Understanding the Influence of Digital Technology in Music Creation

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

The invention of the player piano in the early 1900s was met with strong opposition from the established people of the world of music (Pinch & Bijsterveld, 2003). Musicians, music teachers, and composers all denied the musicality of a machine that reproduced the playing of a piano, noting the importance of a musician's interpretation and technical ability to the art of music playing (Pinch & Bijsterveld, 2003). Beyond describing the music of player pianos as dull and cold, opponents also voiced fears of lower classes using the player piano to close their gap with the wealthy (Pinch & Bijsterveld, 2003). The idea of democratization of music was feared by the opponents of the player piano, but it was central to the argument of the proponents, who saw the player piano as an opportunity for wider access to music (Pinch & Bijsterveld, 2003). Arguments over the legitimacy of art hardly began with the player piano, and they would not end with it either.

The introduction of digital technology into the world of music has been the catalyst for strikingly similar arguments as those incited by the player piano. Those opposed using to digital technology in music dislike the aesthetics of digital sound and are concerned that artistic technique and legitimacy are damaged by the ease of use of digital technology. The proponents find that the ease of use benefits the accessibility of music creation and are excited by the new aesthetic and creative possibilities that digital technology brings to artists. While these arguments may appear to be a simple difference of preferences on the surface, there are unexpected roots that need to be uncovered to understand how each side formed its perspective. The mutual shaping of digital technology and music creation will be analyzed in order to better understand the social, economic, and historical influenaces on the use of digital technology in music creation.

Background

The use of digital technology in music began in the 1980s, when analog tape was superseded by hard disk drives for the storage of music (O'Grady, 2019). By the early 2000s, powerful and affordable computers were widely available to consumers and with them came the potential for almost anyone to digitally create and manipulate sound (Crow, 2006). Digital technology in music refers to the use of microprocessors and memory chips to create instruments and tools that work with sound in a discrete format, as opposed to analog music technology, which works with continuous waveforms (Wise et al., 2011). Digital music technologies are not only cheaper to build, but also make it possible to create new and complex sounds due to the power of microprocessors (Wise et al., 2011). Computers are of course the quintessential digital technology and the many music software applications like digital audio workstations, virtual instruments, and digital effects all fall under the umbrella of digital music technology.

Current literature about the impact of digital technology in music often focuses on the business side of the music industry. The music streaming services that now provide music access to most people can have their creation traced back to a shift in distribution strategy by major record labels after the potential for file sharing was made possible by the combination of digital distribution and the internet. There is some research into the artistic impact of digital technology, but this research often only considers the perspective of a single outspoken celebrity or small group. While these perspectives are worth considering on their own, a more wholistic view of the impact of digital technology can be seen by considering the formative factors of these perspectives and the interactions that shape them.

Methods

In order to understand the mutual shaping of digital technology and music creation, data in the form of arguments for and against the use of digital technology in music were collected. Arguments were collected from current literature on the subjects of technology and artistry in the music industry and yielded a diverse selection of perspectives on either side of the digital technology debate. The literature from which data was collected focused on a single impact of technology or on a small group of supporters or detractors that were outspoken on a specific topic within music and technology. By examining the interrelation of these collected arguments, it was possible to understand how they have been mutually shaped by each other and by unexpected outside forces. The collected data was analyzed for its mutual shaping by examining influencing factors across multiple perspectives and observing how these perspectives connect through their purpose within the digital technology in music debate. The arguments of the opponents of digital technology involve a distaste for digital aesthetics, a belief that digital technology is damaging artistic technique in music creation, and that the legitimacy of music is harmed by the ease of use of digital technology. The proponents of digital technology in music are excited by the new aesthetic possibilities of digital technology, find that digital technology enables new creative perspectives, and believe that the accessibility of digital technology is the key to democratizing music creation.

Arguments Opposed to Digital Technology in Music

The aesthetic difference of digital and analog technology in music is an ongoing debate among musicians, producers, and consumers (O'Grady, 2019). As one would expect, the opponents of digital technology generally prefer the sound of analog audio equipment and

