be translated into musical notation, Sapiro notes the difficulty of producing an orchestrated score from MIDI that may have issues such as unquantised rhythms and unnecessary notes. Translating the composer's work puts pressure on the orchestrator to recreate the demo under time constraints. The piece's research into the composer's use of notation software in their mock-ups and sketches benefits the present study's examination of the time efficiency of the film score production. It likewise aids in demonstrating the potential issues the stated technology

can pose on the collaboration between the composer and orchestrator. The room for further inspection on this topic remains open with recent advancements in notation software and the accuracy of MIDI to notation conversion.

Referring back to Fred Karlin and Rayburn Wright, they talk about the efficiency of using mock-ups and how they are created digitally in Chapter Seven, titled “Demonstrating the Score: Mockups and Electronics” (Wright). It compares the process of handwriting and electronically producing a mock-up with composers such as James Newton Howard expressing their preference for the latter. In contrast to the highlighted benefits of notation software and mock-ups for a composer, Ian Sapiro suggests the technological drawbacks for an orchestrator when the composer delivers a midi mock-up (Sapiro). While this talks about the efficiency of technology, advancements have been made since the release of this book in 2004. Hence, further developments in technology and its correlation to the efficiency of film scoring can be explored in the current research.

As explored by Arditi, the capabilities of the DAW frequently possess a direct influence on the presence of and necessity for certain roles of labour in music production (Arditi). Likewise, advances in NS can impede the collaborative experience existing within the creative process of film scoring. This is explored in Jeremy Borum’s book, “Guerrilla Film Scoring: Practical Advice from Hollywood Composers” (Borum). In Chapter Seven, titled “Score Preparation”, Borum notes the lack of music notation knowledge among famous composers and the workarounds they avail of to notate their scores, namely working with orchestrators and music copyists. The advent of certain DAW’s built-in MIDI to notation conversion presents itself as a cheaper approach for productions where the composer is unfamiliar with NS. From this, it can be ascertained that the presence of such technology signifies the diminishing need for collaboration with an orchestrator. The creative process is, therefore, altered, with composers working independently of an orchestrator’s creative input.

Despite the subsequent benefits to time efficiency this can bring, Borum contends that refining a score in NS is preferable to a DAW's translation to notation, particularly in ensuring a seamless operation in a recording session.

. . . printing from inside your DAW is only a quick and dirty solution. You are better off moving your MIDI into a proper music notation platform . . . as soon as your recording sessions get expensive enough that you don't want them unnecessarily interrupted. (Borum, 87)

The effect NS can have on creativity is investigated in the journal article titled "Elementary Students' Music Compositions with Notation-Based Software and Handwritten Notation Assisted by Classroom Instruments" (Kang). Thirty-seven elementary students were tasked with composing melodies through the NS MuseScore 2 and handwritten five-line staff notation, respectively. It was discovered that creativity ratings, judged by music educators, were higher for the student's compositions using NS over the handwritten approach. Craftsmanship, defined in the study as "the degree to which a piece of music is coherently organized with a clear beginning, middle, and end" (Kang, 36), was scored higher when students composed by hand. The study's exploration of the creative process differences of composing with and without the aid of NS assists in tackling the research question. While this experiment's benefits to education in music technology and composition are readily apparent, the findings can be tested against the client-based compositions of the present research's methodology to support or contrast the conclusions of this resource. The utilisation of MuseScore 4 in the methodology could also refine Kang's results, considering the advancements in the updated software.

## Conclusion

The review of literature has delved into the intricate intersection of music technology and film scoring with the goal of harnessing these perspectives for a comparative analysis before and after the advent of the discussed technological advancements. While various tools, advantageous and detrimental to the creative process, the quality and efficiency of film composition were highlighted, analysis of features such as audio-to-video syncing in a DAW lacks. The presented literature establishes the areas to be addressed in the composer interviews and the dual-approach client-based assessment.

