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The Kids Want Noise

How Sonic Mediations Change the Aesthetics of Music

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Abstract

This dissertation seeks to discuss how new tools for mediating sounds have developed and changed our aesthetic evaluation and framing of musical sounds. The possibility to create and reproduce sounds has had a great impact on the aesthetic development of music and is a topic that can be approached from many angles. This dissertation focuses on three different technological tools that have been important in shaping music from the 1980s onwards. The first examples discussed are the use of Roland´s early drum machines, the TR-808 and TR-909. Here, the focus is on the synthesised kick drum sound and how it enabled the production of base heavy club music. The second example discusses the praxis of sampling as it developed from the samplers in the early 1980s to present day DAW software. The focus is on how different ways of defining the status and cultural purpose of sound recording facilitated different aesthetic approaches to using such recordings in an artistic creative process. The third example analyses cases where artists themselves use digital and electronic tools to create new sound producing devices; not so much to develop and commodify new instruments, but as a focal point in the actual artistic expression.

In all three of the examples discussed, the focus is on how novel possibilities in mediating sounds become part of a renegotiation of existing aesthetic ideals in music. It is not so much the novelty of the different tools themselves that are important, but how the new possibilities these tools enable become interpreted as strengthening or diverging from established aesthetic concepts of music.

Content

Introduction:

I. The kids want noise

Music has always evolved in relation to technological development. By the start of the 1980s, however, this development was speeding up significantly, radically affecting both how music was made and how music could sound. New tools emerged at a rate never seen before and enabled new artistic expressions that often sparked controversy amongst musicians and audiences alike. Michael Jonzun, a protégé of Arthur Baker and a renowned session musician in the late 1970s, recalls the changes in that period with mixed feelings: "Arthur and I did music together – real music. But we discovered great singers rarely made it. The kids in the clubs wanted noise" (Tompkins 2010, p. 109).

Jonzun noted the changes, and by adapting to this new demand for "noise" amongst the younger generation, managed to make a name for himself within the 1980s Electro Funk scene. Working in this musical climate, Jonzun's weapon of choice became the vocoder, originally a technology used for scrambling secret telephone calls which sonically transforms the human voice. By the late 1970s, the vocoder had been repurposed and repackaged into a musical "instrument". By singing or speaking through the vocoder, the pitch of the voice could be controlled by a second sound-source, resulting in a strange metallic effect. In effect, the vocoder blends two sonic sources, typically using a voice as the modulator and a keyboard as a carrier[1]. The "instrument" sounded decisively uncanny, something in-between human and machine. Unlike anything heard before, it fitted the new musical climate like nothing else. Well-developed musical

[1] Jonzun used the Roland SVC-350 Vocoder. This was a rack model that had two inputs for sound, one labelled "Microphone" and another labelled "Instrument". The sound at the instrument input is set to define the pitch of the sound from the microphone input (Roland 1984, p. 4).

skills distilled from decades of musical traditions were no longer capturing the young crowd. As stated above: "the kids in the club wanted noise".

Many writers before me have analysed and described how technological developments —from the 20th century onwards – have brought about changes and new developments in music (Emmerson 2007; Milner 2009; Katz 2010; Demers 2010; Brøvig-Hansen and Danielsen 2016). In these works, the changes occurring at the start of the 1980s have often been linked to the breakthrough in digital technology. This dissertation, to some extent, continues in this tradition of investigating how technology has changed music, with a definite focus on the accelerated changes that occurred after 1980. My aim is, however, to gain new insights by way of a notable thematic reorientation: **namely by focusing on how new technology is part of a larger complex of cultural factors that together change our expectations of what music should sound like.**

In the introductory example of Michael Jonzun and his use of the vocoder, there are two points linked to developments in the early 1980s that I consider to be vital in achieving an in-depth understanding of technology's influence on music. These two points inspired my initial research questions. Firstly: the vocoder was not a piece of *digital* technology. The development of the vocoder started as a tool for speech processing back in the 1930s, and went through many stages of analog development before it eventually became digital (and musical)[2]. Secondly: Jonzun explains his artistic development emerging through his use of the vocoder, by rather cryptically claiming, "Arthur and I did music together – real music" (Tompkins 2010, p. 109). For him, this use of the vocoder represented a change from the *real* music he had done before, to an artistic praxis that signified something new and outside of the established norm.

[2] For a detailed description of the workings and history of the Vocoder see Roads 1996, p. 197-200.

The first point reminds us to be careful of restricting our focus to the material construction of the technology. The emphasis on digital technology in academic research on music runs the risk of diverting us from certain important discussions on the relationship between technology and musical aesthetics. As I embark on my analysis of technology and its impact on music, I therefore wish to widen the scope somewhat, by focusing on the different technologies that enable mediations of sound; a category of tools I will define as "mediating technologies". This definition covers the technology that facilitates the automatic ability to store, reproduce, and generate sound. Such possibilities do, of course, predate the proliferation of digital tools. With this definition, I want to place an emphasis on what the technology *enables,* rather than organising our discussion based on the material construction of tools. Mediating technology, for the first time in human history, made possible the separation of sound from its physical dependence on a concrete acoustic event in time and space. The most striking effect of this, is that it allowed people to listen to a reproduction of a musical performer, without having the actual performer present in the room. In addition, such a process enables a range of sonic and artistic transformations, altering the experience of music and sound drastically from its prior acoustic environment.

The vocoder uses mediating technology as a starting point for extreme reconfigurations. It might be controlled by a human voice, but what you hear is something different. The original voice is transformed into a stream of electronic signals that are then altered by another stream of electronic signals, before being finally assembled into a new sound. In this way, mediating technology can always be understood as creating a "sound" that both technically and culturally breaks the reference to a prior sonic event.

The second aspect that I find important with Jonzun´s account of his use of the vocoder, is his explanation of this artistic development as a departure from "real music". He not only describes his development in terms of creating new sounds, he also emphasizes that this represented a cultural change, forcing him to leave some of his artistic and musical ideals behind in order to seek out a new musical aesthetic. Jonzun's account points to the fact that analysing the effect mediating technology has on music is not only a question about identifying novel sounds, but most importantly analysing how these sounds respond to a larger ever-changing cultural concept of how musical sound is aestheticized.

A crucial aspect of the way in which mediating technologies influenced musical developments in the 1980s, is not only that the technology enabled the creation of new sounds, but that it subsequently altered how audiences and artists conceptualized and aesthetically evaluated these sounds within a musical context. The novel sounds that came out of new mediating technologies were important for developing new artistic expressions, but many of these new expressions could not, in my opinion, emerge without a parallel change in how music was understood amongst practitioners and audiences. The aesthetics of music is a cultural concept that frames how we define and evaluate melodies, sound, social engagement and artistic practice. As a consequence, a fine line has always existed between which sonic parts of our sensorium should be evaluated musically and which should not. Thus, musical sounds are those which fall within a limited field defined by the aforementioned cultural framework. According to Douglas Kahn, the sounds that historically fell outside of the borders of Western music, were described as "noise" (Kahn 1999, p. 68). But as the example with Michael Jonzun shows, artistic sonic expression can break out of the framework of "real music". By stating "The kids in the club wanted noise" - Jonzun implied that established musical categories no longer encompassed the sounds the audiences were seeking; thus he was forced to abandon his previous aesthetic ideals to capture the crowds. From early on then, the development of new mediating technologies has opened up the possibility to create new sounds that stimulate compositional ideas (Eimert 1957, p. 1). The example of Jonzun and his vocoder exemplifies, in my opinion, a time when this process was significantly accelerated.

II. Research question

My overall research question for this thesis is: **how has mediating technology from the 1980s onwards, changed our expectations of how music should sound?** What I specifically want to investigate, is how the new sounds that mediating technology make possible, engage practitioners and audiences in an ongoing reconceptualization of music, shifting the borders as to what sounds are considered musical and how these sounds are analysed and valued within an aesthetic framework. With this focus on musical sounds, I am primarily investigating the changing attitude towards timbral characteristics of music rather than the tonal and melodic aspects. This means that I will put less emphasis on tonal and melodic aspects, but these elements are, obviously, dependent on each other and cannot necessarily be treated as independent features in music. In approaching these questions, it is important to acknowledge that this also represents a two-way process. The changes that happen in our conceptualisation of musical sound, will once again inspire new developments in mediating technology and possibly make us revaluate the tools we already have.

Based on the opening example of Jonzun and his use of the vocoder, it is clear we need to transgress the material categories of technology such as electronic, digital, and analog in order to analyse these changes fully. I will therefore focus on different forms of mediating technology, and subsequently organise my dissertation so that the actual functionality of technology is at its centre.

To answer my research question, I have chosen to organise the dissertation around a discussion of three different technological examples of mediating technology in music production and performance. This will form three different chapters that, in turn, breaks my overall research question into three different parts:

In Chapter 2, I will describe the use of analog synthesized drum sounds. This chapter will investigate how the cultural acceptance of synthesized sound over more traditional acoustic drum sounds, influenced musical aesthetics after the 1980s.

In Chapter 3, I will explore the use of sampling technology - the manipulation and reproduction through digitalisation of sound – used in the musical instrument: the sampler. I will here discuss how different ways of defining the status of recorded sound, can help us analyse both the artistic possibilities and the aesthetic evaluation of the sampler in musical practice. This will be a discussion that spans examples from the early 1980s to the start of the 21st century. An important part of this discussion will centre on how our conceptualisation of sound recordings have influenced our definition of sampling technology, hence defining the purpose of the sampler in different ways.

Chapter 4 differs slightly from the two previous chapters; it does not focus on a specific technology but rather explores attitudes towards mediating technology. With the developments and proliferation of mediating technology from the 1980s onwards, there has been a growing interest amongst artists to design new tools for creating music and sound. The question is how such a development challenges more established ideas of musical instruments and subsequently the aesthetics of music and sound? Due to the broad questions considered in this chapter, the discussion does not arrive at the same type of conclusion as in the two previous chapters. This chapter instead uncovers some important discoveries that are discussed, which offers my concluding remarks and suggest potential opportunities for further research.

