

AND TECHNOLOGICAL MEDIATION

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Abstract

Digital audio workstation Ableton Live affords contemporary musicians to utilize a vast variety of creative tools. Music technologies are developing with a very fast pace. Development of digital audio workstations in general began developing only 60 years ago and become widely used since about 40 years ago. According to Ihde these tools are not passive but are involved in technological mediation between a human, the technology and the world. Ableton Live provides with a set of tools which transforms creative practice of contemporary electronic music musicians. In this paper through Post-Phenomenological lenses is explored how this software changes the way musicians perceive music notation system, visualize various previously not possible too visualize sonic elements and change meaning of virtuosity in music production.

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1 Introduction

This paper is about one of many Digital Audio Workstations (DAWs) - Ableton Live. DAWs in general is a technology which is both very novel because it became widely used in music production only by the very end of the 20th century (Dean 2009) and keeps evolving, but at the same time it is an every-day creative work tool of so many if not the most contemporary music makers. If not directly, then used by someone else in the chain of production of their music. The roots of my interest in this topic comes from being one of these everyday users of DAWs. I learned about, experimented with and used various digital audio workstations while studying BA in Music Technology and Industry, before these studies and of course after finishing them. My creative path in music making started when I was about 15 years old and stemmed mostly from rock music and experimenting on acoustic and electric guitars and singing. However, while in high-school I became strongly interested in experimenting with DAWs, synthesizers, electronic music and computer music in general while of course not leaving rock music behind. As I already mentioned before, during my creative journey I used many digital audio workstations, however while studying BA, I became very interested and used a lot Ableton Live software because of its minimalist and unique interface that suited my creative needs at the moment. It is a software that while having many similarities to other DAW's, also slightly stand out and simply catches my interest. This switch from creating music using only guitar and voice to incorporating digital audio workstations felt like a certain "breaking point" which seemed to change the way I create and the outcomes of this process.

I believe it is a topic that is very important to investigate using Techno-Anthropological approaches as it has many questions, opinions about it and because of how quickly music technology has evolved and keeps evolving – it is important to understand what do these changes mean and how they affect people. Many anecdotal depictions exist of people trying to use and experiment with electronic music or its elements. In 1997 when on the seventh episode of the fourth season of a well-known sitcom Friends, Ross showed his electronic keyboard playing skills which consisted of playing strange animal and alien sounds, yet to him it seemed like sophisticated piece of art and a form of self expression, brought out laughter both from other characters from in the show and people watching series in from of their TVs (Bright 1997). It is an old example and it is does not contain using digital audio workstations but it depicts many controversies that surrounds usage of Ableton Live as well as other DAWs, and many elements in it are simulations of analog electronic music instruments. This project thus is an attempt to shed some light on and find out, how does the usage of Ableton Live actually affect the creative process of its users and what does it mean.

Because of its subjectivity, different understandings and variety of societal phenomena surrounding it, musical creativity and creativity itself is a complex topic to investigate. Before starting to discuss about and investigate the usage and the effects of incorporation of Ableton Live in creative process, in the following sections 1.1 and 1.2 I will give an overview of the role and definition of creativity and creative expression society and musical practices, its change overtime, why is it important to investigate it and finally how creativity acts in music technology.

1.1. Historical Importance of Musical Creative Expression and Innovation

Creativity has been a crucial part of society since stone age. However, at the earliest stages of human existence, it was mostly used for survival (Fuentes 2017). Only later (claims of this vary but it can be as early as 700,000 BC) humans started using creativity as a form of more artistic like expression. These activities from very beginning were extremely closely tied to music technology – instruments. Usage of instruments extended musical abilities of humans from only utilizing their own body, to transferring, converting, extending and exchanging their musical visions to technologies. First ancient pitched musical instruments stemmed from abstractions of voice and later musical instruments started to move towards being removed from human physiology as an example being keyboard instruments (Keislar, Dean 2009, p. 13)

There is a certain amount of paradox and “cognitive dissonance” in terms of how the importance of creativity is at times perceived in today’s society. According to an American primatologist and biological anthropologist Agustín Fuentes, innovation, for example, when coming up with new tools to gather food helped humans survive. In addition to that, being able to innovate and create new technologies is something that is highly unique to humans and has led humans to develop to such a high degree in relation to other animals (Fuentes 2017). Of course, creativity in general and especially creativity for innovation in order to survive is by no means the same thing as artistic creative expression nor musical creative expression, but they both definitely have many meeting points. Value of being unique, original or creative has been changing over history. Being creative was not always seen as a good thing. Innovation and unusual ideas were not very well received during the Middle Ages in Europe because of strong influence of Catholic Church and people who did strange or innovative things were largely regarded as witches and burned, in-prisoned or persecuted. This changed when the Enlightenment era started that carried within and valued innovations, inventions, science and *et cetera* (Müller and Schweiger 2012, p. 1-2). In general, music from The Age of Enlightenment on until [when?] music was accessible mostly for wealthy people and were still very much based on either worshiping God or for aesthetic leisure of the wealthy. Only in the 20th century when contemporary music started emerging and becoming popular, it started being used for so many more purposes.

1.2. Contemporary Importance of Musical Creative Expression and Innovation

Today, when talking about creative expression for the sake of art, it is often seen as something one cannot (and sometimes even should not) make a living of. In other words, creative expression is frequently seen as something strange and unusable in practice. Of course, that is not always the case but happens quite often. Even though, one would say that creativity itself is valued in the innovation sector but at the same time, it is not fully understood and made corporate. All in all, creativity had and still has a much bigger role than it may sometimes appear because of its “invisibility”. The situation of defining creativity is complex and it is like that in all of domains, including music. In this report there will not be a focus on a certain definition of creativity, the goal is to look at specific musical practices and methods, their meanings and musician’s lived experiences and let them define it themselves because the aim of this project is not to find out what is creativity itself but how usage of a product affects contemporary musical creative practices and what these affects potentially mean for music industry. Despite previously mentioned concerns of creativity and its value being misunderstood, today creativity is valued in various forms which became even broader with the rise of computer music. First, throughout the history musical creative expression was often a tool to fight social injustice or to express political standpoints. In such cases music is not something only abstract, it is often very intentional (Shaw 2017, p. 303). Strongest evidences of these phenomenas stem from a time period from 1960’s to 2000’s. For example, Bob Dylan, a singer-songwriter from USA, through his songs expressed ideas about the situation of oppressed and dispossessed minority and became a voice of American Civil Rights movement in 1960’s or various punk bands such as Sex Pistol, Green Day and others resonated youth disaffection to various political situations (Shaw 2017, p. 303). There a vast amount of other examples and they keep emerging until today. Second, one of the reasons why, as an example, again Bob Dylan’s music (along with a vast amount of other music) mattered so much to people because of strong emotions it manages to evoke. Music differs from, for example, from formal communication methods of information in a sense that even if in many times subjective ways, it brings out that information in different and more emotionally intense ways: “Music has the ability to arouse the senses, inflame the passions, induce feelings of calm and serenity, and express every possible human emotion. It fulfils our shared capacity and need for sensory experience, which exerts a powerful influence on our personal relationships and in the wider collective cultural context as members of a particular society. Decisions are made and specific actions have significance because of the meaning we attribute to sensory data communicated by the constant ebb and flow of symbols and signs.” (Shaw 2017, p. 302) Thus serving as both an additional and more emotionally impactful form of communication and idea expression (Shaw 2017, p. 302). Third, musical expressions as well as other forms of art tends to address identity: “As socio-musicologist, Simon Frith explains, ‘music constructs our sense of identity through the direct experiences it offers to the body, time and sociability; experiences which enable us to place ourselves in imaginative cultural narratives’ [16, p. 124]. Consequently, music not only reflects and articulates