## Methodology

### Introduction

The research question posed in this study aims to identify the ways in which certain technologies can help or hinder the various facets of film scoring production. The results of the literature examination have laid the foundation for the present study's contribution to this field. A qualitative methodology and mixed method comparative analysis of two approaches to a client-based composition were undertaken in this research. These methods worked to refine the existing literature through the examination of contemporary technological practices among the composers of today. Moreover, the objective was to exhibit a clear comparison between scoring to film with and without the advent of DAWs, VIs, and NS.

### Method One

The first method of research revolved around the interviewing of five established composers. The expertise and familiarity these subjects have in the field of film scoring with technology rendered them fitting candidates for qualitative analysis. Four of the interviews took place over online calls, while one was carried out in person. They were all transcribed orthographically [See Appendices D to H]. A structured interview was considered for this method; however, the semi-structured form was conducted upon reviewing the benefits proposed by Patricia Leavy in her book on qualitative research (Leavy).

Compared to structured interviews, semistructured interviews can make better use of the knowledge-producing potentials of dialogues by allowing much more leeway for following up on whatever angles are deemed important by the interviewee; as well, the interviewer has a greater chance of becoming visible as a knowledge-producing participant in the process itself, rather than hiding behind a preset interview guide. (Leavy, 286)

The interviews centred around three themes: the creative process of composition and collaboration, the quality of the finished composition and the efficiency of the production. Recognising these themes enabled this method to concentrate on the core elements of the research question, priming the study for a thematic analysis. These themes directly aligned with the fundamental aspects of the research and formed the basis upon which the following questions were devised.

1. How do you find digital audio workstations affect your workflow and efficiency when scoring a film? Are there any particular features within the digital audio workstations that come to mind?
2. How do you find digital audio workstations affect the client relationship and the creative process within that, regarding aspects such as presenting work and receiving feedback?
3. How do you find virtual instruments affect the overall quality of your compositions in regards to achieving the client's vision?
4. What methods do you employ when trying to replicate acoustic sounds, such as an orchestra with virtual instruments? Are there any particular parameters and editing tools that aid in this?
5. Have you composed for live musicians in any projects? If so, can you talk me through any specific software you used in that process for creating a score?
6. How did this software aid in the efficiency of the production?

These questions were specifically designed to gain insight from these composers regarding their compositional process, quality of composition, and production efficiency, evaluating the influence technology has on them. They also targeted the three focal pieces of technology in this study: DAWs, VIs, and NS. Availing of a semi-structured interview allowed for flexibility in broaching relevant topics to the research that may have been absent



in the structured questions. These subject areas also aimed to stimulate the discussion of techniques that could be practically applied in the compositions of the subsequent methodology.

## Method Two

The second method was implemented after the interviews. A seven-minute short film was provided by a client, along with a brief for four cues, detailing their wishes for the music to accompany these scenes [See Appendix A]. A dual approach to this brief was utilised: one involved composing with the availability of a DAW, VIs, and NS, while the other excluded any of the specified technologies in the creative process. CUE TWO and CUE FOUR were arranged in the DAW, Ableton Live 11, availing of VIs from BBC Symphony Orchestra Core. MuseScore 4 served as the chosen NS for any notational purposes. CUE ONE and CUE THREE administered the latter approach. A Yamaha Arius YDP 145 piano existed as the primary tool; the envisioned orchestral voices were notated by hand in blank music manuscripts. While none of the stated music technologies were availed of in the compositional process of this procedure, producing a final audio product for a comparative analysis with the former approach necessitated the use of a DAW and VIs.

The creative process of producing these two compositions was documented through journaling [See Appendix B]. As the client's input was crucial to measuring the quality of the work, their own record of the collaborative experience was also required. This was accumulated in meeting notes at the start of the project as well as between each revision of the cues. While this employed a qualitative analysis, the examination of quality and efficiency undertook a quantitative analysis. Adherence to the client's brief was exhibited through a one to ten satisfaction rating from the client on each point of their brief, in addition to an overall rating of each revision. The time taken with each approach was recorded to gauge the influences technology can have on efficiency. In addition a brief qualitative

assessment of each arrangement was provided in the analysis, focusing on the innovative qualities of features such as melody, harmony and structure.