This dissertation aims to establish increasing knowledge about how mediating technology affects aesthetics, whilst also contributing to the wider discussion upon how contemporary culture changes in response to the tools and technology we create.

III. Scope and Limitations

Structuring this dissertation into three separate discussions of different examples of mediating technology in music, sets clear boundaries for the text whilst forcing me to span the borders of established fields of research. In these three chapters, I will analyse and discuss a variety of artistic examples, by comparing them to different conceptualisations of music and aesthetics. This will include, in part, a historical account of how the artistic expression associated with the different tools has been framed and explained by practitioners, academic and audiences.

Much of the material in this dissertation is situated within the research field often defined as *popular music studies*, but this dissertation is in no way a study into popular music as a musical phenomenon. Middleton describes popular music as a tendency within a larger field of music that is constantly in motion (Middleton 1990, p. 7). Since I have structured my thesis around specific technological examples, my scope does not necessarily follow the tendencies and movement that are often understood as popular music. Artistic examples appearing in the coming discussions are also derived from many other fields of music and even other artistic disciplines. Thus, if we are to place this research within any established academic field, it would probably be more correct to do so within the field of *sound studies*. According to Trevor Pinch and Karin Bijsterveld, sound studies developed as a result of how media technology was changing both consumption and production of music. This urged researchers to take a much broader approach to sound and music than was found in standard disciplines like ethnomusicology, history of music, and sociology of music (Pinch and Bijsterveld 2004, p. 635-636). In recent years, this academic field has developed a broader approach to the study of sound, spanning the fields of acoustic ecology, auditory culture, art studies, musicology and much more (Pinch and Bijsterveld 2011, p. 7).

My research question about the relationship between mediating technology and music should place me in the middle of the field of sound studies. Yet, my focus on the aesthetics of sound in music, places my research rather on the margins of this academic tradition. Caleb Kelly is concerned that the emergence of sound studies has been less interested in the sounds themselves and more interested in the culture that surrounds the sound (Kelly 2017, p. 15-16). In common with Kelly, my writing has a strong emphasis on the sound itself; the sonic aesthetics of music. What I am focusing on in this dissertation is the sonic manifestation of music, the sound we hear when we listen to music. My special interest is on the timbral characteristics of sound and how these fit into our cultural expectations of music. Through an aesthetic approach to these sounds, I will consider both the qualities of the sounds and what they are culturally understood to signify in relation to our *appreciation* and *evaluation* of the music. The unique aspect of such an approach to music, is that I will not focus so much on topics such as the social conditions surrounding the musical praxis and how it fits into the formation of social identity and economical distinction. Aesthetics is about the qualities and distinctions that we appreciate in music that can primarily be explained as internal aspects of the music. Following Kant's age-old definitions, it is about appreciating and valuing something without considering what practical and social benefits it gives us[3]. Such a focus is not always compatible with all research traditions on sound and music. In particular, the sociological approach to sound and music has traditionally been seen in opposition to the aesthetic approach: "To a large extent, the sociology of art has defined itself through opposition to aesthetics" (Hennion 2002, p. 1).

What makes the aesthetic approach to sound in music different from other research traditions, is that it involves a more subjective intervention and interpretation of the artistic expression. By placing an emphasis on an interpretive subject, it can also claim to yield insight that is not always apparent to all practitioners and audiences. Compared to other disciplines that examine music, this means that the aesthetic approach does not yield any objective truths, it focusses more on critical reflections (Demers 2010, p. 5). Discussion on musical aesthetics is strongly rooted in the academic field of philosophy, but it also appears amongst non-academic critics, practitioners and audiences who voice their opinion about their experience of music. There have been several writers who have approached music and technology from an aesthetic viewpoint, both by focusing on electronic music (Emmerson 2007, Demers 2010, Toop 1995, Prendergast 2003 and Brøvig-Hansen and Danielsen 2016) and through sound art (Kahn 1999, Kelly 2009, Voegelin 2010 and Moor 2016). However, as I have already mentioned, my focus on aesthetics through the concept of mediating technology in music, is intended to offer a different approach to this research field. Significantly, such an approach reconnects musical aesthetics to material, social and economic factors. This can, in turn, be interpreted as a move away from the aesthetics of the artwork towards a sociological deconstruction of art.

[3] Kant explains the aesthetic judgement as a "disinterested" satisfaction. This is a subjective judgement, that does not include any justification of the purpose of the object in question (Beardsley 1966, p. 210-217)

However, Hennion argues that this not is the case when we talk about music and mediations.

> "Mediations are neither mere carriers of the work, nor substitutes which dissolve its reality; they are the art itself, as is particularly obvious in the case of music: when the performer places a score on his music stand, he plays that music, to be sure, but music is just as much the very fact of playing; mediations in music have a pragmatic status - they are the art which they reveal and cannot be distinguished from the appreciation they generate." (Hennion 2002, p. 3).

This explains how intertwined music is with the tools that mediate it, and how connected the artistic experience is to its material realisation. Although Hennion has a slightly different approach to mediating technology, not only focusing on the automatic transitions from symbols to sound as I do, he provides a clear illustration of how important my focus on the technology of mediation is, in approaching the aesthetics of music.

IV. Outline of dissertation

The main part of this dissertation will consist of the chapters discussing my three examples of mediating technology in music. But before this, I will use Chapter 1 to define some of the important concepts used in the dissertation and give the historic background for the following discussions. In this chapter, I will first explain my definition of mediating technology and what this specific definition can contribute in terms of new insight to the discussion of technology and musical aesthetics. I have chosen to use a very specific definition of mediating technology, that at the same time expands it beyond the mimetic qualities that are often attributed to it. My particular definition of mediating technology also urges me to be more precise in how I apply other terms such as "music technology" and "musical instruments". Secondly, I will include a discussion on how the fluidity of music as a cultural and aesthetic concept is to be understood.

This discussion will enable us to better understand the cultural forces that are at play when certain sounds are evaluated as musical and others are not, and also help to explain how this demarcation can change over time. Thirdly, I will outline the historical background to my main discussion. This will focus on the artistic developments that evolved as a result of mediating technology before the 1980s. Through this, I will establish the larger framework for the topics that will emerge in the later discussion.

I will then move on to the three main chapters, discussing three examples of mediating technology used in music. There will be a short conclusion or summary at the end of each chapter, but I will conclude this dissertation with a final chapter relating my findings to my overall research question.

1. Definitions and Background

1.1 Defining mediating technology

Central to my dissertation is a very specific definition of mediating technology: this takes Jonathan Sterne's definition of "sound reproduction technology" one step further. In his book *The Audible Past* (2003) he claims: "modern sound-reproduction technology uses devices called *transducers,* which turn sound into something else and that something else back into sound" (Sterne 2003, p. 22). What my definition has in common with Sterne´s, is the emphasis placed upon that "something else" which is turned into sound. I would, however, be more precise and label this "something else" as: signals/codes that in themselves are not sounds. In Sterne´s definition it is these signals and codes that enable the storing and reproduction of sound; my definition of mediating technologies also includes using these codes and signals as an additional means to create and manipulate sound. Another important aspect I have taken from Sterne, is that these signals/codes are turned into sound vibrations, as Sterne explains, through the use of *automatic transducers*. A clear example of this type of technology is where electronic technology creates fluctuations in magnetic fields or electric currents that subsequently creates vibrations through the speakers. This points to two key realizations about what mediating technology is in relation to sound. Firstly, you are primarily making electric currents, magnetic fields and digital numbers, not sound in an acoustic fashion. This sets this type of technology apart from the technology that has been used in all previous acoustic instruments[4].

[4] This is a definition that of course overlaps with concepts of electroacoustic music, that is defined through its move from acoustic instruments to sound purely produced by speakers (Emmerson 2007, p. xiii). This is a concept that largely was developed by Pierre Schaeffer. In his text Traité des objets musicaux: Schaeffer defines the "electroacoustics system" describing nine stages from the production of sound events to its final projection though loudspeakers (Schaeffer 2017 p. 322-323). This is a concept that has much in common with my focus on mediating technology, I have chosen,

Secondly, the leap from these electric currents and magnetic fields to actual sound is an automated translation through transducers. My definition therefore sets mediating technology apart from previous methods of transcribing and storing music as notation, since notation is not an automated process but needs a performer to actively interpret the abstract signs to create sound[5].

My definition of mediating technology thus sets a broader scope for my dissertation than if I restricted myself to Sterne's definition of sound reproduction technology. The main reason for such a broad definition, is to emphasise the technology as a productive technology. In this dissertation, I begin my analysis based on the understanding that mediating technology always *produces* sound. This move is inspired by Katherine Hayles´ claim that all types of theoretical analysis call for some degree of abstraction, since no theories can account for the infinite multiplicity in our engagement with the real. The danger though, according to Hayles, is that in all such attempts to erase the multiplicity of the real, "we risk losing the sight of the variegated leaves, factual branching, and particular bark textures that make up the forest" (Hayles 1999, p. 12). In this way,

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though, not to use this term since it can also refer to established stylistic directions in Western contemporary music. Much of Schaeffer's motivation for establishing an artistic framework is rooted in the concept of "acousmatic", listening to sounds without any visual reference to what is creating the sounds. In his view, this can subsequently create a unique situation of "reduced listening" (Schaeffer 2004, p. 78). I will return to this topic in chapter 1.4.3 where I will discuss in more detail the aesthetic ideals established through such concepts.

[5] This definition of mediating technology in relation to sound, has similarities to aspects often associated with newer digital technology, such as how Leve Manovich talked about the "new media object" as something that could be described formally, focusing on the mathematical codes of digital media (Manovich 2001, p. 27). However, his examples were taken mainly from visual media, where there is a great difference between the analog photographic image connected to reality through a chemical reaction, and the later digital images that are created through interpreting binary codes. Sound reproduction and mediation of sound, however, always happens through interpretation of codes or signal, both in digital and analog formats.

the concepts we use to organize our research, sets the scope for our possible findings. Approaching a known empirical field with a slightly different theoretical perspective and a slightly broader scope will open up the possibility of different findings.