disparage the sound and workflow of digital tools (O'Grady, 2019). In describing the superior sound of analog gear, words like "live," "natural," and "warm" are all used to characterize the analog output as a far more human sound than that of digital, which is derided as "robotic" and "cold" (O'Grady, 2019). Sales of old analog equipment support the voiced aesthetic preferences, as the used analog gear market has grown significantly, even with the widespread availability of cheaper and often more user-friendly digital gear (O'Grady, 2019). The interest in old analog gear is not limited to older generations who learned their craft with classic equipment, but younger generations participate in the analog resurgence as well, which can be seen most clearly in the new-again resurgence of vinyl records in the music consumer market (Harper, 2016). Music creators interested in analog gear are not limited to the second-hand market; in response to the renewed interest in analog, classic audio hardware companies have released new models of their classic gear and even developed software recreations that mimic the imperfections of their analog counterparts (O'Grady, 2019). With access to software instruments and effects, even fully digital producers can access the analog sounds of the past. However, for the purists of analog sound, a simple recreation is not enough, as they consider both the sound and workflow of analog equipment to be critical to the experience of creating music (O'Grady, 2019). One well-known and outspoken opponent of digital technology is Brian Eno (O'Grady, 2019). Labeled as the "professor of audio," "professor of pop," and "brainiest person in pop," Eno is an important figurehead in the history of creative and artful music production (O'Grady, 2019). Coming from a time where digital gear was yet to exist, Eno used the technologies of the time like tape loops and analog delays to innovate in his field (O'Grady, 2019). Considering his history with pushing analog gear to its limits, it is unsurprising that Eno would continue to prefer the analog gear that he knows best. In addition to claims about the superior sound quality, Eno expresses his

preference for working with analog gear as a matter of his desire to create music with a hands-on approach (O'Grady, 2019). Analog techniques like tape-looping are a precise art, with the consequence of a mistake being a wasted recording and wasted time (O'Grady, 2019). This is a stark contrast to its digital equivalent, where looping a piece of audio may literally take a single click of the mouse. There are no consequences for mistakes either, thanks to non-destructive digital editing and the ability to undo any action. To artists that have grown up with digital tools, Eno's work is easy to overlook in its significance due to the changes in technical difficulty as technology shifted away from analog (O'Grady, 2019).

Changes in technical ability required by producers are part of the larger question of legitimacy in music creation. Opponents of digital technology observe the increasing ease of access to music creation that digital tools provide, and ask the question: who actually deserves to be called an artist (O'Grady, 2019)? Historically, art and music schools acted as a source of legitimacy for musicians, and with schooling came the technical discipline that an artist was expected to have (O'Grady, 2019). Expensive recording technology also contributed to a distinct separation between the professional and amateur, with the latter being unable to reproduce sounds of the same quality as professionals due to their limited access to recording studios (O'Grady, 2020). Digital technology has greatly diminished this divide with cheap and available audio gear that is capable of capturing and creating sounds of a quality that is indistinguishable from a professional studio (O'Grady, 2020). Considering the shrinking gap between the sound of professionals and amateurs, opponents of digital technology use elements of technical ability to assign legitimacy (O'Grady, 2019). The result is that opponents consider the ease of use of many digital tools to diminish the artist's control over the music, making the music a less authentic creation than something made using years of experience with an instrument or analog technology

(O'Grady, 2019). The issue of artist control and intention has existed in music before the creation of digital technology and even before the creation of electronic instruments, but it was reignited in a new age with the introduction digital tools (Pinch & Bijsterveld, 2003). The lower amount human control over the editing process in a digital workflow and the use of instruments like samplers that replay recorded sounds raise concerns over music being deprived of expression and losing aesthetic diversity (O'Grady, 2019). Aesthetic concerns are also raised over the use of lossy compression in the distribution of music (O'Grady, 2020). Lossy compression is a process in which the size of a digital music file is reduced at some cost to the sound quality (O'Grady, 2020). For storing large digital libraries of music and streaming music over limited internet bandwidth, compression is an important process, but its effect on the music quality is harshly criticized by some musicians, producers, and consumers with interest in high fidelity sound (O'Grady, 2020). Listeners claim the sound of lossy compressed files becomes distorted and unnatural, and artists raise concerns about the loss of data causing the complexity of their work on the music to go unheard by the majority of listeners (O'Grady, 2020). Artists raise similar concerns about the equipment on which their music is being listened too, blaming basic gear like cheap earbuds and laptop speakers for ruining their music for listeners (O'Grady, 2020). The negative effects of lossy compression and budget listening environments exist in contrast to the preferred studio-grade gear that the critical artists use to create their music (O'Grady, 2020).