The merit of this method lay in the freedom to hone in on areas missed in the existing literature, such as audio-to-video syncing in DAWs. The findings from the review of literature also aimed to be refined in this method as the application of the stated technologies with their most up-to-date functions helps in keeping the study current.

## Conclusion

Two methods were employed in this research, supplying both qualitative and quantitative data. The semi-structured composer interviews existed to supplement the findings of the reviewed literature with pertinent questions surrounding the themes of the creative process, efficiency and quality in film scoring. The following client-based assessment analysed the impact of using DAWs, VIs, and NS in the creative process of film scoring. The comparison between the technological and acoustic approaches worked to glean insight into the creative process, quality and efficiency in film composition through mixed method data.

It is important to recognise the limitations of the present study. The sample size in the first method prompted the risk of sampling bias with these five composers, as their experiences and practices may not represent the broader population of film-scoring professionals. The semi-structured format carried the potential of subjectivity in responses, however, the variety of perspectives served to outweigh the negative of this limitation, considering the creative field the practitioners work in. The dual-approach compositions assumed that the provided client brief reflected the preferences of all potential clients. A larger sample size of composers and clients in this method would have avoided this generalisation. Regardless of these limitations, the perspectives gathered from composers, together with the practical application of two compositions, laid the groundwork for a

thorough examination of the dynamics between technology and film scoring in the following results section.

## Analysis

### Thematic Analysis

Thematic analysis is an effective way of categorising themes within a pool of data (Braun). According to Braun and Clarke, coding is an iterative process of structuring data with codes that “identify and provide a label for a feature of the data that is potentially relevant to the research question” (Braun, 67). Two types of codes mentioned in their text were utilised in this study.

1. Descriptive/Semantic: Codes that highlight the surface meaning of a text
2. Interpretive/Latent: Codes that identify meanings within the subtext of a participant’s answer

The following codes were surmised from the data as subsets of the three main themes of this research.

Theme One: Creative Process	Theme Two: Quality	Theme Three: Efficiency
Collaboration	Client Satisfaction	Adaptability
Composing	Homogenous Sounds	Feedback
Mixing	Profession Degradation	Notating
Notating	Realism	Workflow
Video Syncing		

The composer interviewees will be referred to in this analysis by their initials: Emer Landers (EL), Jake Morgan (JM), Ross O’Connor (RO), Natasa Paulberg (NP), and Kevin Whyms (KW).

## Theme One: Creative Process

### *Composing*

Amongst the interviewees' responses, the general consensus surrounding the approaches to composition was that the founding of creative ideas primarily unfolded within the DAW.

“ . . . for me and a lot of composers, we do all our kind of creative writing in there.” (NP)

In contrast, Emer felt that composers should have a plan before opening the session, adopting the DAW as an “input software” for inserting ideas as opposed to designing them.

### *Notating*

All interviewees shared similar processes for creating scores. This consisted of duplicating the session in their DAW and applying hard quantisation to all the MIDI notes before importing that information into the NS.

“ . . . everything needs to be quantised, hard quantised.” (NP)

### *Video Syncing*

When asked about the process of lining music up to the film, interviewees pointed towards the various features of the DAW they utilise to sync their cues to video, such as markers and the tempo track.

“ . . . you must have a timecode on the picture, and it's synced with the timecode of your DAW . . .” (NP)

“ . . . this tiny little section of a bar here going up to 190(BPM), it's basically getting this bang in sync, and you see, nothing's actually happened in that bar. . .” (KW)

Other participants, such as Jake, alluded to the modern creative practice of composing alongside the film's visuals in real-time.