As I have already mentioned, the ability to mediate sound liberated the production and consumption of music from its dependence on the acoustics of the physical world, severing it from the established concept of musical performance. In the light of my research question, which explores how mediating technology has changed our cultural expectations of how music should sound, this new reality embodied an immense shift in musical creation. The important question though, is how these new possibilities were to be understood in relation to the established ideals about music amongst practitioners and audiences. Did mediating technology represent a positive improvement on earlier ideals of musical sound, or did it denote a definitive break with the established aesthetics? Since my research question is directed towards the interconnection between mediating technology and developments in musical sound ideals and aesthetics, it is important that my definition of mediating technology is formed to facilitate this type of discussion.

To explain how my definition shapes my analysis further, we can compare it to alternative ways of approaching the same topic. Brøvig-Hansen and Danielsen also analyse the effect of mediating technology on music in their book *Digital Signatures – The Impact of Digitalization on Popular Music Sound* (2016). However, they focus primarily on digital technology and are more in line with Sterne's original definition of sound reproduction. In this book, they introduce the concept of "digital signature" to describe the effect we experience in sound as a result of the treatment of digital technology; a concept they further connect to the term "opaque mediation". By using these concepts, they point to the self-presentation of the media: just like an opaque glass makes us aware of the window we are looking through, opaque mediation makes the technology visible for the viewer. The digital signatures are what make us as listeners aware of the technology that renders the sound, enabling the mediating technology to play an aesthetic role in musical experiments (Brøvig-Hansen and Danielsen 2016, p. 5). Even though this is a very good concept for explaining the aesthetic possibilities in mediating technology, I have chosen to go beyond this metaphor. My reason being that analysing "digital signatures" still places a great deal of emphasis on the medium´s ability to re-present sounds. The idea of opaque mediation acknowledges the characterisation of media-technology as primarily a means to convey something beyond the medium itself, often reproducing the sounds of a past musical performance. Our awareness of the medium can, of course, play a role in our aesthetic appreciation of the music. However, such a characterisation of mediating technology can lead to an interpretation of our awareness of the medium as a barrier between us and the desired content. The opacity of the media then, is interpreted as working against an ideally transparent medium; it stands between us and the artistic content. In this way, the concept of digital signatures can become a loaded term that emphasises the quality of transparent reproduction as the most important quality and primary purpose of any media.

In any analysis of music, starting out by defining the purpose of media technologies as primarily striving for a transparent representation, is something Sterne claims is not productive. The reason for this is that all musical instruments, in one way or another, can be seen to reproduce sound (Sterne 2007, p. 8). Most sounds we hear in music are generated by an instrument constructed to reproduce a desired sound. Whether it is a violin or a gramophone player does not necessarily represent such a big difference, since neither of them constitute a more natural given sound-source than the other. Taking this into consideration, I have therefore chosen to take a much broader approach to the possibilities in mediating technology and sound. There is, in my opinion, little point in trying to separate out signatures of the medium because there is no medium without a signature[6]. How we evaluate the sound of these mediums, if we are hearing the reproduction, manipulation or creation of sounds, is, as I will discuss later, largely a consequence of cultural conditions. What people might acknowledge as the transparent possibilities in different mediums to convey the "real", is a feature that is a result only of the ability in the medium to apply strategies based on one or another cultural standard, not on an ability to truthfully represent an external signified (Bolter 2007, p. 201). Brøvig-Hansen and Danielsen do of course recognize this fact as well, pointing out that cultural considerations are what makes an audience recognize some sonic qualities as digital signatures and others as not. The purpose of a broader definition of mediating technology, such as I suggest, is to make this exact point even clearer.

By emphasizing the ability to create and manipulate sound as a defining feature in mediating technology, perceiving the medium as either transparent or opaque becomes just one of the many ways the audience can interpret the sounds they hear. This subsequently opens the analysis more towards my research question: how the creative possibilities in mediating technology are shaped by, and in turn, shape musical ideals and aesthetics; how the creative possibilities in mediating technology can change our expectations of how music should sound.

[6] This is a discussion that Bolter and Grusin touch upon in their book *Remediation: Understanding new Media* (1999). They define medium, as that which "appropriates the techniques, forms, and social significance of other media and attempts to rival or refashion them in the name of the real" (Bolter and Grusin 1999, p. 65). In their opinion, the representational aspects of media today are always established through reference to earlier forms of mediations.

1.2 Defining tools for musical creation, musical instruments and sonic tools

My definition of mediating technology - categorizing the technology based on how it actually creates and manipulates sound - also sets the premise for how I define other concepts, especially those of musical instruments and music technology. The wide appliance of media technology in the production of music has made Jonathan Sterne argue that there are no longer any distinctions between media technology and musical instruments. According to him, this division had been based on a theoretical logic informed by an ideal about formal classifications in "organology", not a practical classification based on function and meaning (Sterne 2007, p. 3-4). To a great extent I agree with Sterne, but I will however sketch out a more detailed categorization to clarify the role mediating technology plays in shaping musical expressions.

Central to how I have chosen to categorise the different ways mediating technology has been utilized in music, are two main concepts: "tools for musical creation" and the "sonic tool". "Tools for musical creation" includes the tools that are both designed and used as part of music production and musical performance. The general term of "music technology" can in some cases also include tools that are designed and used primarily for consuming music. My category of "tools for musical creation" does however include two sub categories: that of "musical instruments" and what I call "musical production tools".

My definition of musical instruments has much in common with that of Sterne. As he does, I have chosen to base it on how instruments are used and what meaning they are given. As a "tool for musical creation", a musical instrument is designed and understood as being used as a tool for musical creation, unrelated to its material construction. However, what makes musical instruments into a specific sub-category, is that they are used by the practitioners as the primary source of the sonic expression. A keyboard synthesizer is a clear example of a musical instrument since it can be used as the primary means to generate the sound and melodies in music. An equalizer, on the other hand, whilst being a tool for musical creation, is usually applied merely to adjust the frequencies of the sound from the keyboard synthesizer. It is therefore not a musical instrument but rather a "music production tool". The category of "tools for musical creation" includes a range of such production tools that are important in creating the music we hear, but are not the primary instruments that we as an audience recognise.

What is very clear with this distinction between musical instruments and music production tools, is that this is a very fluid categorisation. The distinction between these categories, is clearly dependent on what role the tools are assigned within the musical practice. Assigning new roles to a tool can therefore move it into a new subcategory. There are, for instance, examples where the equalizer can be used as the primary source in a musical expression, filtering and sculpting sounds into music. The different types of mediating technology that fall into the category of "tools for musical production" can in this way *all* become musical instruments, but such an alternation depends on how the tools are understood both by artists and audiences. In my definition therefore, the musical instrument is not a stable category based on given material qualities as in previous definitions, but embodies a more fluid definition dependent on the specific context of use and cultural definition. Brian Eno´s text, "The Studio as a Compositional Tool" underscores this way of defining musical instruments (Eno 2004). In this article, he actively argues that tools which have been previously understood as merely a means of recording and reproduction can take on a central role in musical creation. The same ideas had already emerged in the 1950s at the very start of musical experiments with such technology (Eimert 1957, p. 2 and Schaeffer 2012, p. 9). The cultural definition of tools is a topic that emerges several times throughout my dissertation. Organizing my thesis around mediating technology used in "tools for musical production", enables me to discuss the use of different tools, as they migrate between the subcategories of production tools and musical instruments.

The second category of mediating technological tools I focus on, is what I call “sonic tools”. The defining criteria of this category is that it includes all tools that can create and manipulate sound, but that lack a prior intent to be used for creating music. For this reason, these tools are excluded from the category of “tools for musical production”. A megaphone, for instance, is a sonic tool. It can of course be utilized to create music, and even used as if it was a musical instrument, but it is significantly different since its cultural meaning primarily is constituted by its use to amplify verbal messages and commands.

The category of sonic tools is also a category that is very loose and fluent, based on the specific cultural context in which the tool appears. A sonic tool can become a tool for musical production if its main purpose and design changes through time to become primarily associated with that of musical practice. The purpose of such a definition might become more apparent if we turn to a more traditional example. Both a violin and a washboard can be used as a musical instrument, but most people would agree that placing them in the same category of tools would erase many important cultural distinctions. The violin comes with a prior intent and cultural definition of creating music. Many other tools can create sound, but they often lack this type of prior cultural connotation. In chapter 4 of this thesis, where I discuss tools created by the artists themselves, this distinction becomes important since such novel tools lack the cultural connotations of existing musical instruments and production tools.

The common denominator in how I define the aforementioned concepts of mediating technology, (tools for musical creation and sonic tools), is based on how they are used and how they function. This facilitates a move away from such material distinctions as electronic and digital. Setting the focus on the concept of mediating technology enables me therefore to clarify some distinction between how different tools used in music actually work. This however makes the scope of my dissertation even larger, but it enables me to point out that the crucial distinction is not necessarily between a vinyl record and a CD, but more about the leap from notation to gramophone. With this focus in mind, we can more easily identify crucial aspects based on what this technology means in terms of establishing new sonic and artistic possibilities, rather than merely analyse them based on their material construct.

1.3 Music, a fluid concept

The goal of this dissertation is to show that the changes mediating technology exerts on the aesthetics of musical sound, always happens as part of an aesthetical reorientation of musical ideals. Artists can easily push their technological tools to extremes, but the success of their experiments is not achieved through the pure novelty of the results. This dissertation instead discusses how new artistic expression must relate to audience expectations of music, either by placing itself within a dominant framework of musical aesthetics or by presenting itself as a means to transgress very specific aesthetic borders. Understanding the effect of mediating technologies upon musical aesthetics is not just about the functional complexity of the tools; it is also about understanding a complex set of relations involving audience expectations and musical traditions. To answer my research question, it is therefore important to recognise that musical aesthetics *is* something that can change. Thus, this section explains the fluid aspects of musical ideals, identifying some of the forces that constitute musical ideals and also what influences it to change.