social identities but plays a formative role in the construction, negotiation and transformation of sociocultural identities.” (Shaw 2017, p. 306) There are numerous examples throughout history of using musical expression to express one's sexual identity (David Bowie, Lady Gaga, Madonna, George Michael and more)(Shaw 2017). Fourth, creative self expression is also seen in numerous therapeutic methods to help dealing with psychological issues. When searching for academic research content on creative expression, there can be immediately seen a huge amount of research papers and books on creative expression as a form of psychological therapy. In addition to this, music creation is often seen as a form of therapy even without it being a very specific and treatment related psychotherapeutic technique. Many musicians talk about creating music as a form of relieving of stress and expressing or understanding your negative or very complex emotions and thoughts. These reasons often become motivations to create a song. It is interesting to think about, how or whether these practices of expressing your negative emotions differ, for example, when creating a song by using simply a guitar and your voice and when one is using a digital audio workstation with a variety of plugins installed into it and a vast variety of different options to express ideas and possibly stimulate creativity in different ways. Does such, at first glance, more complex network of creative tools help expressing ideas and emotions or does it distract from the main idea that a musician came up and overflow him or her with too many unnecessary options and directions to follow? In other words, is it better to use simple methods and technological tools that worked many times in the past or is it better or necessary to constantly experiment and search for new technological tools to express creativity? Finally, musical creativity has other less sensitive roles such as aesthetic and emotional pleasure or usage for various rituals.

1.3. Music Technology Development Before Emergence of Digital Audio Workstations and Its Meanings

When analyzing and the usage of digital audio workstations, it is important to first understand the timeline of innovations in music technology and their meanings. Many of these technologies resonate with digital audio workstations including Ableton Live in various ways. Also, a bit part of technologies that were invented earlier in history, especially in 20th century are either simulated in one way or another in most DAWs or used together with digital technologies. A big part of traditional music instruments are direct ancestors to computer music technology (Keislar, Dean 2009, p. 13) Because of these reasons this section of the report will overview and discuss music technology development before emergence of digital audio workstations. Because every chronology is always incomplete in any case, I will talk about only about a few inventions that seemed historically relevant to the research topic and tools that are included in the Ableton Live software.

Taking off the discussion from a phenomenological perspective, an important invention is the musical notation when looking into, the development of music notation during Middle Ages and especially polyphony. Invention and eventual usage of musical notation started in Middle Ages, spread and eventually put foundations to modern notation and musical system in general (Goodall 2015). The

invention of musical notation is one of the most crucial and steps in music technology. Before music notation existed, it was a norm to always improvise music when performing it, and with the invention of notation, after some time it became normal practice to notate and “preserve” musical creations and to replay them later on (Goodall 2015). These days, in general, only Jazz music is still based on live improvisation in terms musical performance setting. Another of the most revolutionary and impactful to music making processes was the invention of phonograph by Tom Edison and its later adaptation for playing music. This invention allowed to record and to play music in the comfort of your own home. This was a very big change in music making because now musicians became aware that their creation will be replayed again and again. However, one thing was not invented yet – an ability to so strongly edit the music recorded as it is possible now. Invention of recording was one step towards one of the most important impacts to musical creativity – invisibility.

A popular view of the developments in music technology in general when starting to look from very early on (ancient times) to up this day is viewing them as abstractions and disjunctions. These abstractions and disjunctions are often being seen as either mediated extensions of humans or a form of self-amputations (Keislar, Dean 2009, p. 13). Keislar shows his interpretation of a timeline of these abstractions an disjunctions:

Table 2.1 An interpretive summary of some major developments in music technology prior to the computer

Technology	Introduced in	Added role	Abstraction	Disjunction	Proliferation	One-to-many mapping
Musical instrument	Prehistory	Instrumentalist, instrument builder	of voice	of sound production from body	of sounds: increased range of timbre, pitch, duration, loudness	of performer to sound generators (in some instruments)
Keyboard	Antiquity, Middle Ages			of control mechanism from sound generators (pipes, strings, etc.)	of timbres; of simultaneous pitches; increased range of duration and loudness (organ)	of performance skill to instruments and timbres
Music notation	Antiquity (symbolic); Middle Ages (graphic, with pitch axis)	Composer	of performance	of musical conception from sonic realization (temporally); of composer from instrument (performer is intermediary)	of the composition across space and time; of the composition's complexity, texture (polyphony), and duration	of one musician (composer) to many (performers); of one composition to many performances of it
—	—	Conductor (an outcome of notation-enabled complexity)	(conductor is an abstraction of the performer, a meta-performer)	of composer from performer (conductor is new intermediary); of performers' parts from the conductor's score	of parts (texture)	of one performer's (the conductor's) gestures to multiple voices or instruments
Mechanically automated musical instruments	Middle Ages, becoming more		of performer	of performer from score and instrument, which are now directly conjoined and the	of identical performances across time and (later, with mass production) across space; increased ranges of	

	common in 18th and 19th centuries			performer eliminated	musical parameters, sometimes exceeding human limitations	
Sound recording	Late 19th to early 20th century	Sound engineer	(a "concretion" of the score; captures the concrete performance rather than the abstract composition)	of performer from audience; of performance in time (editing); in musique concrète, elimination of performer and instrument	of identical performances across time and space	of performer to multiple audiences
Electrical transmission of sound (e.g., broadcast radio)	Early 20th century		of acoustical transmission	of performer from audience	of performance across space	of performer to multiple audiences
Electronic musical instruments	20th century	With synthesizer, composer or performer can become a builder of virtual instruments (patches)	of acoustic musical instruments	of control mechanism from sound generator; in theremin, a complete physical decoupling of performer from instrument	of timbres; of possible controllers; increased ranges of all musical parameters	
Electronic sound processing (reverb and spatialization)	20th century		of room	of sound source from original position and space; of listener from physical space		

The fourth row does not present a new technology, only another human role that resulted from the technology in the previous row.