“ . . . being able to play the video and be able to play the music along with it. I mean, it sounds so simple, but that’s one of the majors for me.” (JM)

#### *Mixing*

The tasks involved in producing mock-ups as well as a polished audio mix were brought up by the interviewees. These production skills were identified as a major part of the creative process in modern film scoring, particularly for composers working on low-budget projects.

“ . . . the bigger the budget . . . you’d have someone mix the piece . . . the lower the budget, I suppose, the more you have to do.” (JM)

#### *Collaboration*

The complexity of these additional responsibilities for the modern film composer can often be overlooked, resulting in high expectations from clients.

“ . . . they perceive it as being like a film edit . . . Could we just move that scene? Can we use the other take for that? . . . I had to reorchestrate the whole section you didn't like . . . So, they don't understand the time it takes . . .” (RO)

### Theme Two: Quality

#### *Profession Degradation*

The increased accessibility of film composition is a theme that arose in many of the interviews. This “oversaturation of people”, as Ross puts it, results in poor arrangements due to the lack of backing up material with theoretical knowledge.

“ . . . it's disappointing when you hear scores, and you're like that's just a garage loop . . . that degrades the profession . . .” (NP)

While some of the participants supported the expansion in aspiring film composers they agreed with the sentiment of a quality drop in areas of the industry.

“ . . . more people can do it, which is a good thing, but also, it can lower the standard a little bit . . . and that's why the amount of scores nowadays that are produced that are in the key of C at 120 BPM.” (KW)

#### *Homogenous Sounds*

Each interviewee picked up on this trend touched upon by Kevin about many film scores sounding like they all come from the same place.

“ . . . sometimes people can hear the same virtual instruments in different scores on television, and I'm like "Oh, that's that patch from Omnisphere," I know it because I've used it” (NP)

“ . . . everybody is using the same sample libraries. Eventually, everything starts sounding the same . . .” (JM)

Natasa shared her audio processing strategies for ensuring a unique sound, including adjusting microphone placements and levels, reverb and mixing libraries. She stressed the pitfall of using presets and the default parameter settings of a sample.

#### *Realism*

When asked about manipulating VAIs in the context of resembling their acoustic counterparts, interviewees shared tactics such as offsetting notes on the grid, drawing lines for expression or automating the MIDI CC data with a modulation wheel and mixing libraries. In addition, Natasa and Emer affirmed Wright’s stance on the benefits of virtual-acoustic blending (Wright).

“ . . . I would mix the live orchestra with sampled orchestra to create a fuller sound” (NP)

“ . . . I always will have at least one solo instrument . . . to make it sound like it's an ensemble playing” (EL)

The importance of idiomatic writing also arose, outlining the detriments of “writing for samples” as Natasa puts it.

“ . . . you forget what a live orchestra can do that samples can’t.” (NP)

Emer extended this observation to encompass specific faults a composer inept with music theory can encounter with VIs. One such scenario posed how a composer could play a chord in a two-trumpet patch, resulting in the output of six trumpets when that sound may not have been the intention. Idiomatic knowledge, such as understanding the effect different registers have on the dynamic qualities of an instrument, was also addressed.

“ . . . they'll put it really low in volume against the rest of their arrangement, which is not how it would naturally sound, but it's something that you can do in a DAW . . .” (EL)

#### *Client Satisfaction*

Sending mock-ups containing an accurate depiction of the final product for a project significantly aids in the feedback process with clients. Ross illustrated this by contrasting it with an unfortunate scenario where a client is only able to hear a cue on the day of recording and disapproves. Natasa expressed a similar sentiment, defining the drawbacks of relying on piano sketches wherein a client “can’t imagine” how the final piece will sound. Ross likewise shared his preference for accurate mock-ups.

“ . . . it's a great positive step for directors and producers . . . it gives them a level of criticism that they wouldn't have had without it . . .” (RO)

The influence of a mix’s production quality on a client’s approval of a cue was speculated by interviewees.