When Michael Jonzun claimed "the kids in the club wanted noise" (Tompkins 2010, p. 109), he (probably unknowingly) tapped into a crucial topic in 20th

century musical aesthetics. “Noise”, a term with multiple meanings, emerges as a central concept when discussing how “music” is culturally defined. Establishing the concept of “music” implies drawing up borders to distinguish which sounds should be aesthetically valued as music and which sounds should be excluded from this category. The term “noise” is, as mentioned, often used to describe the sounds that exist outside of what is commonly and collectively, in a specific place and time, defined as “music” (Kahn 1999, p. 68). But since the definitions and aesthetic ideals for “music” are in constant flux, the consequence of Kahn´s definition is that what is “noise” and what is “music”, changes in relation to the historical and cultural context.

There are several other ways to define sonic noise, to which I will return to later in my dissertation. However, my point about “music” as a fluid concept concentrates upon the idea that “noise” appears as the sonic opposite of music. An important aspect that Paul Hagerty points out is that “noise” only ever exists in opposition to the other: “music”: “Noise is negative: it is unwanted, other, not something ordered. It is negatively defined – i.e. by what it is not (not accepted sound, not music, not valid, not a message or a meaning), but it is also a negativity. In other words, it does not exist independently” (Hagerty 2007, p. 5). Kahn upholds this same division between “music” and “noise”, framing “noise” as “the other” and unmusical sounds. However, at the same time he underscores that “noise” also represents a sound that is a crucial point of musical and aesthetic transformation: “The division between sound and musical sound is negotiated and policed in terms of a traditionally established axis irrelevant to most music, although that dividing line is as crucial as it is unacknowledged” (Kahn 1990, p. 67). This relates directly to my opening example with Jonzun and his use of the vocoder (Tompkins 2010, p. 109). Merging his music with the “noise” the kids wanted, resulted in a new and different musical expression in line with an emerging new taste among the audiences. The relationship between “noise” and “music” is therefore something that is unstable; “noise” can enter the domain of musical expressions and through time shift the borders as to what sounds the establishment values as part of musical expressions. According to Peter Krapp (2011, p. 61), the history of western music seams to develop as a methodical violation of previously accepted rules.

One of the most thought provoking and radical explanations of the interdependence and fluidity between “noise” and “music” was brought forward by the French writer Jacques Attali, in his book “Noise” from 1979. For him, “music” and “noise” were basically the same sounds when defined in purely material scientific terms. The distinction appeared in how some sounds conformed to known and accepted cultural codes identifying them as music, while others did not. A listener familiar with these codes would recognize some of the sounds they heard as music. “Noise” would therefore not necessarily be identified by its inherent sonic quality (or lack of such), but emerge as a result of a cultural evaluation of the sonic expression (Attali 1985, p. 23-25).

Much in line with Kahn and Hagerty, Attali claims “music” exists solemnly as constituted through a network of meaning that is put in place and shared by a society. In such an established network of meaning, Attali, as Kahn, states that making “noise” acts as a potent means at the artist’s disposal to interrupt the existing balance. According to Attali, the appearance of “noise” can subsequently free the listener’s imagination: “The Presence of Noise makes sense, makes meaning. It makes possible the creation of a new order and another level of organization, of new code in another network” (Attali 1985, p. 33). “Noise” represents the fundamental component for changing the framework of music, subsequently mutating the old structure of code. In the hands of composers and musicians, “noise” becomes a powerful tool for pushing musical aesthetics in a new direction. Integrating the new sound into compositions and performances will at first be recognized as “noise” in the ears of the audience, but at the same time it opens up a new field of possible musical expressions. As new musical ideals and codes are established within this field, what once was “noise”, can gradually become a recognized component in the musical vocabulary.

Attali takes his analysis of musical change even further and identifies the process as a key ingredient in establishing power structures within our society. The changes that occur within the musical codes, herald the changes that are to come in society at large. Using “noise” therefore becomes a powerful tool in changing the social, political and economic orders. These are very bold claims to make and I refrain from commenting upon them here. However, what makes Attali especially relevant for my thesis, is how he links musical changes to developments in technology. New inventions and new instruments come with the prospect of creating new sounds and new social orders - to create “noise”. This makes novel forms of sonic combinations conceivable, opening up new fields of possibility in music. Attali claims that “the music instrument often predates the expression it authorizes” (Attali 1985, p. 35). The new instruments that are made, expand the scope of what performers and composers can create. The introduction of the piano and later for instance the electric guitar, resulted in totally new compositions that would have been unthinkable with other instruments. At their entry point into the musical establishment, the new possibilities inherent in these instruments broke with the musical norm, thus creating what the audience would understand as “noise”.

Even if Attali´s accounts are both inspiring and thought-provoking, they fall short of being positivistic in explaining the forces behind musical changes. Whilst he presents us with a very important observation that it is cultural established norms that define the difference between “music” and “noise”, his accounts of *how* these norms themselves are established and what makes these musical norms change, are rather vague. The problem that Attali does not mention, is that throughout history there have been several new musical instruments invented, all with the ability to create new sonic expressions perceived as “noise”. But significantly, very few have sparked such a musical change as the piano and electric guitar.

My dissertation aims at moving beyond just stating that “noise” is separated from “music” through a culturally defined network of meaning, and rather explores this topic in further depth by asking: *how* do certain technical developments actually manage to destabilize the borders between “noise” and “music”? To gain a deeper understanding, we have to take a closer look at *what* forces are shaping the codes governing musical concepts in society. Attali´s discussions on the topic are very much based on external factors in establishing change in musical concepts. However, I believe it is of crucial importance to move beyond the purely external factors of material and social conditions, and place a greater focus upon internal forces, such as the aesthetical and philosophical discussions that exist inside the established musical domain. How these musical ideals are established and developed, are crucial in understanding the changes that occur in music. One of the best attempts to explain such internal forces in music that we have seen recently, is Lydia Goehr’s: “The Imaginary Museum of Musical Works – an Essay on the Philosophy of Music” (2007).

In a similar way to Attali, Lydia Goehr focuses upon the concept of “music” as a cultural construct that regulates both human praxis and the ideals of musical sound. But in contrast to Attali, Goehr does not directly write about changes in music, but rather how the concepts we use to understand music often fail to consider these fluid aspects of musical praxis. Central to Lydia Goehr, are the analytical problems that occur when historically and culturally defined musical concepts, through philosophical justification, gain too much authority, thus passing into the field of music analysis as neutral and universal concepts. In numerous analyses, we fail to acknowledge that the concepts we apply in evaluating and making sense of music, in themselves are philosophical constructions. What we take as rather basic concepts in a fundament of musical analyses, has according to Goehr, a greater impact upon how we evaluate and understand music. When analysing changes in music, we therefore need to direct our attention towards the concepts we use as a basis for such analyses: "The concepts that centrally shape our thinking about theory and practice are those we want and need the most to submit to investigation" (Goehr 2007, p. xliv). My dissertation thus follows Goehr's argument and sees the questioning of our understanding of the codes that govern musical theory and practice as crucial: not only in explaining how mediating technology as a tool for musical production is interpreted, but how it subsequently results in a variety of aesthetical reorientations in musical sounds.

Goehr´s main concern is with the concept of musical works and how it has managed to dominate and shape much of musical analysis for nearly two hundred years. In her opinion, the concept of musical works is clearly a historical construction that developed with the emergence of Romantic music in the 19th century: this fulfilled an ontological need at the time to define music in terms of original, stabile and repeatable entities. The problem is that the historical context that influenced the work concept has more or less been forgotten and the concept given a natural place in defining music both before and after the Romantic period. Her motivations for writing the book stemmed from the apparent lack of concern about the cultural and aesthetic implications of using the work concept; by many it seemed to be the only packaging device around. Moreover, the works concept has a historical connection in relation to classical music, but according to Goehr, we also tend to think about other musical genres like jazz and experimental music as being musical works (Goehr 2007, p. 224).

In the historical context before the Romantic period, it is apparent that music in the form of an original, stabile and repeatable work, was not that important. In earlier times, the social situation surrounding the performance of music was the main focus, a stance that leads to one of Goehr´s most provocative statements: “Bach did not intend to compose musical works” (Goehr 2007, p. 8). In many of his compositions, Bach was reusing elements in putting together a new mass or oratorio to accommodate a specific occasion. In the 20th century, musical genres that focused more on happenings and improvisations were also clearly at odds with the central concepts of musical works. Even so, the concept of musical works continued to take a prominent place in defining and analysing musical practice, both before and after the Romantic period. This later development is something that Goehr attributes to the high cultural status the Romantic ideals of music have gained in Western culture (Goehr 2007, p. 250). Through meeting the conditions of the work concept, musicians of many genres have sought to justify themselves as artists.

It is of course clear, that a lot of the earlier and later examples of musical praxis can easily fall into the category of musical works. What however is important, is that such musical expressions were not necessarily created with the intent to do so. They become what Goehr calls *derivative* examples (Goehr 2007, p. 253). The work concept gets modified to cover any peculiarities diverging from the norm, but the crucial point is how this subsequently affects our analysis of that music. Treating something as a derivative musical work can have crucial repercussions for how we understand the aesthetics of music, since we can end up excluding important artistic aspects from our analyses.

To understand the potential problematic aspects with the work concept, especially when it comes to its derivative instances, Goehr focuses upon how it functions as a *regulative concept.* The regulative concepts have a normative function in determining, stabilizing and ordering the structure of practice:

> "Within classical music practice we compose works, produce performance of works, appreciate, analyse, and evaluate works. To do this successfully we need a particular kind of general understanding. Every time we talk about individual musical works we apply this general understanding to the specific case. This understanding focuses upon one or more regulative concepts." (Goehr 2007, p. 103)

The concept of musical works therefore determines, stabilizes and orders the structure of musical practice. It indirectly suggests to musicians what beliefs are to be held and what actions are to be taken. What becomes music in the strictest sense, ends up being normalized through a general understanding of what constitutes a musical work, and in this process the music used as the initial examples of musical works, ends up defining much of the aesthetic ideals. A musical work is not just any group of sound, but a class of sound that relates in important ways to the activity of composing and performing. From an ontological point of view, this development has proven effective in framing what types of sonic creativity fall within the interest of musicologists and audiences, and also in establishing a distinction between what is aesthetically appreciated as musical "sound" and what is "noise".