Figures 1 and 2: A chronological list of some music technology innovations interpreted as abstractions and disjunctions. Taken from *The Oxford Handbook of Computer Music*.

1.4. Emergence of Digital Audio Workstations and Digital Age in Music Making

Digital audio workstation is a software application designed to manipulate sound and is the main tool when producing most of today's Western contemporary music. This manipulation can be done for various purposes. In modern music production these purposes can be divided into certain stages of production (creative stage, recording or entering musical inputs using other techniques, editing, mixing and mastering) which usually go in a consecutive manner one after another. Some of them are more technical than others but all of them involve creativity because of the nature of music making – most of the time is about both expressing your creative ideas but also about working with technicalities which can be both limiting and allowing for interesting aesthetic choices. In the creative stage musicians can use DAWs for experimenting and collecting ideas, during recording preserving these ideas in creatively and aesthetically pleasing manner, during mixing and mastering technical and aesthetical qualities are decided. In electronic music making, the previously mentioned music production stages merge more often than in other contemporary music genres.

In about 1980s, digital audio workstations started to become available to the larger part of musicians (Dean 2009, p. 3). A lot of critique to electronic music existed and is still stemming from the 1980s because of low processing power and availability of varied samples and sounds of VST

instruments. These limitations mixed with computerization in pop music industry lead to most 1980s music sounding very similar. However, this was overcome with the rise of processing power, raising variety of VST instruments and samples as well as capacity to store large databases of different sounds. Today such music created in 1980s is often seen and unique and is referred as “the 80s sound”. Such music’s aesthetic elements often are also incorporated in today’s music. As CPU computing power rose, to a large part because of the introduction of the Macintosh personal computer by Apple Inc in 1984 (Dean 2009). Over time it became cheaper to own a computer at home. Not to mention that at the beginning, digital music creation process was as somebody might call “coding music”. In other words, it was only possible to input music through text commands. This means that there was a certain sense of “timely disconnection” when inputting musical notes. In academic sense this can be described as composer operating “out of time” and when computer became powerful enough it now become possible for composers to operate with a computer in “real-time” (Dean 2009, p.4). When computers became powerful enough, it became possible to translate “electronic” sound in real-time (at least to such degree that a human cannot recognize it as being delayed – there is always some degree of very micro delay when playing back audio (Dean 2009). It can be said that at the very beginning computer was more like a different kind of music notation inputting system, and with a rise of processing power, it became more similar to an instrument or even rather a “meta-instrument”. However, it is not not only an instrument, it also has many other complex functions. Some also describe digital audio workstations as very complex mixing consoles (Dean 2009). Initial appeals for computer music included the then perceived potential to recreate any possible sound and to realize performances that are too precise and complex for a human performer (Dean 2009, p. 4).

Nowadays more or less everyone in developed countries can easily get access to digital audio workstations. Even though, some might argue that DAWs are expensive, not to mention various third-party plugins that many professionals use in addition to stock tools that are already installed in the software. This ease of access within itself carries not only possibly changing creative practices but also possibility for almost anyone to access music production tools and start creating music. Even if the main investigated technology in this paper is Ableton Live which is one of the most expensive professional audio workstations (if not adding into account various student discounts), there is also a very vast variety of free software alternatives and plugins. Many would argue that with right skills, with these free tools is possible to achieve the same or very close results to those achieved with professional tools. Not to mention the high amount of online learning resources. Again, many argue that you do not need a university course or to learn how to create music these days, and it is achievable solely by watching, for example, YouTube tutorials. However, both this access and such a vast amount of learning tools, often raise controversies and anxiety by both other musicians and music listeners. Electronic music creators or even those who incorporate only some electronic music elements into their music are often automatically seen as “less musicians” and their music “less creative”. Also, their skill level is also

often seen as lesser than of those playing a “traditional” instrument and creating “traditional” contemporary music such as jazz, rock and *et cetera* (Kaiser, Dean 2018, Strachan 2017).

Creating music with digital audio workstations is often mixture of using digital tools with “real” instruments. It is interesting that the price of mixing a music track often rises with the usage of hardware tools in the process. This, of course, is a result of hardware tools being more expensive. However, the fact that there is a demand for mixing using hardware tools shows hardware tools being some type more valued and professional tool. Ableton Live, however, is mostly used for electronic music creation which often does not involve live instruments (of course not as a rule). And music making process often happens in a manner which audio engineers often refer as “in a box” (Prior 2008). “Invisibility” factor that comes with utilizing digital tools is often a point for discussion. What can this invisibility mean in digital music making practices? First, there is the ability to have a vast amount of music instruments at the same time but do not see them until launched (Prior 2008).

Many electronic music creators do not play a musical instrument an input notes manually using mouse. This is not limited to amateur creators. A very famous Canadian *house* music creator Deadmau5 (Joel Thomas Zimmerman, as he explains in his Masterclass, does not play instrument while creating music. He explains that he rather inputs notes using mouse and keyboard and describes his music instrument playing skills as basically non-existent. However, he has a very strong technical understanding about all the digital and also hardware tools he is using. He uses a high number of synthesizers – both software and hardware and emphasizes the importance of creating unique sounds. It appears very important to him to know how to sculpt these sounds using synthesizer’s parameters (Masterclass 2016). This both creative-technical approach can be seen often in creative practices of electronic music. It can be viewed as an approach of engineering music using brain rather than through more physical and more intuitive approach. This phenomena of the ability to enter notes by hand without playing them using a traditional musical instrument is one of the reasons why electronic music creators are often not being seen as “real” musicians. It is because there is a strong cultural connection with music creation and virtuosity (Kaiser 2008).