“ . . . they might hear a piece that's not necessarily well composed but sounds glossy and shiny, and they might prioritize that . . .” (EL)



Ross, while sharing the same view, noted that the quality of VIs did not inherently make “a bad arrangement” better than “a good arrangement on the worst virtual instruments”.

### Theme Three: Efficiency

#### *Workflow*

The most common trend amongst the interview data was the emphasis on music technology’s aid in time management and workflow. Features such as templates proved how, as Natasa stated, “the DAW is a way to be speedier”. Emer added how templates can also be utilised with NS, where she has “engraving rules” in Sibelius, meaning the layout is designed for optimal workflow.

“. . . my bar numbers always look a certain way . . . to save yourself inputting the same things every single time . . . when you're time-crunched.” (EL)

The consensus around NS was that while the technology is quicker and more efficient than handwriting, the act of converting MIDI into digital notation is still a long process. Emer’s suggestion to use negative delay with samples acts as a solution that negates the tedious process of offsetting notes in the DAW and creating a duplicate session to export to the NS.

#### *Collaboration*

While Jake noted that with mock-ups, “the feedback process is much more efficient”, he suggested the issues of cross-compatibility when collaborating with composers and assistants using other software or operating on a different update. This issue aside, Ross spoke of the convenience of working with people abroad, wherein one can send a session to a collaborator and have it returned with their integrated changes. In a collaborative setting with an orchestrator or music copyist, the legibility of digital notation was likewise noted to cause fewer interruptions in workflow.

“ . . . my shorthand is brutal, you know, for sheet music. I can read it, you know, but no one else could.” (RO)

#### *Adaptability*

Another advantage of music technology addressed by the interviewees was the ability to make quick adjustments to a cue when on a tight schedule. Ross contrasted this with the handwritten struggles of scribbling stuff out and amending errors in transpositions that the instant playback of NS would have highlighted.

“And that's the great advantage of virtual instruments. They want it in a different key, you grab it, and you do it . . .” (RO)

#### *Comparative Analysis*

##### *Theme One: Creative Process*

##### *Handwritten Approach*

CUE ONE and CUE THREE began at the YDP 145 digital piano, experimenting with ideas while watching through the scenes. Scoring to the video involved a methodical plan of the location of hit points and duration of the cue in relation to the video frames per beat. This, along with cue sheets, was established before putting any notation on paper. The piano sketches were expanded into seven to ten voice sketches. Melodic material from the right hand of the piano sketch and accompaniment from the left hand were distributed across orchestral instruments to test potential textures. These were then refined in the final score, utilising the YDP 145 to justify the harmonies.

##### *Technology Approach*

CUE TWO and CUE FOUR were completed in Ableton Live 11, utilising VIs with a MIDI keyboard. In both cases, an accompaniment was established and looped, atop which melodic ideas were generated in a trial-and-error approach. In the revisions of each cue, additional voices were layered, availing of instant playback and the loop function to explore harmonies and potential counterpoints through humming. The film's scenes, with timecode,

were placed into the arrangement view of the DAW. Markers and the ability to play VIs in real-time to the video were employed in the process of video synchronisation. Upon Kevin's suggestion, automation of the tempo track was applied to reach certain hit points.

#### Theme Two: Quality

##### *Client Ratings*

The final scores of CUE TWO and CUE FOUR received an overall rating of ten, displaying an increase from the scores of eight and seven in the first revision. CUE ONE scored seven, a decline from the previous sketches' scores of eight and nine. CUE THREE scored nine in its final revision, remaining unchanged from the second mock-up.

##### *Arrangement*

CUE ONE showcases counterpoint, dissonant intervals, and variations in harmonic rhythm. The piece also portrays a discernible narrative, steadily building to a climactic resolution.

CUE TWO exhibits two distinct sections, primarily homophonic in texture. The accompaniment is repetitious, displaying few changes in harmonic rhythm.

CUE THREE exhibits three distinct sections with a tempo change, time signature changes, counterpoint and little repetition of phrases.