It might seem beside the point to focus upon developments that happened two centuries ago, but the concept of musical works is actually very important in relation to my focus on mediating technology. The concept of musical works has had a decisive function in Western music, in defining music as an ontological entity for further aesthetic analysis. With the introduction of mediating technology, the possibility to automatically store, manipulate and create sound, and hence music through codes, provides new ontological possibilities for defining sound and music. In my opinion, it is clear that these new possibilities can facilitate new approaches to analysing music; whether it be strengthening the traditional concepts through establishing derivative work concepts, altering the work concept or even breaking with it. A reoccurring theme throughout this dissertation, therefore, will be how new tools for music production relate to three different agents that Goehr defines as essential to how the concept of musical works is constituted and sustained within musical praxis: the purpose, nature and relationship between the composer, the score and the performance (Goehr 2007, p. 20 and 253). These three agents identify different aspects that are central for any definition of musical works. Firstly, there has to be a composer, a creative force behind the music, putting forward original artistic ideas. Secondly, these ideas have to gain some tangible manifestation, traditionally in the form of a musical score. Thirdly, the artistic ideas have to be realized into sound through some sort of musical performance, making the work come to life as a sonic manifestation.

How we understand a musical work depends to a large extent upon how we choose to define the nature of, and the relationship between the three agents. My point is that using mediating technology has the power to significantly influence the workings of these three agents, how music can be composed, how it is materially manifested and how it is performed. In forthcoming discussions, the relationship between mediating technology and the agents of composer, notation and performance will therefore be a reoccurring topic. There is never a neutral definition of these agents, and in all cases, the normative power of the examples we use to exemplify a musical work is decisive. What we choose as the starting point will to a large degree define how we assign the roles to the composer, to notation and performance. As Goehr states: "I seek to demonstrate that thinking is never as pure or innocent as some would like it to be…" (Goehr 2007, p. 3). Depending on how practitioners choose to define the purpose of mediating technology, different aspects within the creation and framing of these complex sound structures they call musical works, will be emphasized; different sonic/musical characteristics will be included or excluded from the concept.

Technology has always played an important role in defining the concept of musical works, even before the introduction of mediating technology. Historically speaking, the development of notation has taken centre stage in defining the musical work. This is, of course, a consequence of how the works of classical music in the form of notated works have been the prime example for what a musical work is. In his book "The Languages of Art" (1968), Nelson Goodman upholds the musical score as a defining element in constituting the musical work. A fundamental consequence of such an emphasis on one of the three agents that make out the musical work, is that it places great aesthetical stress on a performer's ability to stay true to the notation of the work. Ideally the notational system should cover, without exception and uncertainties, each and every sonic characteristic that corresponds to the given work. In many instances, the European classical notation system *is* very precise in relation to the tonal system, telling the performer what tones within the standardized 12-tone system to play. The rhythmic features of the melodies are also covered rather well, but as Goehr points out, there are musical aspects within the notation system that are very imprecise (Goehr 2007, p. 24). One such element is, for instance, the tempo markings. Goodman´s response to this "problem" is to claim that tempo markings do not qualify as defining characteristics for the concept of musical works (Goodman 1968, p. 185). As a result, the musical aspects that cannot be covered by the notation system become less important for the aesthetic analysis of music.

The repercussions of Goodman´s emphasis on notation as the defining element for musical works, is that the tonal characteristics of music defined through the score gain paramount importance for all analysis of music. Consequently, sonic characteristics that regularly appear in every musical expression but elude representation through the tonal system of the notation, fall outside of musical analysis. Setting the "correct" tempo is a crucial part of all musical praxis, but for Goodman it is not considered to be a defining characteristic in constituting a musical work. Based on the overall importance that is ascribed to the concept of musical works, the characteristics excluded by Goodman's definition, subsequently can become less important in an aesthetic analysis.

Today, this focus on notation in analysis of music that Goodman was advocating is widely criticized and mostly abandoned by critics and academics. Nicolas Cook, amongst others, argues against the significance of notation by pointing out that it is not that important for the audience; what matters is what the music sounds like. Musical sound does not contain notes, notes are imaginative entities that trained musicians use for mapping the sounds in relation to time and pitch (Cook 1990, p. 219). Analysing music is about focusing on the realisation of these notes, not the structures in the notation itself. Cook is also discussing how music is defined culturally, through what he describes as a musical culture. For him, a musical culture is based upon imagining sound as music, and its basic identity lies in its mechanism for constituting sound as intentional object. In Western musical culture, notation, from a single note all the way to the complete work, is the basis for such a mechanism. The problem, however, is that the listeners do not experience the sound as these objects. The listeners experience the sonic impressions of these structures and objects (Cook 1990, p. 223). Most importantly, these structures that make up the musical culture, often through the education of composers and performers, do not adequately explain in full the listener's experience (Cook 1990, p. 3). Cook claims that listeners enjoying music, even when they are well schooled in the theories of Western music, do not necessarily pay attention to such objects as chord progression or compositional structures. This is an important claim that I will return to in my further discussions.

However, in a historical context, the focus on notation was pivotal for musical aesthetics and important for analysing music. As a consequence, it also became an inspiration for how music should develop further, setting a point of departure for the aesthetic direction in musical experiments. An example, that in my opinion, serves as a good illustration of how established musical norms (in this case the established tonal rules of music) can further define the possible direction of musical progress, is found in Ferruccio Busoni´s essay *Sketch of a New Esthetic of Music*, first published in 1907. This is a famous instance exemplifying the early 20th century´s urge to develop music in new aesthetic directions - a text that became an inspiration to several composers. He argues for establishing a new "total music" that could break free from the constrictions of contemporary laws and aesthetic ideals. According to Busoni, music was as an art-form still in its infancy, an art-form in dire need of developing its expressions: "The function of the creative artist consists in making laws, not in following laws already made" (Busoni 1911, p. 22). The focal point of his critique was directed towards what was a defining force in music at his time: the established tonal system for music. Evolving music, was in his opinion, limited by how the accepted notation system and traditional roles for scales stood in the way of true musical expression. For the music to evolve, he therefore argued the need to advance from the 12-tone system, and the direction forward was to work with quarter tones and third notes.

Busoni´s urge to break with the established tonal system of music, was also inspired by what he saw as new technological possibilities in musical instruments. Performers dependent on traditional instruments were largely confined to the established 12 tones through the design of the instruments they used. But Busoni was inspired by the "Dynamochord" (also called "Dynamophone" or "Telharmonium"), an invention by Thaddeus Cahill and one of the very first electronical instruments to be designed. This was an instrument that technically could produce any range of tones with total precision, and theoretically also third and quarter tones. Cahill´s idea behind its construction had little to do with expanding on musical ideals, it was based upon a commercial idea of transmitting music to subscribers by means of the telephone grid (Manning 2013, p. 3). However, the "Dynamochord" turned out to be a failed business venture and never saw any type of experimental use before it was dismantled.

In retrospect, it is evident that Busoni´s thoughts about music and the potential in new music technology, were coloured by rather powerful assumptions about what music should be and what parts of musical creativity and praxis were to be understood as important. He was clearly advocating for breaking away from the established rules of tonal music, but at the same time his focus was also limiting. When Busoni discusses the limitations of existing musical instruments in his text, it is not the way they sound that he criticizes, as Nicolas Cook would later claim to be most important to the listener, but rather how its tonal system only maps the pitch in 12-tones. Busoni is therefore an early example of how the understanding of technological possibilities for new musical expressions are tangled up with existing musical ideals and aesthetic theory. The composers' and performers' possibilities to create new musical expressions are clearly dependent upon technological developments, but at the same time existing ideals frame the directions this development is going in. In hindsight, however, his goal can be criticized as just replacing one tonal system with another, rather than actually taking our understanding of music in a radical new direction. Musical approaches that later were to become important for the development of new musical expressions, such as pursuing new sounds and new forms of musical composition or performances, were not so much a part of his vision of future music. If we use Cook's explanation of musical culture, we can probably explain this by arguing that Busoni was too caught up with the mechanism of constituting sound as intentional object, rather than paying attention to how listeners actually enjoy music.

How Busoni´s experimental thoughts were shaped by governing tonal ideals, exemplifies a tendency that I will return to in my later discussions. An important aspect with analysing musical developments, is to question how the dominating musical ideal defines these further developments. We must also expect that when later mediating technology becomes available, similar interpretations to those Busoni carried out frames how later practitioners envision its use. However, even though Busoni could be criticized for not actually coming up with new musical concepts, his call for artists to create new rules rather than following established norms did inspire others to take musical ideals further. Echoing some of Busoni´s ideas, but taking them in a very different direction, was the Futurist Luigi Russolo. Six years after Busoni´s text, in 1913 Russolo wrote his manifesto *The Art of Noise* (1967), advocating for a broadening of the sonic concepts of music. Both Busoni and Russolo were theorizing about changing the technical conditions behind the creation and performance of music, but Russolo not only criticized the tonal capabilities of traditional instruments but called for totally new and different timbres and sonic characteristics. His main claim was that the emerging industrial societies brought "Noise" into human lives. The sound of growing cities, factories, motors and trains had changed the human sensibility towards music: music was to take its cues from the sonic environment that humans lived in, hence responding to the sonic complexity of modern life.