Academic research show that DAWs allow for a differing mode of creating music. Traditional music is very intervalic and structured. In contrast, music created with DAWs is a lot fuzzier at least in some instances and more often left to chance (Keislar, Dean 2009, p.23) But at the same time is about technical parameters but those parameters are different from “traditional” parameters in music making. Because of the ability to interact and create music without fully understanding music theory or music composition or knowing how to play an instrument whatsoever. There are many tools that assist with or take over those previously crucial skills of music making. This often raises skepticism, anxiety or even anger by those who are skilled in playing a musical instrument, are literate in music theory or those that see these skills as crucial and respected. It is a known fact that it requires a lot of hard work,

time and practice to learn how to play a musical instrument. Yet, can play in one way or another (of course, often in a way that is often very far from playing the “real” version of the instrument) simulated version of that instrument by a press of a few buttons. Even if its not the “correct way” in traditional terms, it is still fully possible to create aesthetically and sonically pleasing results using variety of “helping tools”. In addition to that, it is also possible to create and sounds or playing techniques that without digital tools would not even be possible. Another important and controversial element of electronic music creating versus “traditional” ways, there is no need to have strong musical hearing. Such musical elements as key and harmony can be changed, fixed or set using digital tools that can be installed or already exist in most DAWs. It is especially easy to achieve this when using MIDI technology. This is yet another reason for skepticism as good musical hearing is also often seen as a must for a good and respectable musician (Prior 2008).

Due to the computer’s ability to correct or to avoid at all many human like musical imperfections, such as, the ability through MIDI technology to perfectly time a performance in both timing and velocity, and also, the ability to pitch correct live performances and in many ways fix and manipulate them, modern music (especially electronic and pop music) is often criticized for sounding “non-human”and “artificial”. Human performance contains imperfections that to a certain degree are perceived as satisfying for human brain. Those imperfections are extremely difficult to recreate using a computer – some claim that it is in fact not yet possible. A human performance also contains peculiar emotional content. Electronic music creators often use previously mentioned techniques where music notes are inputted note by note with a mouse and so on. There is a concern that this way the emotional content is lost.

Musicians who create music using a computer often have to switch from having dialogues with other musicians to having dialogues with a computer. This dialogue by some scholars are being seen as improvising during the creative process. Growing capacity and Invention of MIDI technology and its ability to playback sound in real time allowed for computer to go into a dialogue with a computer (Dean 2009). Roger T. Dean discusses how a computer can be an aid while improvising. It can basically aid the musician through “developing responses and trajectory during a performance” (Dean 2009, p.139). Improvisation aspect is important to discuss about because of the specific abilities that Ableton Live provides for musicians to improvise. Dean as an example of this trajectory acts through a partnership with a musician. For example, he talks about how Patchet described the capabilities of a computer of a Korg Karma workstation as “a way to integrate user input into a predefined musical style in a meaningful way” (Dean 2009).

A bit part of using Ableton Live and other daws that are focused on especially electronic music creation consists of having access to large amount of sound databases, music creators have a quick and easy access and go through at any time a variety of stored musical elements that later can be used for

controlled and performative ways (Dean 2009, p. 5). Digital audio workstations provide with an ability to have large amounts of sound libraries basically at the touch of a hand. At the same time, in the professional setting, there are certain libraries that even if very large and extensive in many cases are also the same ones. This is related to usage of samples and those samples dictating the result of music created. Which I guess easily can become very similar to one another. However, if you think about traditional instruments — it's the same.

A lot of controversial and critiquing thoughts get electronic music's qualities that are often described as "non-human". However, there are academic perspectives that show that a listener has an ability to recognize and co-relate with music generated using a computer (Dean 2009, p. 5). Pierre Schaeffer gave some ideas in relation to these problematics. Drawn from Peircean terms (or maybe rather more from Saussure), he stated that sound is a "sign...supported by meaning". (Bailes and Dean 2009, p. 474). Thus, this opinion means that it is not the quality of music created by a computer that might make music sound "non-human", it is the musicians ability to communicate meaning to the listener using elements provided.

Not only in digital world there appears a very huge amount of control over parameters but also ability to manipulate space. Even though there are quite many techniques to manipulate space using hardware tools, this ability extends even more using digital tools. Most of the space is artificial to begin with because of recording in a sound insulated studio and then adding space artificially. In a sense that space becomes even more "artificial" with digital tools. This changes musicians abilities to perceive space (Keislar, Dean 2009, p. 17). DAWs also delete boundaries between synthesized and natural sounds, a user can play with both natural sounding sounds and synthetic sounding timbres (Keislar, Dean 2009, p. 22).

1.5. Ableton Live

Having talked about both Ableton Live and more general elements in digital audio workstations, this section will talk about and explain the investigated technology itself in more close and technical detail. Even though many of tools that are in this software were already discussed in previous sections of introduction, that is why I will not go into very specific details of workings of those tools. First version of Ableton Live (1.0) was released in 2001 in Germany. Its initial purpose was focused on live performances of electronic music. It is still used for this purpose these days, however, it is used as much for creating music today. The latest version of the software is 10.1 which was released in 2019.

Ableton Live, first of all, consists of what one would call a digital mixing console which allows to control and manipulate sound and its properties. This console is coupled with a variety of "stock" plugins (or sound manipulation instruments and effects) that are pre-installed into the software. These plugins include synthesizers and samplers Impulse, Simpler, Drum Rack, Instrument Rack, Analog,

Analog and others. They are digital instruments designed for generating sound of playing around with musical elements. In addition to these instruments there are a variety of audio and MIDI effects. Finally, there are tools and options that allow to edit sound and musical MIDI elements (Ableton 2019). In addition to “stock” plugins there is a possibility to use third party plugins of the same quality. This ability of usage third party plugins opens up for a world of almost infinite sound manipulation options. Ableton Live also has its own visual programming interface Max for Live that can be integrated in the software. This allows for even more possibilities.

In essence Ableton Live is very similar to the other digital audio workstations, however, it has two views of the workspace. The working space of this software is divided into Session View (Figure 3) and Arrangement View (Figure 4) (Ableton 2019). Session view is the one that is unique if compared to many traditional DAWs that has a more linear visualization of musical structures recorded into the program. One example is Pro Tools software view (Figure 5) that is also often called “the industry standard”. Session View in contrast to traditional workspace view in the DAWs among other things, allows for more interactive creative of performance process



Figure 3: Ableton Live’s Session View. Illustration source:

<https://www.sweetwater.com/store/detail/Live10StandEdu--ableton-live-10-standard-academic-version-download>.



Figure 4: Ableton Live's Arrangement View. Illustration source:

<https://www.sweetwater.com/store/detail/Live10StandEdu--ableton-live-10-standard-academic-version-download>.