Arguments In Favor of Digital Technology in Music

Unlike the opponents of digital technology, the proponents see the aesthetic possibilities of digital technology as a benefit of its use. The new ways to interact with sound that digital

technology affords is a level of control and granularity wholly unique to digital tools (Jones, 2000). Digital copying and editing do not damage the quality of the sound, encouraging a mindset of consequence-free exploration and creativity (O'Grady, 2019). A digital context for sound editing, creation, and visualization also allows artists to think about music in novel ways as a direct result of the use of digital technology (Brown, 1995). The internet and the growth of streaming are other digital technologies that act as sources of inspiration for artists. With steaming, artists have access to so much music to learn and take inspiration from that it would be impossible for them to experience all of it (O'Grady, 2020). The wide range of musical history available to artists through the internet sometimes manifests in a maximalist aesthetic, where countless sources of inspiration and samples of sound are combined to form music that is clearly tinted with the influence of the internet age (Harper, 2016). Although this "internet music" aesthetic has been criticized as cheap and inauthentic, the work of these musicians has also been praised as artistic commentary about the very lack authenticity of the internet, validating the artistic possibilities of the digital technology that these artists use (Harper, 2016).

Proponents of digital technology also see its potential democratize music creation through accessibility. The DIY musical aesthetic is usually attached to the punk genre, but with the availability and low prices of digital music gear as compared to traditional instruments and analog gear, the ability to create homegrown music has never been more real (O'Grady, 2020). Amateur artists can put together simple home studios and make music that rivals the sound quality of professionals (O'Grady, 2019). A home studio could be as simple as a computer with free audio software, and with internet access, an artist could even distribute their music online (O'Grady, 2020). The accessibility of digital music technology also has the power to encourage new musicians to take their first steps in music creation by being easier to use than analog gear

and easier to learn than classical musicianship, especially for young artists who are already comfortable with computers (Wise et al., 2011). The combination of increasingly cheap computers and free music software can create new musicians without the difficulty of traditional music education (Wise et al., 2011). Digital technology also provides education opportunities of its of own, with the huge number of internet resources that are available for amateurs learning to use digital music technology (Cascone, 2000). The communication potential of the internet makes it easy for artists of similar skill levels to connect and learn together, which is a sense of community and encouragement that would be difficult or impossible to find without digital technology (Ebare, 2004).

Analysis

The first argument of the opponents of digital technology that will be analyzed is their aesthetic preference for analog sounds and distaste for digital. Aesthetic preferences can be understood as more than simple personal tastes, as they are formed through both the holder's unique experiences and their participation in social groups (O'Grady, 2019). In the case of the opponents of digital technology who prefer analog sounds, one influencing factor is their history with the old technology, so their taste for analog is a result of nostalgia and preference for the technology they know best. Beyond the impact of history, preference for analog sounds can also be explained by the artist's desire to protect the significance of their previous work. This is especially clear in the case of Brian Eno, whose status is closely tied to his history with analog technology (O'Grady, 2019). Eno's work with techniques like tape looping are made easy with digital technology, so by continuing to favor analog means of production, Eno can retain the status associated with his pre-digital work (O'Grady, 2019). A final influencing factor to

consider in the analog preference debate is that of price. Although expensive digital music tools certainly exist, the price range reaches much lower than analog tools, making analog gear an option for only the artists who can afford it, which is a group that most amateurs do not belong to. If only established artists use analog technology in their production, then it follows that the idea of analog would come to represent a more professional sound as a result of the economic divide created by the pricing of the gear. The growth of the pre-owned analog gear market and the reissuing of classic hardware can be seen as consequences of amateur and semi-professional artists' desire for what is perceived as a more professional sound.

Digital opponents' concerns about the loss of technique and authenticity can also understood in a context of historical defensiveness and economic influences. Traditional training and music schooling are far less important to music creation with the prevalence of modern tools and jobs like that of the session musician have been threatened by the introduction of easy-to-use instruments (Pinch & Bijsterveld, 2003). With this context, negative responses to the lack of expression afforded by digital tools are not only a consequence of the tools, but also a reaction by musicians who feel like their education and experience are being undercut by changing technology and want to protect their job security.

The proponents hold opposite views on the matter of ease of use. Rather than focusing on a potential loss of expression, they set their sights on the improvements to accessibility that digital technology provides. There are many factors that help digital technology support accessibility, with the most obvious and significant being the low prices of digital music tools. The low prices are not only important for their direct impact on accessibility, but also in their use in encouraging potential artists that music creation is not out of reach. The historical need for schooling, technical expertise, and expensive technology can be highly discouraging for

amateurs, but each of these roadblocks is subverted by digital technology. Continuing the theme of contributing to accessibility is the communication and distribution potential of the internet. When physical music distribution was the only option, distribution at any scale was near impossible for amateurs, but with digital music files and online sharing platforms, distribution is not only free for amateurs, but they could even profit from it. The ability of the internet to connect groups of people with similar interests from around the world is also valuable for encouraging and educating amateur artists. Having a group of peers to learn and grow with would be nearly impossible before the internet. The accessibility of music creation is strongly impacted by digital technology and the increase in new amateur artists has resulted in the market for accessible music technology growing even larger, with the emergence of increasingly cheaper digital hardware and cheap and even free music software.