According to Russolo, traditional harmonies in music did not excite the audience any more. This meant that contemporary composers at the time were seeking out more complex and dissonant chords to keep in touch with the new sonic awareness. At the same time as Russolo published his manifesto, composers such as Stravinsky were pushing the boundaries as to how a symphony orchestra should sound by using ever increasingly dissenting chords and percussive instruments. The very same year, Stravinsky premiered *The Retie of Spring* for a shocked Parisian audience (Ross 2007, p. 80). But for Russolo this was not enough. In his manifesto, he argued that the traditional musical sound, or as he called it, "pure sound", in itself was too restrictive. No matter how hard a composer worked to create intricate harmonies and stretch the capability of the orchestra to produce new colours of sound, it would not get close to the results Russolo felt the audience had need for:

> "Each sound carries with it a nucleus of foreknown and forgone sensations predisposing the auditor to boredom, in spite of all the efforts of innovative composers. All of us have liked and enjoyed the harmonies of the great masters. For years, Beethoven and Wagner have deliciously shaken our hearts. Now we are fed up with them." (Russolo 1967, p. 6)

To revitalize music, it was therefore not enough to develop a new tonal system as Busoni argued for, but to develop the very sound of music by abandoning the pure sounds in order to "conquer the infinite variety of noise-sounds".

The noise-sounds Russolo wanted to approach, were inspired by the sound of the new modern machinery, including the sounds of war-machines. In opposition to Busoni, Russolo did not look to new electronic technology as a way to realize his aesthetic ideas, but instead constructed mechanical noise machines. He was not looking to imitate the sounds he heard from other machines; rather he defined 6 new categories of noises, inspired by modern life.

Russolo can be seen as an early exponent in exploiting the dichotomy between "noise" and traditional musical sounds as a means for artistic explorations, paving the way for later writers like Kahn and Attali. Compared to Busoni, his work clearly points towards a new direction in musical evolution, breaking away from previous musical languages defined in line with musical notation. But at the same time, we can question whether much of his musical approach was based on merely creating a binary opposition to the established ideal; basing aesthetic ideology on opposing the established one. What, however, is clear with both Russolo and Busoni, is that their ideas of musical development called for a new approach to the creation of sounds and music. Both called for the creation of new tools for the performance of music, either in the form of instruments with an expanded tonality, or machines that could produce noise without tonality. Yet, none of Russolo´s technologies depended on any form of sonic mediation, the type of technology that I want to focus my thesis upon. Significantly though, Russolo and Busoni exemplify how altering the conceptions of music, often (but not exclusively) depends upon the development of new tools for music production.

1.4. Historical background - The legacy from the early 20th century

> "Experimental and electronic music was once not-so-benignly tolerated at the margins of western art music, but it has over the last decade or so moved toward a central position as something of the soundtrack of our digital culture. Where it once was merely tolerated it is now more engaged and doesn't have to apologize to anyone". (Kahn 2004, p. 79)

This quote from Kahn points to a very important issue concerning the topic for my dissertation. The changes that happened in music due to the developments in mediating technology from the 1980s onwards, brought forth aesthetic ideals and sonic concepts that had previously only existed on the margins of Western musical culture. Mediating technology has a long history in Western music and looking back to previous artistic practices can help us better understand current developments. The problem is, however, as Kahn points out, that these historical examples have not always received the attention they deserved when the dominant history of Western music was written. In this section, I will therefore explore how the emergence of mediating technology in the 20th century before 1980, sparked novel artistic expressions often on the fringes of musical practice.

Whilst embarking on this short historical account of mediating technology and music, I do not mean to argue that changes that came after the 1980s must be seen as a direct result of earlier experiments. What I want to achieve here, is to create a historical background based on often lesser known artistic examples, that can help us to contextualize the importance of choices made by many more contemporary practitioners. In my opinion, key happenings in the music of the late 20th century mirrors events that appeared at previous points in history, not by repeating the same technological experiments, but rather by re-approaching, in part, conceptual rearrangements of musical aesthetics.

The first effect of mediating technology on music came with the ability to record and reproduce sound. With this development, music was no longer a fleeting experience confined to a specific musical performance but could be experienced and analysed repeatedly. Gradually, the same technology became important in the altering of sounds, even enabling the creation of totally new ones. In relation to these developments, two important questions about music raised, in my opinion, new controversies and needed to be constantly re-negotiated: Firstly: how is music supposed to sound? And secondly: how is this music - through active engagement by composers and performers – to be created? These two questions will be central to the following historical account.

A conceptualization of musical works that had previously relied on notation as the only stable representation, had with mediating technology suddenly been given a new tangible manifestation, making it possible to repeat and re-experience a specific performance of the work. This radically altered the role of the performance in relation to the previous emphasis on musical scores.

Simultaneously, it also made it possible to establish a new relationship between the composer and the work created. On the one hand, this new mediated realm could be understood as an extension of the existing musical ideal defined by acoustic concert music, placing a greater aesthetic emphasis on the actual performance of musical work. On the other hand, the mediating technology could also be taken as a starting point for creating new sounds and inspire a new aesthetic exploration beyond the ideals that previously had governed musical aesthetics. This second view could imply a distinct departure from the dependence on the performative aspects of musical works.

To explain how artists have dealt with the question about musical sounds and its connection to how music is to be made, we have to look into rather diverse musical practices. Several parallel developments in the first part of the 20th century touched upon these questions. I begin by looking at how the emerging recording industry developed a different conceptualization of how musical sound was to be aestheticized, hence how music was to sound. What makes this especially interesting, was how practitioners developed new musical ideals while still paying homage to established musical concepts. I will thereafter focus on how mediating technology was taken up amongst the more avantgarde and experimental artists, inspiring them to pursue new musical directions often evolving in direct opposition to established ideals. Lastly, I will touch upon how practitioners in popular music treated these questions.

1.4.1 Recording enters the stage

Looking into the changes that occurred when recording technology first entered the field of music, it is striking how the changes did not come as a direct consequence of material and technological change alone. For the development to take place, people had to drastically alter the way they thought about sound. Today, the possibilities for recording and reproduction are natural parts of our definition of sound, but around the time when the gramophone was invented, the understanding of sound was something very different. Based on this, the early history of sound recording in music exemplifies how important the changes that occurred in the cultural understanding of musical ideals are for the effects mediating technology exerts upon music.

There have been several writers who have pointed out that Edison's invention of the phonograph in 1877 was perhaps not so much a technical triumph, but rather an accomplishment in redefining our conceptualization of sound. The materials and technology needed to realize his invention had been around for a long time. The turning point was that Edison managed to expand on the conceptual understanding of what sound could be, concluding that sound could be the subject of both recording and reproduction (Kittler 1999, p. 29; Milner 2009, p. 23). This fact is underscored by the French inventor Édouard-Léon Scott de Martinville´s patent, *The Phonautograph* from 1957. This was a contraption that had very much in common with that of Edison's invention 20 years later, but de Martinville´s machine was designed simply to inscribe sound vibrations into a material, storing them only for further visual scrutiny and examination. It was a very concrete recorder of sound, but lacked the actual ability to replay the sound. There were few technical limitations that stopped de Martinville from including such a function. If the thought had occurred to him, he would have beaten Edison to his invention by 20 years.

The media theorist Friedrich Kittler tries to elaborate on how this cultural change came about, arguing that social and philosophical developments at the time of Edison's invention had already laid the groundwork for new conceptualizations of our senses and physical surroundings (Kittler 1999, p. 29). The fact that we now know of a probably unrelated French patent from 1877 similar to Edison's gramophone – unrealized due to lack of funding – underscores the point that the late 19th century was a time when several factors, not only technical and material, came together spawning the idea of sound recording and reproduction.

It is clear that these new conceptualizations of sound had to gradually mature before the repercussions could be experienced on a larger cultural scale. Its appliance in music was something that developed over time. When the musical establishment gradually came to terms with the concept of recording, both practitioner and audience were faced with a new creative landscape - establishing new premises for producing, consuming and evaluating music. With this development, we can see that two different ways of understanding recorded sound crystalized. One way focused on defining the recorded sound as an authentic recreation of an actual sonic event, pushing practitioners towards using mediating technology as a continuance of established ideals of musical performance. The other definition of recorded sound described it as a new sonic expression, pushing for a new and different aesthetic understanding of sound.

In his book “Recording Angel” (2005), Evan Eisenberg argues for the latter. He claims that recorded music was so different from earlier musical praxis that it should be understood as a musical expression in its own right. He coins the term “phonography” to describe how recorded music constituted a new musical paradigm both for composers, performers, and the audience. Eisenberg’s point is that the word “record” is actually misleading in describing this new medium. As the majority of recordings that have been made in the 20th century are studio recordings, they are in effect recordings of nothing: “Pieced together from bits of actual events, they construct an ideal event. They are like composite photography of a miniature” (Eisenberg 2005, p. 89). In my opinion, this represents an important insight and reinforces my definition of mediating technology in this dissertation. The music experienced through mediating technology is not necessarily a re-presentation of a “real life” event, but most of all embodies a new and different sonic whole. If we are to take Eisenberg´s position at face value, we cannot argue for any possible transparency in the medium, and as a consequence, musical ideals and aesthetic sensibilities do not *necessarily* translate from previous musical praxis into the new medium of recorded sound.

Whether or not practitioners and artists followed what came to be Eisenberg's ideal of "phonography" or understood sound recording as a reproduction of live music, it becomes evident that mediating technology was complicating people's relationship to the sound of actual musical instruments. This initially happened through pushing both the audience and performers to consider the acoustic space as an integral part of the musical experience. When electronic amplification enabled the use of microphones that could pick up much more sound from the environment around the instruments, this problem escalated. The very first recording techniques were based on mechanically capturing the physical vibration of the sound, forcing the performer to sing or play directly into a recording horn. With electric amplifications microphones could be placed in different positions, capturing the sound from different acoustic angles, thus turning the act of recording music into a process involving several new choices.

For Edison and his followers, the development of the amplified microphone represented a break with what they defined as a purer approach to music. They favoured the earlier mechanical recording process, conveying through physical means the physical vibrations emitted by a musical instrument. Opposing this ideal, Edison's competitors in the gramophone company *Victor* pursued the new electronic amplifications, claiming its ability to capture more sounds from sources outside the actual instrument, added important features to the music (Millner 2009, p. 54). The dispute made it very clear that sound in itself was subject to a new set of aesthetic questions– questions that went beyond the earlier concerns about instrumentation and performance techniques. It became incessantly harder to uphold any natural given link between prior sonic ideals in early musical performance and those new possibilities that emerge with recording. The act of recording sound had no singular objective and naturally given link to the musical performance of an acoustic concert. The established musical tradition and aesthetics did not naturally translate into this new mediated form of music. The recorded music, as Eisenberg argued, represented a very different musical experience and expression compared to that of previous live music.