Figure 5: Workspace view of Pro Tools. Illustration source:

<https://www.sweetwater.com/store/detail/PTHDAUP--avid-1-year-updates-and-support-for-pro-tools-ultimate-perpetual-license-expired-plan>.

Music created using Ableton Live is mostly of electronic nature because it is designed mostly for such music. However, it is not a strict rule. However, Ableton live possesses certain challenges of not many audio editing possibilities that are needed in, for example, rock, jazz or pop music.

1.6. Problem Formulation

That above historical discussion and taking a look into music technology innovation and its influence and phenomenological show complexity towards creativity and creative practices. Today contemporary music creation is comprised of interacting with variety of digital music creation tools that keep improving with a very fast pace and with bringing new tools into play. Musicians are living in a constantly changing environment – it changes as they go and are surrounded by a vast amount of technologies all the time. The usage of these technologies is at the same time exiting for music creators but also raises a number of controversies and unanswered questions. This makes it important to take a deeper look into the usage of Ableton Live in musical creative practices. This research project aims to understand and analyze the usage of Ableton Live and implications this usage has for practices of musician's and in turn to the world that eventually hears and experiences these creations. This leads to the problem formulation of this project which is the following:

“How does usage of digital audio workstation Ableton Live affect creative practices of its users?”

2 Methodology

2.1 Research Design

In this section the approaches of investigating and answering the research question of this paper will be presented. However, first of all, it is important to mention that the process of describing the issue and the field was a difficult process during this project. This in turn also affected methodology used for this project It was not because of the topic of the project but because this particular project had a different starting point which consisted of focusing both on economical pressure and creativity itself in relation to technology. Doing literature research and thinking about the topic and its context has proved that it was not possible to focus on there two research topics at the same time and also that the starting point had flaws which did not fit with Techno-Anthropological goals and values, and also it would only cause confusion and poor research outcome. This duality is still slightly evident in this paper (for example, in part of the empirical data collected). However, despite part of the data being unfocused, because of at the same time it is having relevant points and it fitting to quite high extent to the new research design. In what ways it is not focused will be explained a bit later on.

2.1.1. Research Stages

My research design for this projects consists of three stages: (1) exploring and understanding the phenomenas, theories and problematics of the research topic by doing literature research and auto-ethnography, (2) collecting and decoding empirical data and (3) analyzing it by applying a theoretical framework which stemmed from the first research stage. However, due to before mentioned issues, these stages were not performed in a linear manner but rather was a process that often involved going back and forth between these stages. This might add some inconsistencies to the results of this research.



Figure 6: Visualization of research stages performed.

Exploration of problem area started both by doing literature research and searching for relevant theoretical framework but also by doing auto-ethnography. Since this research stems a lot from my own background and experiences towards both Ableton Live and creativity, auto-ethnography was utilized to explored the topic, to generate ideas and to better understand my own biases, feelings and notions. The approach was to try to create try to create music while using only guitar and my own singing and then using Ableton Live software and to write field notes after doing this process and to film the process. Some reflections that stemmed from these observations were even though my creative processes differ while taking these two approaches, the creative practices are quite deeply mixed with one another and it is really hard to continue using only guitar or only Ableton Live (my creative practices has changed since I started using Ableton Live myself and it has become a second nature to be able to utilize tools that Ableton Live has); at the same time this usage of a single instrument and voice, seems to also put me in a higher focus level and pushes towards a goal to create a song rather than constantly explore and and experiment. These only a few observations among other which I will not mention in this part since auto-ethnographic exploration of my own practices is not the goal of neither this report nor method used. However, this experimentation lead to better understanding possible issues and helped to generate some questions that were later asked participants. This method together with literature research lead to coming up with certain sub-questions for answering the research problem such as: “How is creating music differ when using a digital instrument versus physical, “how does the environment and communication or isolation from other musicians affect creative practices?”, “does the big variety of different digital creative tools excite or distract users?”, “how does virtuosity translate when creating music using Ableton Live?”.

2.1.2. Two Empirical Datasets

Empirical data collected for analysis consists of two different datasets and is focused on individuals using Ableton Live software.

First dataset is concentrated around the previously mentioned research question of this paper (“How does Ableton Live affect creative practices of its users?”) and was focused on answering this main question with the help of previously mentioned and several other sub-questions through semi-structured interviews.

Three semi-structured interviews were conducted from two students from creative music technology field and a lecturer and music creator also from the same field. First and Third informant were found through a Facebook group for music producers in Lithuania. Second informant was found through asking around my and trying to find relevant participants in Denmark. First informant is Robertas Žutautas. He is a Master’s student in electronic music composition in Kaunas University of Technology. Robertas also has Bachelor’s degree in Music Technology from the same university. He creates both electronic music and and plays at the moment in a rock band. Empirical data was collected through conducting a semi-structured interview through a call. Second informant is Simon Sana Hald. He is a student of Sound Design at Sonic College in Haderslev, Denmark. To conduct empirical data I went to Haderslev to the sound studio of this college. A face to face semi-structured interview was conducted with at the same time filming and observing his creative process and creative environment. The third informant was Andrius Laucevičius who is both electronic music creator and performer and a lecturer in Kaunas University of Technology for electronic music composition in Kaunas University of Technology. Andrius also works with a well know Lithuanian electronic music creator Ten Walls. Similar as with the first informant, a semi-structured interview though a call was conducted.

The second data set is a result of initial ideas for this project which as mentioned before appeared to be wrong. Even though this data was not focused, it appeared useful because its questions that were asked were about creativity methods when using Ableton Live and thus still related with the topic. Observations that were relevant to answering the research question were taken from this data set as an addition to the main data set. This data set consists 1 semi-structured interview through a call with a student in a field music technology and industry, 2 semi-structured interviews of people who use digital creative technologies in different creative fields (video making and graphic design), also 2 open-style questionnaires where electronic music creators answered in writing the same questions about working with Ableton Live, and also 1 auto-ethnographic diary of participants’ creative process during over a week. Identities of these participants remain anonymous because that was promised before conducting the data.

2.2. Literature Review

As mentioned before, a literature research was conducted as a part of this project. The literature search has proved that there is a high amount of academic literature on digital audio workstations and their impact to society, even higher amount can be found on historical perspectives of music technology and music technology's role over history in general. Even though digital audio workstations is relatively new technology which also still keeps developing, it is also not an uncharted area when it comes to research. However, Ableton Live itself is not as well researched. When a phrase "Ableton Live" is entered in both Scopus and Aalborg Universities search systems, only less than 200 results comes up in both of these systems. A large part of these papers is about the life performance aspect of the software – since it was its initial purpose, but this software is definitely also suitable for creative practices. Other popular topic in regards of Ableton Live in academic research databases is artificial intelligence. Probably because it has Max for Live programming interface which makes it easier to work with it. Papers about its relationship with creativity of course also can be found.