CUE FOUR consists of an eight-bar pizzicato accompaniment that repeats for the entirety of the piece. The melody contains repeated diatonic notes and little movement in terms of pitch range aside from minor leaps to accommodate sequences of the main motive.

#### Theme Three: Efficiency

The approximate time spent on CUE ONE and CUE THREE was thirty-six hours and fifty-five hours, respectively. In each case, an hour was dedicated to discerning the suitable tempo and the location of hit points within the measures considering the frames per beat.

CUE TWO and CUE FOUR amounted to ten and six hours of work. It should be noted that

each revision of CUE TWO and CUE FOUR was conducted in one sitting, while the others involved continuous breaks. Interruptions in workflow were more common in the handwritten approaches, particularly surrounding transposing instruments.

## Discussion

### Theme One: Creative Process

The DAW has positioned itself at the centre of many composers' working environments, from the initial steps in conjuring themes and compositional ideas all the way to structuring and refining the arrangement. Considering the findings from the combined analyses, the creative procedures and the resultant artefacts of composing could be argued to be influenced by the stated music technology. The ability to loop a section and gradually layer voices over a single phrase, along with instant playback, are two of the most liable functions in regard to this claim. This conclusion supports the trial-and-error approach proposed by Strachan in relation to the impact of working within a DAW (Strachan). Emer's suggestion to view the DAW as software for inputting ideas instead of formulating them could combat this approach, refining the structure and narrative of a piece.

The need for music theory knowledge to be a film composer has declined. However, to be a film composer working with live arrangements, theory knowledge remains imperative. The comparative analysis showed that while MuseScore 4 helped with transpositions, composing for a large ensemble required idiomatic knowledge of the instrumentation to avoid the pitfalls listed by interviewees. The impact NS has on the diminishing existence of composer and orchestrator collaborations was gauged from the interviews. This could be a result of the software's aids in various tasks, such as transposing, which minimises the required scope and proficiency of one's music theory knowledge. This demonstrates how NS has allowed composers to maintain sole authorship in the creative process without external inputs from orchestrators, confirming the interpretations of Borum's findings (Borum). The act of triggering VAIs using a MIDI keyboard controller can also result in a "writing for samples" frame of mind. The technology allows composers to produce sounds that aren't realistic on the respective acoustic instrument. This can be beneficial if an unrealistic electronic orchestra hybrid sound is the intent of the project, but for an acoustic replication,

this is an aspect of the technology to be wary of. This further illustrates the importance of idiomatic writing when working with VAIs or arranging for live performers.

A knowledge of mixing and mastering, in this case, proves essential for the modern composer, particularly on lower-budget projects. The creative endeavour now demands greater investment into producing quality audio as opposed to the music theory and arrangement qualities traditional composers were primarily valued for. This complies with the combined roles of producer and composer mentioned in Arditi's examination of the DAW and studio labour (Arditi). Moreover, the proficiencies of music technologies have led directors to expect composers to fulfil these roles, capable of making changes to a cue in an instant, akin to the custom of a film edit.

#### Theme Two: Quality

As identified in both CUE TWO and CUE FOUR, the accompaniment is highly repetitive. The rationale behind this outcome may stem from the creative process of exploring melodic ideas with VIs atop a looped accompaniment, a practice encouraged by the features available in a DAW. This line-by-line approach to composing, while still applicable, appeared to be less detrimental to the innovation of the handwritten cues. This could be attributed to the process of establishing melodic and harmonic material in a simple monotonal sketch and then gradually introducing complexity when layering voices in incremental steps. The conclusion can be made that being restricted to one instrument in the composition process can help inspire creativity. This is due to the necessity to be more innovative when not exposed to VIs, which produce an impressive sound on even the simplest arrangements. In a similar vein, the choice paralysis induced by the vast libraries of VIs and the luxury of having an orchestra at a composer's fingertips with instant playback can hinder creativity. Despite the present research's focus on large ensemble composition,

this proposition could supplement the craftsmanship benefits highlighted in the study with handwritten practices in elementary music education (Kang).