The new aesthetic possibilities of digital technology are also championed by the digital proponents. Shaping the aesthetics most strongly are the influence of the information access of the internet and creative freedom of artists experimenting with new technology. Artists with the majority of musical history available at their fingertips are saturated with inspirations and the time cost of seeking out niche sound cultures has been reduced with the community building of the internet. In addition to the inspiration of history, the inspiration of new technology is important as well, with digital technology providing a toolset that allows audio to be manipulated in entirely original ways. Although the opponents of digital technology would consider these tools less expressive than traditional instruments, the detail and level of control that is possible if the artist wants has never been greater, making original sound creation a common practice.

Responses of digital proponents to the detractors in the form of music exist in the internet music aesthetic: a style that seems to respond to critics of digital technology by reveling in the

excess of information, connectedness, and control that digital technology provides. As an aesthetic that was born out of a digitally saturated society, it exists due to the viewpoints of both the proponents and opponents of digital technology. The artists understand the concerns of digital opponents, especially in issues like the lack of humanity in digital art, but rather than reject the digital technology, they respond to these concerns with creations in the medium they know best: digital music.

Conclusion

Like the turbulence caused by the player piano in the early 1900s, the introduction and growth of digital technology in the world of music reveals imbalances and interconnection among elements of society, history, and art. The hidden sources of preferences for analog or digital sounds give insight into how artists of different generations react to changing technology in their field. Many established musicians seek to entrench their place is musical history by consecrating their technology of choice and new artists dive head first into the technology they find the most accessible, creating a further technological division between the already divided amateurs and professionals. Both groups gravitate to the technology that they are used to, and aesthetic preferences and ideas about legitimacy and authenticity in art grow from there. Although opposition to digital technology has had no observable effect in stopping its growth, the impact on how the legitimacy of digitally created music is viewed is not insignificant, and it is important to recognize the many variables at play when these judgements are made. Qualifying digital technology as having a distinctly positive or negative effect on music would fail to understand the history, complexity, and interconnectedness of the many participants in music creation.

References

Brown, A. (1995). Digital technology and the study of music. *International Journal of Music Education*, *os-25*(1), 14–19. https://doi.org/10.1177/025576149502500102

Cascone, K. (2000). The aesthetics of failure: "Post-digital" tendencies in contemporary computer music. *Computer Music Journal*, *24*(4), 12–18. http://www.jstor.org/stable/3681551

Crow, B. (2006). Musical creativity and the new technology. *Music Education Research*, *8*(1), 121–130. https://doi.org/10.1080/14613800600581659

Ebare, S. (2004, February 2). Digital music and subculture: Sharing files, sharing styles. *First Monday*, *9*(2). https://firstmonday.org/ojs/index.php/fm/article/download/1459/1374/14662

Harper, A. (2017). How internet music is frying your brain. *Popular Music*, *36*(1), 86–97. https://doi.org/10.1017/S0261143016000696

Jones, S. (2000). Music and the internet. *Popular Music*, *19*(2), 217–230. http://www.jstor.org/stable/853669

O'Grady, P. (2019). The analogue divide: Interpreting attitudes towards recording media in pop music practice. *Continuum*, *33*(4), 446–459. https://doi.org/10.1080/10304312.2019.1626348

O'Grady, P. (2021). Rethinking criticism about lossy compression: Sound fidelity, large-scale production and audio capital in pop music. *Convergence*, *27*(4), 1075–1091. https://doi.org/10.1177/1354856520976454

Pinch, T. J., & Bijsterveld, K. (2003). “Should one applaud?”: Breaches and boundaries in the reception of new technology in music. *Technology and Culture*, *44*(3), 536–559. http://www.jstor.org/stable/25148160

Wise, S., Greenwood, J., & Davis, N. (2011). Teachers’ use of digital technology in secondary music education: illustrations of changing classrooms. *British Journal of Music Education*, *28*(2), 117–134. https://doi.org/10.1017/S0265051711000039