The main source for understanding the field of the investigated technology domain, implications and controversies that exist was The Oxford Book of Computer Music edited by Roger T. Dean. It is a collection of articles by different authors on a very wide variety most important understandings, meanings and issues in the topic of computer music. This book served as a very good contextual frame and a starting point for further researching. The choice to use this particular book was made because it immediately caught my attention after entering relevant keywords into Aalborg Universities' database and appeared to be a reliable source of information. In addition to this book a range of academic articles, and a small part visual media sources were used.

Earlier historical understandings and context of creativity and creativity stemmed for the most part from Howard Goodall's book The Story of Music and and Agustin Fuentes book The Creative Spark: How Imagination Made Human's Exceptional. Both of these books are written by academics but in a more popular style. These books served as a framework and a building block for additional scientific articles on these topics and for giving a broader understanding of creativity and music technologies over the history.

3 Theoretical Framework

In the following section I will explain the theoretical basis for analyzing empirical data collected. This project aims to analyze, discuss and understand a "close-up" relationship between a musician and his or her creative process and Ableton Live software, rather than putting a lot of focus of surrounding power relations that might exist. Thus, the theoretical framework to analyze meanings of this relationship was chosen to be Post-Phenomenology. Even though because of the strong focus on

analyzing creative practices of people, one could argue that of course other theories might have been utilized; for example, Practice Theory. However, due to being unable to perform participant observation, Post-Phenomenology was chosen as more suitable framework. Central questions of Don Ihde's philosophy of technology are: "What role does the technology play in everyday human experience? How do technological artifacts affect people existence and their relations with the world? And how do instruments transform and produce human knowledge?" (Verbeek, Achterhuis 2001). Ihde's standpoint can also be seen as relativistic: "When perceiving world is as much in the people as people are in the world. This cannot be separated" (Verbeek, Achterhuis 2001). In addition to this, Ihde sees two kinds of perceptions – bodily (micro perception) and cultural (macro perception) (Verbeek, Achterhuis 2001).

The roots of Post-Phenomenology come from an American philosopher of science and technology Don Ihde. He is often called a father of Northern American philosophy of science and technology. It is because he is one of the first philosophers in USA who talked about philosophy about technology (Verbeek, Achterhuis 2001). The most prominent book written by Ihde is *Technology and the Lifeworld* where he also lists the human, technology and world relations that were discussed later. One of the core ideas of his is the critique of classical Phenomenology which, according to Ihde, fails to notice that human perceptions are instrumentally embodied through technology. Other known figures that followed his ideas by also adding new elements are Peter-Paul Verbeek, Lars Botin among others. I am focusing mostly on Don Ihde's ideas.

According to Post-Phenomenology, technologies are not simply isolated tools. They shape the world by allowing or pushing towards certain actions which in turn shape the world. This process is called *technological mediation*. The core of Don Ihde's ideas are post-phenomenological relations which aim to understand the connection between a human, technology and the world. He describes four types of relations. First one is the *embodiment* relation. Technologies form unity with a human being and it is directed to the world. For example, in a large concert setting, a musician uses a microphone, but he or she does not just sing directly to that microphone, the musician uses it to communicate music through using the microphone and amplification technology. Another example could be that a musician does not simply look at digital audio workstation, he uses it to create music and later to share it with world. It can be represented visually in this manner:

(human – technology) —> world

Second relation is *hermeneutic*. Ihde describes these are technologies that represent the world. These technologies direct people how they read the world. An example from music world could be a sheet of music or MIDI layout in digital audio workstation. Technologies form a unity with the world rather than the human using it (Verbeek, Achterhuis 2001, Ihde 1990). This is its visual representation:

human —> (technology - world)

Third relation is *alterity* relation. In this case human interacts with a technology with a world as a background (Verbeek, Achterhuis, 2001, Ihde 1990) operating a machine. One example, is taking money from an ATM. Visually it can be represented like this:

human —> technology (world)

The last relation of Ihde's is *background* relation. These are technologies which act as a context for human experiences. They are the context for human existence (Verbeek 2001, Achterhuis, Ihde 1990). Examples are sound from air conditioner, getting a notification while making a call. In a studio setting, a feeling of sound isolation and acoustic treatment when working with music, the way studio is set up, the chair to sit on in the studio and so on. Visual representation of this relation looks like this:

human (technology / world)

4 Analysis

In this part the empirical data collected will be analyzed through the Post-Phenomenological lenses of Don Ihde's four types of relations of technological mediation – *embodiment*, *hermeneutic*, *alterity* and finally *background*.

4.1. Usage of Ableton Live and Embodiment Relations

4.1.1. Session View and Its Affects to Musician's Creative Practices

A big part of the interviewed musicians state that the initial reason for choosing Ableton Live is not only its suitability for their needs and certain relative uniqueness (if compared to many other music making software) but also its suitability for live electronic music performances. To be more precise, a bit part of informants started using or was attracted to this software for this reason. However, they later (or at the same time) also realized its suitability for also creating tracks. At big part of this attraction, according to the empirical data is connected (when talking about both usage for creating music and performing it) Session View.

Most of other softwares which the student from Sonic Music College also referred as "traditional", have a working view or space that is very visually very "static" and based on linear viewing of music structures. Ableton Live's Session View, on the other hand, is based on collecting series of clips, musical ideas which can also be organized in many ways and played out, mixed and

matched both by using mouse and automation, MIDI mapping settings or various MIDI controllers. This moves from “traditional” focus on coming up with ideas and sticking them together in very linear manner to a more interactive way of creating where a musician can test out ideas in a different and more interactive way. In terms of embodiment, due to usage of this particular view, embodiment relations changes – to be more precise, the way a musician embodies digital audio workstation changes. Usually, the traditional linear view of a software allows musician to see and break down structure of a song in a visual way from which it can be manipulated and edited. This, of course, allows playing it back. But this way of seeing your creative material through a digital audio workstation changes when utilizing Session View. Musician is able to see the musical and technical structure his or hers created music in a different way which is not as linear but more chaotic and interactive. In an interesting way Ableton Live’s Session View both allows and pushes a musician to think and see created musical structures in a more messy and interactive way. A significant part of the informants state that in a Session View it is easier to view and to work on very particular and at the same time quite distant musical ideas, also to compare them and to “test them out” in a different way. It can be said that Session View empowers a musician to experiment more and to see his or hers musical ideas more easily and to go back and forth between them. Musician both merges and communicates with Ableton Live software while using the Session View – this distinction depends a lot on creative methods practiced. When thinking about musical ideas themselves, suddenly not only musical idea is present but now it can be translated into Ableton Live software. However, musicians most often transfer this material into the Arrangement View of Ableton Live which is more similar to that of “traditional” digital audio workstations.