The constraints of working with sketches become apparent during the client feedback process. As observed by interviewees and further demonstrated in the compositions of the study, clients struggle to envision how a fully orchestrated cue will sound based on a piano sketch. The drop in the client's quality ratings in the final score of CUE ONE emphasises this further. In contrast CUE TWO and CUE FOUR boasted a consistent ascent in quality ratings with each revision. This underscores how sending mock-ups of a cue with high-quality audio allows for clearer communication and enhanced satisfaction within a collaboration between composer and client.

The widespread availability of music technology has led to an influx of composers, particularly those without the opportunity to study traditional music theory. The quality of these composers' arrangements may be worse because of it. On the other hand as convened by some of the interviewees, the playing field is levelled, potentially granting opportunities for innately gifted composers unable to afford a formal music education. This accessibility can also be attributed to the emergence of homogenous sounds. A vast array of parameters are available with VIs, however, possibly as a result of the high quality of the default patches, some composers feel less inclined to avail of them. This leads to the frequent occurrence of similar-sounding timbres across film scores, as mentioned in the interviews. The art of manipulating and tweaking patches with microphone placements, reverb and layering to establish a unique sound becomes increasingly important as the film composer population rises. These inventive applications add to Klein's exploration of manipulating the timbres of VIs (Klein).

### Theme Three: Efficiency

The time spent on cues written by hand increased with each revision as the pieces were expanded from piano sketches to orchestral scores. Conversely, the time taken with cues composed in the DAW decreased with each revision. This displays how the bulk of the work is predominantly accomplished within the early stages of the writing process when working with music technology, as opposed to the increasing workload evident in handwritten practices. The creative workflow appeared more fluid with the aid of music technology, considering the necessity to take frequent breaks with the handwritten approach. The interview responses added to the benefits of time management with organisational features such as templates. Working with NS can still be a frustrating and slow process, supporting Sapiro's discussion on the difficulties of MIDI to notation conversion (Sapiro). Emer's suggestion to use negative delay alleviates the issues of unquantised rhythms, removing the time-consuming task of manually offsetting MIDI notes. As displayed in the comparative analysis, the preproduction required for syncing to video added time to the process, interfering with the creative writing's flow.

As highlighted in the interviews, editing features within the DAW and NS improve a composer's ability to adopt changes in their cue. In the comparative project, adjustments, particularly to the tempo, were manageable within the session, with the luxury of visualising any alterations to the video syncing in real-time. Without the DAW, any requested changes from a client that alter the placement of hit points would involve a reworking of frames per beat calculations to reframe the score. This is a time-consuming and tedious task that the advent of music technology has alleviated for composers. Additionally, this menial preproduction work can result in composers losing the creative workflow and spark.

As explored in the interviews, variances in software and update stages between collaborators can pose setbacks to the efficiency of the creative relationship. However, the



ability to share sessions with people abroad can improve time efficiency and ensure simplicity in the creative process. When compared to handwritten sketches, issues of legibility are eradicated with digital notation, saving time with the resulting absence of miscommunications traditional composers, music copyists and orchestrators may have encountered. Interviewees also highlighted the efficient feedback process of sending mock-ups. In the comparative analysis, the client conveyed the difficulty in providing notes on CUE ONE and CUE THREE. In contrast, there was no confusion when discussing the compositions conducted in the DAW and showcased to the client through mock-ups. This proves that music technology offers a superior platform for clients to share detailed criticisms on a cue, ultimately accelerating the workflow while assisting the composer in meeting the client's vision.

## Conclusion

The present study set out to identify the ways in which music technology has altered the field of film scoring and what current practitioners and aspiring composers can procure from it. The proficiencies of DAWs, VIs, and NS discussed in the findings have rendered this technology an essential tool for the vast majority of composers in the fast-paced modern industry. Within the creative process, the DAW was found to encourage behaviours of trial-and-error, while the reliance on VIs demanded more attention to production practices as opposed to music theory. Handwritten compositions appeared to reap greater complexity in their arrangements, while the availability of mock-ups was shown to aid a composer in attaining a client's vision. The speed of music technology offered improved adaptability to changes and time management, contributing to the efficiency in both the creative workflow and collaborative process.