Due to the new sonic reality that emerged with sound recording, the creative process in music was subsequently altered. With earlier music, the composer could shape the sonic characteristics of melodies through choices of instrumentation and performance techniques. With the proliferation of recording technology, a new layer of possibilities was added. These possibilities emerged out of the new technology that surpassed the traditional artistic compositional and performative roles. These new possibilities were also situated amongst a new group of practitioners whose existence was outside that of the traditional musical agents described earlier. This new agent was the recording technician. The construction of recording technology and the whole process of recording came as a result of a range of technical choices that affected the resulting sound of the recording. With these realizations, the concept of recorded sound suddenly introduced a range of choices and possibilities that set its creative process apart from music in its previously non-recorded acoustic form. The procedure for recording sounds turned out not to be a single lane, but a path riddled with technical choices all resulting in different aesthetic expressions.

One of the earlier and at its time most extravagant examples of experimenting with the new possibilities in sound recording, was Stokowski and his experiments in amplification and recordings of classical music for the Disney picture *Fantasia.*

For the production of this film, the engineers at Disney developed a new standard for sound in pictures: the "Fantasound". They did so, not with the aim of simulating live entertainment, but rather to evolve beyond its inherent limitations (Telotte 2010, p. 36). Stokowski had for years worked to expand the sound of the symphony orchestra by using microphone placements and electronic amplification (Milner 2009, p.64). For *Fantasia,* the sound of the symphony orchestra was eventually mixed together from eight recording channels, into three different channels: screen left, screen right and screen centre (Telotte 2010, p. 39). For Stokowski, the means of recording was a technology that he could use according to his interpretation of the musical work, bypassing that of just reproducing the sound of a live performance, instead giving the audience a unique version of the music.

The music Stokowski recorded for *Fantasia*, is a powerful example of how the sound of a traditional orchestra could be experienced in a new way through the technology of sound recording. By using microphones, he could make the audience experience sounds in the orchestra that they had never heard before. But even here, the mainstream recording industries did not fully embrace these possibilities. It turned out, for different reasons, that nurturing the cultural link between recorded music and the traditional format of live acoustic musical performance became far more important than focusing on the new sonic and expressive musical possibilities. What came to shape much of the commercial recording industry, was not so much Eisenberg´s idea of "phonography" but primarily the concept of High Fidelity. This approach understood sound recording as an authentic recreation of an actual sonic event, returning us to what I defined as the first way of understanding sound recording.

The defining basis for High Fidelity was attempting to subdue much of the *creative* potential in sound recording, establishing the narrative that technology was developing towards an always more transparent recollection of sound and musical performances. It was about establishing a natural link between the recording and the original sound or musical performance. According to Jonathan Sterne, this ideal of a stable and exact reproduction of sound, was not based on any scientific methods, but rather a purely cultural concept (Sterne 2003). Focusing on one specific sonic ideal among many possible ways of recording music, becomes therefore a cultural choice. If we return to the concept of sonic signature that Brøvig-Hansen and Danielsen use to explain how mediating technology can influence musical aesthetics (2016, p, 5), Sterne repeats my point from the introduction that all mediation has its signature. That we sometimes choose to call something a transparent reproduction of sound, is a cultural choice. As Sterne concludes, the debate about the so-called fidelity in recording, is actually a debate about the aesthetics of sound (Sterne 2007, p. 8). Zagorski-Thomas underscores this conclusion when he argues that the sonic ideal in High Fidelity was actually founded on a very strong mediation of sound. It was based on clear sound often achieved through recording the different instruments separately; a process that created a sonic result very different from how a live concert would sound (Zagorski-Thomas 2012, p. 60). In addition, such a process often included boosting the high and low frequencies in the sound.

Even though the artistic and creative potential afforded by mediating technology was obvious to many in the early days of recording, such an explanation of sound recording was not a good sales pitch when promoting phonographs in a commercial market. The establishment of the High-Fidelity ideology started out, according to Sterne, as part of the overall promotion of gramophones as a domestic commodity. Early sales commercials for gramophones would focus on the similarity between the performer and the gramophone, such as claiming "Both are Caruso" (Sterne 2003, p. 216). In this early period, the dealers of Edison's gramophone also introduced a demonstration of their device through what was named the "Edison Tone Tests", where live musicians were performing alongside a gramophone recording of themselves (Thompson 1995, p. 131). The artist would perform alongside the record, then stop, in order to demonstrate the similarity between the two.

With the growth of the record industry, ideals of High Fidelity came to play a central role in the 20th century understanding of recording technology. Returning to my definition of mediating technology, it is clear that the development of High-Fidelity was decisive in framing sound recording as a tool striving towards a transparent reproduction of sound. This is related to the social function of the technology, and the relationship between sound and its source. As Sterne argues: “fidelity is the story we tell ourselves to staple separate pieces of sonic reality together” (Sterne 2003, p. 219). In Sterne’s account, High Fidelity therefore functions to cover up the inconsistency between what Eisenberg defines as “phonography” and the aesthetic concepts derived from previous musical ideals. With the ideology of High Fidelity, the three agents of composer, notation and performer, retain their legitimate authority in defining musical expressions. According to Goehr, the concept of High-Fidelity upholds the work concept as it was instigated in the Romantic period (Goehr 2007, p. XXXiii). In my opinion, High Fidelity´s ability to bridge previous cultural concepts about musical aesthetics with a new technological commodity and expression, is the reason why it managed to gain such a position within the musical industry. The downside of this, is that an artist´s possibility to truly develop new musical aesthetics based on the new tools, was restrained within the domain of the recording industry.

But even though the concept of High-Fidelity was thoroughly dependent on conveying the traditional musical ideologies as rooted in the three agents, composer, notation and performance, it gradually became apparent that that these traditions would not escape the effects of mediating technology. At the centre of this development, questions were emerging about how the performer could best convey the musical work in question. Performing in a concert setting would place restrictions on the musicians regarding instrument placement and the acoustic space they were confined to for the duration of the concert. However, the format of sound recording allowed performers to seek out alternative performative settings to those available in the traditional concert format. One could choose rooms and instrument placements without having to consider the audience, and also record different parts of the work at different times and in different locations. As Zagorski-Thomas pointed out, High Fidelity recordings often separated the different instruments in the recording process to achieve a much clearer sound than in a normal live performance setting (2012, p. 60). At the centre of this reorientation, was a desire to enable the performer to express the composer's musical ideals more freely, and to choose those options that artistically would bring the result closer to their vision of the composer's work. While still staying true to the sound of the instruments´ acoustics, the recording technology could be used to stitch together a new performance situation for realizing a musical work.

While musical genres of the mid-20th century such as Jazz, Blues and Rock evolved alongside the increasing possibilities in sound recording (I will return to this a bit later), classical music evolved mainly by altering existing ideals. Classical music is therefore a better example of how the use of mediating technology sparked transitions in musical aesthetics. Classical music illustrates the importance of how the possibilities in mediating technology are interpreted based on dominant musical ideologies. The very best example of such transitions can be found in the art of Opera.

As a musical art form, Opera had traditionally been dependent on additional artistic elements such as acting, costumes and scenography. When the work became fixed to the medium of recorded sound, all these elements were stripped away from the listener's experience, thus altering the aesthetic appreciation of these works into something very different. Due to this change, the question arose as to whether opera recordings should try to maintain the sound of an opera from the point of the best seats in the opera house, or if the aesthetic approach to the work should be more concerned with how the opera should sound through the medium of your private hi-fi system. The famous producer John Culshaw, was of the impression that one should approach the work to be recorded from the point of where the result was to be experienced – at home. Working with conductors of high status such as Karajan and Solti, he used technology freely in his recordings to create an ideal soundscape, often branching out from the acoustic restrictions evident in traditional concert halls and opera houses. Perhaps the most famous example of Culshaw´s sound ideals can be heard in his recording of Solti conducting Strauss' "Elektra" for Decca in 1966 (Badal 1996, p. 7, Prendergast 2017).

Culshaw's method was very much in tune with Eisenberg´s ideals of "phonography", but he became entangled in a long dispute with the critic Conrad L. Osborne about the right way to experience opera. Osborne felt that this new approach to older works which were intended for the stage, represented a deviation from the aesthetics of live music, which in his opinion, was the only way to experience this work of Strauss. Culshaw responded to this criticism by arguing that he was liberating the work of Strauss from "the confines of inherited traditions and architecture". For Culshaw, keeping to the sound of a traditional operatic hall would not be relevant for the majority of audiences who would experience the work in their living rooms. Furthermore, this decision was not just a yearning to satisfy a record buying audience, his choices were driven by a desire to reach deeper into what he saw as the essence of the musical work.

> "We didn´t want to make a nice comfortable recording for the canary fancier to chatter about: we wanted it to hurt in the way Strauss meant it to

> hurt, and involve in the way Strauss meant it to involve. This is what really matters, because it is what the composer wrote." (Culshaw 1968, p. 69)

Culshaw´s statement demonstrates a crucial reorientation towards the established aesthetic ideals of music. Both he and Osborne were arguing for an ideal representation of the musical work, applying what Goehr calls the Romantic "Werktrauer", making the performer subservient to the work and its composer (Goehr 2007, p. 231). The novel aspect of Culshaw´s approach, however, was that he saw the composer's musical intention as not necessarily confined to a historical live musical context but something that could exist beyond the concert hall. With the means of recording technology, the performer was empowered, enabling them to realize the work of the composer through new means and presumably getting closer to the actual ideas the composer had envisioned. Through Culshaw´s approach we can see that the three traditional agents of music: the composer, notation and performer, can also work with recorded sound as a primary medium of expression. The difference is that the work of the performer is freed from that of a concert setting, and that the craftsmanship of the recording technicians becomes part of the realization of the musical work. The aesthetical repercussions of such a change in the work concept, places more emphasis on an ideal existence of the musical work outside of the real-time live performance and the singular acoustic space of the concert hall.