4.1.2. Ableton Live and Virtuosity

It is evident both in the contextual research of this project and both in the empirical data that the usage of Ableton Live, and in addition to that usage other digital audio workstations and even such technologies as video making technologies and what they allow and amplify urges to rethink what musical virtuosity is, what it means and how it can be translated and even amplified using Ableton Live. When playing with a traditional musical instrument, a musician extends his musical abilities to this musical instrument – he is now able after acquiring a certain set of affordances to express his or her ideas. However, without spending a lot of time learning this instrument, is not possible to do that. If a musician wants to create music using a traditional instrument, it is almost impossible to do that (at least in a sense that most people would find pleasing to listen) without learning how to play an instrument. However, Ableton Live allows for a different kind of virtuosity. User of Ableton Live extends his or her abilities and in a way connects with the software and now is able to be a *virtuoso* of any instrument either in a easier or a different way. An Ableton user who does not record full musical parts into the musical creation software or only just inputs notes into it, mediates with with the software by embodying it as and extension of his or her mental virtuosity. In other words, a person has an idea and a traditional instrument would not allow him or her to express because of lack of technical skills.

At the end, creative ideas of a musician are being mediated through the DAW through the means of embodiment relation and then the result affects both the creator and listener in turn.

A significant part of musicians interviewed use VST libraries filled with instruments. These libraries again through various different techniques allow for “playing” and utilizing not one instrument but (especially is a musician already plays an instrument, allows for extending his or her instrument range almost indefinitely). A musician embodies this variety of VST instruments and now not only utilizes a small amount of instruments that he or she can play already but extends this ability to many. Also, through this usage of VST’s and simulation of instruments, he or she can see and understand these instruments in a different way. There’s basically no physicality of touching these instruments but there is a visual simulation and perception of them and also the recorded sound. Through mediating with VST’s, musicians are able to extend their perceptions and certain virtuosity skills. Probably the biggest abilities open up if a musician plays keyboard. A lecturer and creator from KTU most of the time records his musical elements mostly by “playing them in”, however, he does not focus on the virtuosity factor but rather records these small parts and then manipulates them using Ableton Live’s tools. At the moment of the recording and embodying Ableton Live as this meta instrument. This allows to be able to play and embody – to see, hear and feel his creative visions through a big variety of instruments and sound colors or shapes.

4.2. Usage of Ableton Live and Alterity Relations. Interacting With Digital Music Instruments

Again, a big part of interviewed musicians start their creative process with using either a drum sample, drum machine or picking one VST instrument. This was also evident while doing my own auto-ethnography. That means that musicians using Ableton Live during the very beginning of their creative stage start it by interacting with a technology and in a way communicating with it – asking for an input from. This can be seen as an alterity relation if looking from a post phenomenological lenses. World at this moment acts in the background while musician directly interacts with the technology. From this input (a vast variety of possible ones) that Ableton allows, the technology of choice in a way decides the creative direction that the song is going to take. Of course, it depends on what the exact input is. It can be simply a drum loop or other pre-existing instrumental part. Even if it, of course, probably starts with musician’s own idea, this instrument of course shapes the following composition. A starting point can also be (musicians interviewed use variety of these methods, as it is evident that creative methods used by musicians even if they have also many meeting points are also very different from one another) a synthesizer and a musician can start by sculpting his own unique sound and (or rhythmic part) but then the choice of the synthesizer and controls it still has influences the composition.

4.3. Usage of Ableton Live and Hermeneutic Relations

Working with Ableton Live is in many cases of the practices of the interviewees involved working with MIDI technology a lot. And working with MIDI in terms that musical notes are not being played using a musical instrument but entered manually. This, as mentioned previously in this report, can be compared to musical notation. However, even though the bigger part of the musicians do play musical instrument (and its not clear if they read notes), this means that this MIDI based notation system changes or affects the way music is seen. Traditional music notation is based on a lot of complex elements which need to be first learned in order to understand them and in this way to understand music. With the ability to enter or to read this for of the notation, music can be understood as simply clusters of sounds elements in relation to musical scale. In one way, this simplifies the understanding of music because it is evidently more complex and have more elements in it than simple visual clusters. Traditional notation communicates more information to its reader. However, at the same time, it makes it more difficult to start to be creative and it also in a way leaves less space for creativity. It is because it gives to a musician more strict and clear instructions what he or she should do. MIDI notation system, in contrast, leaves more space for exploring your creativity and releasing ideas. In turn these ideas after that translates in what is seems to be more abstract and varied musical structures, also more strictly organized and structured. This is evident in many electronic music tracks. Also, in contrast to playing with an usual instrument, recording an instrument leaves with not seeing the musical structure of what was played immediately, as it can be done when playing in a musical part using MIDI technology. When an instrument is recorded, only a sound wave is seen which of course still enables musician to not only hear and feel music but also see it visually: a musician can see dynamical and frequency variations of the sound-wave. Through MIDI musician can immediately see visual and tonal structure of a musical part. And with a conversion to audio file which easily can be done in the software itself, also the same soundwave qualities. It is off course possible to transform audio to MIDI but that is not precise usually and requires hustle.

Similar thoughts can be said about the usage of many other sound manipulation tools. A large part of electronic music creators (and a big part of those interviewed) not only create music but also do other technical steps themselves. These steps are technical but at the same time requires a lot of creativity since music production practices even those technical involves a lot of creative choices. For example, sound design or mixing of a song is not only about making the song to sound technically correct but also about aesthetic and creative choices in terms of sound qualities and what emotions, atmosphere, colors and and other qualities they express. It is also about making certain creative compromises because it is not always technically correct or possible to achieve certain elements. Both Simon and Andrius are involved in such practices and plays quite a lot attention to these things. Many of those tools to do more technical design (compressors, reverbs, EQs and other) not only allow for artificially manipulating sound and creating a certain kind of artificial realities but also allow for seeing

sound in ways that otherwise would not be possible. This might allow for greater possibilities to understanding sound and to sculpting it in way imagination wants. Many of these technical tools have their hardware alternative but those hardware alternatives quite often also make it harder to have such an easy access of seeing technical sound structures visually. Not to mention various technical difficulties about which one of the informants talked a lot. However, it is important to mention that most of the informants stated that Ableton Live compared to other DAWs seems to be designed to be an easy, accessible and intuitive. However, even though informants find Ableton Live very intuitive, it appears to be less capable of audio editing possibilities. On one hand, one could say that this does not matter since this software is oriented more towards creating and performing music and not treating it technically. However, if taken into account that so many electronic music creators do every stage of music creation can appear as bit concerning. Because it leads to the simplification of music details and might lead to music becoming shallow and way to simplistic. Many informants also state that Ableton Live's sound is also worse, reasons for that are not clear but that means that it poses certain dangers of listeners' perception of sound. In this age of abilities of sound manipulation it might be not the most efficient way not to make use of all the technical to manipulate sound to to recreate it precisely.