In regards to the implication of these findings, a composer can achieve an optimal balance by adopting a mixed-method approach. While the handwritten practice may not be essential, creating mono-timbral sketches and devising a rough framework for the contour of a piece can enhance the intricacy of an arrangement while communicating a distinct intention. Following this, music technology can be leveraged for optimal workflow and refining the production for a polished result. Weighing the limitations in methodology, future research could invite multiple composers and clients to partake in the dual-approach practice, encompassing a variety of film genres. To avoid a sampling bias in the interviews, studies could expand on this topic with a larger database of professionals across different levels of expertise. This study highlights the differences in film composition with and without music technology, demonstrating that the practical benefits of traditional scoring still exist. Embracing the combination of these two approaches allows the modern composer to refine their arrangement skills and elevate their craft while meeting the shifting demands of cinema.

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## Appendices

### **Appendix A: Client Brief and Meeting Notes**

[https://drive.google.com/file/d/14bb7-1luxv8Cw4y0BZzVsVQ4s7zDwBKG/view?usp=drive\\_link](https://drive.google.com/file/d/14bb7-1luxv8Cw4y0BZzVsVQ4s7zDwBKG/view?usp=drive_link)

### **Appendix B: Comparative Analysis Journal**

[https://drive.google.com/file/d/1iotWtAyCoKOsiyy5Q7wft\\_z7t8mrmYLw/view?usp=drive\\_link](https://drive.google.com/file/d/1iotWtAyCoKOsiyy5Q7wft_z7t8mrmYLw/view?usp=drive_link)

### **Appendix C: Sketches, Cue Sheets and Final Scores**

[https://drive.google.com/file/d/1upWEU1O\\_JUKYEL5MuN5EO2GWgwcaWpSI/view?usp=drive\\_link](https://drive.google.com/file/d/1upWEU1O_JUKYEL5MuN5EO2GWgwcaWpSI/view?usp=drive_link)

### **Appendix D: Emer Landers Transcription**

[https://drive.google.com/file/d/15eU-4RBsK1uIGKj\\_kDYwn7vFGnvlCoUA/view?usp=drive\\_link](https://drive.google.com/file/d/15eU-4RBsK1uIGKj_kDYwn7vFGnvlCoUA/view?usp=drive_link)

### **Appendix E: Jake Morgan Transcription**

[https://drive.google.com/file/d/1oJJeGmFhzGhNewsaZPuN53ySlK7TVxT9/view?usp=drive\\_link](https://drive.google.com/file/d/1oJJeGmFhzGhNewsaZPuN53ySlK7TVxT9/view?usp=drive_link)

### **Appendix F: Ross O'Connor Transcription**

[https://drive.google.com/file/d/1MHrutilgKXeb9bEZKUOepqcLuAm0fi-r/view?usp=drive\\_link](https://drive.google.com/file/d/1MHrutilgKXeb9bEZKUOepqcLuAm0fi-r/view?usp=drive_link)

### **Appendix G: Natasa Paulberg Transcription**

[https://drive.google.com/file/d/1u\\_bg06SGNDwPkicUMXj0dNGj1R5p-jwe/view?usp=drive\\_link](https://drive.google.com/file/d/1u_bg06SGNDwPkicUMXj0dNGj1R5p-jwe/view?usp=drive_link)

### **Appendix H: Kevin Whyms Transcription**

[https://drive.google.com/file/d/1kBl7g\\_8z6wHhvnJ1NlnBtuisK3TK7Zdb/view?usp=drive\\_link](https://drive.google.com/file/d/1kBl7g_8z6wHhvnJ1NlnBtuisK3TK7Zdb/view?usp=drive_link)