4.4. Usage of Ableton Live and Background Relations

Two of the informants mention the visual interface of Ableton Live as attractive (even though the lecturer from KTU also states that it may appear as programming interface at very beginning due to its minimalism and other stylistic choices may look unattractive if compared with other "traditional software" which appear to attract with having many options and so on). Andrius likes the versatility of the design of the software (you can change how the software looks by changing its skins and thus modifying coloristic appearance of the program). These elements might seem as very minor at first. However, these design choices act as a background relation in the creative process of the musicians. Having a software that has a color scheme that a creator likes can inspire, minimalistic design of Ableton Live can help focus. At the same time this minimalistic design of Ableton Live corresponds with the minimalistic stance of electronic music itself that most part of the informants produce.

4.5. Variety of Tools and Its Impacts to Creativity

As mentioned previously in this report, musical practices of today's musicians contains a big variety of tools to create with. The opinions whether this variety is for the good or is it just a distraction – differs. One part of musicians say that they like this variety because of the ability to explore options or to be able to recreate interesting sounds, another part says that this huge choice can act as a distraction. Participant Robertas stressed this aspect a lot. For him this variety of degrades creativity by dispersing focus and leading him to doing other things than creating and and leads to getting lost in all these options. All, in all it appears that not this existence of variety of choices is the issue but the ability to learn either to chose and delimit yourself to a few "right" tools or to learn how to control yourself while

balancing between these options. For example the lecturer KTU, sees this variety as a good thing because he really likes to explore new synthesizer sounds, he likes to search for new colors. In terms of Ihde's relations, this variety puts musician into a very complicated cluster of various technological mediations, which very often can be described as alterity type of relations from which he or she has to chose and these choices alter both the productivity, creativity of theirs and also the relationship with the world.

5 Conclusion

It is evident that usage of Ableton Live allows for changing and expanding creative abilities of musicians. Ableton in many ways can act both as meta-instrument and as a tool that enhances abilities and mediates the world and creative practices. Abilities of musician's can be visualized and manipulated in many different ways. Usage of Ableton Live brings to the front view a new form and understanding of virtuosity: this phenomena now is about knowing how to interact with the technologies and playing around with them, constructing creating realities rather than first learning how to play an instrument. The way musical structured are also change. On one hand, it is visualized in a more simple way inputted into the software, however, various tools for reading audio allows for having more complex visual representations of audio.

References:

Achterhuis, Hans, ed. *American Philosophy of Technology: The Empirical Turn*. The Indiana Series in the Philosophy of Technology. Bloomington: Indiana University Press, 2001.

Chai, Jia-Xiang, and Kuo-Kuang Fan. "Constructing Creativity: Social Media and Creative Expression in Design Education." *Eurasia Journal of Mathematics, Science and Technology Education*, October 27, 2017. <https://doi.org/10.12973/ejmste/79321>.

Dean, R. T., ed. *The Oxford Handbook of Computer Music*. Oxford Handbooks. Oxford ; New York: Oxford University Press, 2009.

Friis, Jan Kyrre Berg Olsen. "Perception: Embodiment and Beyond." *Foundations of Science* 17, no. 4 (November 2012): 363–67. <https://doi.org/10.1007/s10699-011-9242-y>.

Fuentes, Agustin. *The Creative Spark: How Imagination Made Humans Exceptional*. New York, New York: Dutton, 2017.

FutureLearn. "What Can We Learn from Don Ihde?" FutureLearn. Accessed February 27, 2020. <https://www.futurelearn.com/courses/philosophy-of-technology/0/steps/26324>.

Goodall, Howard. *The Story of Music*. London: Chatto & Windus, 2013.

Hills, Alison, and Alexander Bird. "Against Creativity." *Philosophy and Phenomenological Research* 99, no. 3 (November 2019): 694–713. <https://doi.org/10.1111/phpr.12511>.

Ihde, Don. *Technology and the Lifeworld: From Garden to Earth*. The Indiana Series in the Philosophy of Technology. Bloomington: Indiana University Press, 1990.

Kaiser, Jeff. "Improvising Technology: Constructing Virtuosity." *Cuadernos de Música, Artes Visuales y Artes Escénicas* 13, no. 2 (July 6, 2018): 87–96. <https://doi.org/10.11144/javeriana.mavae13-2.itcv>.

Kevin, Bright. "Friends," 1997.

Masterclass: Deadmau5 Teaches Electronic Music Production, 2016.

Müller, Sigrid, and Cornelia Schweiger, eds. *Between Creativity and Norm-Making: Tensions in the Early Modern Era*. *Studies in Medieval and Reformation Traditions*, v. 165. Leiden ; Boston: Brill, 2012.

Prior, Nick. "OK COMPUTER: Mobility, Software and the Laptop Musician." *Information, Communication & Society* 11, no. 7 (October 2008): 912–32. <https://doi.org/10.1080/13691180802108982>.

Shaw, Julia J. A. "From Beethoven to Bowie: Identity Framing, Social Justice and the Sound of Law." *International Journal for the Semiotics of Law - Revue Internationale de Sémiotique Juridique* 31, no. 2 (June 2018): 301–24. <https://doi.org/10.1007/s11196-017-9533-x>.

Strachan, Robert. *Sonic Technologies: Popular Music, Digital Culture and the Creative Process*. New York, NY: Bloomsbury Academic, 2017.

Thomas, Bonnie. *Creative Expression Activities for Teens: Exploring Identity through Art, Craft and Journaling*. London ; Philadelphia: Jessica Kingsley Publishers, 2011.

"Welcome to Live — Ableton Reference Manual Version 10 | Ableton." Accessed February 27, 2020. <https://www.ableton.com/en/manual/welcome-to-live/>.