The same attitude to recording technologies as Culshaw´s works embodied, had earlier been advocated by the pianist Glenn Gould. As a classical musician choosing to retire from live performances, his article *The Prospect of Recording* from 1966 became one of the most thought-provoking writings on sound recordings from the 20th century. In this article, he explains why he dropped playing concerts and instead pursued a recording career, claiming - in the same way as Culshaw - that this move gave him the possibility to reach a more complete realization of the musical works. His writing is, in my opinion, one of the best explanations of how recording technology can be used to expand on existing ideals for musical aesthetics. The reason for this, is that Gould built a thorough argument as to how the new medium would let us achieve an actual appreciation of the musical works in themselves. This argument centred on the sonic experience as the focus of our attention, rather than allowing the additional notions about how and when the recording was made influence our appreciation of the musical work.

At the time of the article, Glenn Gould had become somewhat of a controversial figure, openly admitting to the use of tape-splicing techniques in producing his record releases. In the text, he explained how his recordings of Bach were made up of different takes, played on different days, and then spliced together. The opening and the end were taken from one take, but the middle movement was spliced in from a recording of the work done the following day – a choice that was not popular among the audience.

At the time, splicing together different takes when recording classical music, was considered as cheating - a means of covering up inabilities in the performer´s skill. A soprano not hitting the high notes could retake the different parts to perfection, presenting a result that she would probably not be capable of doing at a concert. But in a similar vein to Culshaw, we can see Glenn Gould striving to liberate music and all art from the historic constraints inherent in the concert format. This implies that we should approach the musical work itself by paying less attention to its means of execution. Listening to the recordings, we should stop considering questions about who, when, how and where it was recorded, but listen more to the sonic results. Gould's explanation of why he uses tape splicing, is precisely this. By piecing together parts from different performances, he could present the audience with a new musical entirety that in his opinion represented a better realization of the musical work (Gould 2004 p. 117-116).

To illustrate what type of aesthetic appreciation Glenn Gould was seeking through his use of different recording techniques, he points to a discussion that from time to time has appeared in visual art. Throughout the history of art, there have been numerous paintings that have been identified as forgeries. What usually occurs, is that such works of art automatically lose their value and become uninteresting to an audience. But Gould questions this, asking why our understanding and appreciation of art is so ingrained with understanding who made it and when. Is it not correct to claim that the most important aesthetic experience of art, occurs at the meeting point between the art work and the audience? The visual expression in an artwork does not change if it turns out that it was made by someone else at a different time. The same conflict is also evident within music when our knowledge of performer and the time and place of performance takes on a central part in our aesthetic experience of music.

In my opinion, both Gould and Culshaw exemplify a very important aesthetic shift in music: moving beyond the performer's role in a concert setting and instead placing more emphasis on the artist´s ability to put recording technology to use in achieving the best possible realization of the music in question. With this new approach, the performer retained a central role in the realization of the composer's work, but the work was now to be appreciated by the audience in the form of a recording played in their living room, and not confined to a specific incident in the concert hall. As a result, performers of classical musical could free themselves from the limitations that a concert performance imposed on them, and approach the music from different directions. With this move, a new conceptual space was established that could be further populated by new paradigms for musical experience. The case with Culshaw and Gould shows however, that this space was, in their work, interpreted and employed in line with the governing musical ideal of musical works. New artistic possibilities were introduced expanding the aesthetic prospects of the performers and conductors, but overall it was aimed at reaching the ideal intentions of the composer of the musical work.

In the next section, I continue to investigate the creative possibilities afforded by mediating technology in music, but shift the focus towards artists who used it to pursue rather different aesthetic ideals. Instead of working in line with what Goehr calls "Werktrauer", the striving for an ideal realisation of the musical work (Goehr 2007, p. 231), the following examples focus upon artists who aim at establishing very new ideals for what music should be.

1.4.2 The avant-gardes and experimental artists search for new sounds

The work of Gould, Culshaw and also Stokowski represented a desire to use new mediating technology to develop musical aesthetics as it originated from the known acoustic instruments. Parallel to this development, however, was a rather different approach to sonic mediation, a development that in one way represented a clearer break with existing musical ideals. Instead of just reproducing sound derived from traditional instruments, certain artists were inspired to investigate the radical possibility of mediating technology as a way to create totally new sounds, which were not dependent on acoustic instruments. This represented the start of another trajectory in musical aesthetics: the search for a totally new means of creating sound through mediating technology.

Today, sound recording is generally understood in opposition to digital and electronic creation of sound. But as I advocated in my opening definition of mediating technology, it should rather be understood as two sides of the same technological development. It is important to acknowledge that the "invention" of the gramophone was decisive in both developments. The new conceptualisation of sound that emerged with recording technology enabled people to envision sound beyond the traditional acoustic realm of musical instruments. In addition, the technology for sound recording came with the prospect of new ways of generating sound. When you construct a device for reproducing recorded sound, much of the design of this technology is based on reinterpreting and recreating the signals stored in a static physical medium, applying some type of transducers (Sterne 2003, p. 22). The machine in question has to be able to create sound out of another type of signal. Skipping the part of recording and instead focusing on interpreting the stored signals into sound, would mean that you theoretically could generate new sound from this type of signal.

Amongst the earliest artists to voice an interest in pushing the use of recording technology in music beyond that of pure sonic reproduction, was the Hungarian artist László Moholy-Nagy. In his article Production Reproduction (published in 1922), he drew inspiration from his own visual investigations in photography, a practice where he had long experimented with using the darkroom and developing processes to create new imagery. He speculated that similar techniques could be applied to the phonograph, turning the technology into a means for producing new sounds:

> An extension of this apparatus for productive purposes could be achieved as follows: The grooves are incised by human agency into the wax plate, without any external mechanical means, which then produce sound effects which would signify – without new instruments and without an orchestra - a fundamental innovation in sound production (of new hitherto unknown sounds and tonal relations) both in composition and musical performance (Moholy-Nagy 1985, p. 289).

This quote is taken from a very short article and it must be emphasized that there is no evidence to indicate that Moholy-Nagy actually did anything to pursue these ideas further. Yet, it exemplifies important thoughts about expanding upon the emerging possibilities of a new medium, working towards a new concept of music. It therefore serves as a historic example of why we should apply a broader scope to mediating technology in music, not only limiting it to a discussion about storing and reproducing acoustic sounds. In his article, Moholy-Nagy directly questions the purpose of recording technology asking: "what is this apparatus good for?". As a result of these questions, a reinterpretation of the material level of sound recording could take place, envisioning new ways that practitioners could create musical sound. With this, the technology emerged not just as a means for re-creating former sounds, but as a means for two new creative strategies. Firstly, if the technology could be used to produce new sound, composers could go beyond the traditional sounds of the orchestra. Secondly, this could also free the composer from the limitations and inaccuracies of performing musicians who were to interpret the music, taking direct control of the sonic result by engaging directly with mediating technology.

Moholy-Nagy´s idea of inscribing sounds directly to discs through engraving was never achieved, but his ideas of repurposing the recording technology to create new sounds and establish new compositional practices was an idea that developed amongst others. The early use of the gramophone to expand the musical palette of sound, happened primarily by the manipulation or juxtaposing of sounds. This approach became the key ingredient in what came to be called "gramophone music" or "Grammophonmusik" in German. This was a short-lived experimental genre developed by musicians associated primarily with the experimental artistic community in Berlin, but had offsprings in other European countries. Very little has survived of these early musical experiments, but there are fragments and written reviews left behind, amongst others from the works of composers Paul Hindemith and Ernst Toch. Both working out of the Hochschole für Musik in Berlin, in 1930 they presented musical works that consisted of (or included) sound created through the manipulation of gramophone recordings (Katz 2010, p. 110-113). An important element in these works is the sonic transformations that happened when the playback speed was changed. By re-recording sounds while manipulating the playback speed of the gramophone, they could for instance make a human voice span several octaves. They also experimented with juxtaposing different recordings by playing back several gramophones simultaneously, in addition to accompanying them with live instruments.

It is worth noting that the thoughts and experiments instigated by Moholy-Nagy, Hindemith and Toch, had close to no impact on how contemporary academics thought about the emerging mediating technology. But in my opinion, these examples are very important because they demonstrate how fundamental the desire to experiment with and rethink the use of mediating technology is for musical practitioners. They exemplify the urge to use technology to establish new musical practices, new ways of creating sounds, and establish new approaches to the realization of musical works, in bypassing the ideals of traditional performances through non-acoustic creation of sound.

I would nevertheless claim, that the radical principles governing these early experiments explain why they were neglected by contemporary critics. Adorno, with his enormous influence on later writings on music, expressed at the time a very negative attitude towards any new musical prospects coming out of both recording technologies and radio. Even if he has been understood as a radical writer on culture, his articles *The Curves of the Needle* (first published 1927), *The Form of the Phonograph Record* (first published 1934) and *The Radio Symphony* (first published1941), set him very much out of tune with the experimental avant-garde artists of his time. One plausible explanation for Adorno´s resistance towards these new technologies is that he had very little knowledge of the actual experiments happening amongst the avant-garde composers. Caleb Kelly concludes that Adorno: “did not know of the then-contemporary experiments that used and then misused the record and the phonograph to produce new phonograph-specific music" (Kelly 2009, p. 53 and 108). If Adorno had actually experienced some of the new works being produced, it might have made him view the technology differently. But when reading Adorno's text, it becomes apparent that his reliance on established classical musical ideals surfaces as an even larger obstacle in acknowledging any artistic potential in mediating technology, and further appreciating the radical experiments contemporary to his writings[7].

In these three articles which deal with recording technology's effect on music, Adorno constantly compares the phonograph and the radio against sonic and artistic ideals from classical music - what he defines as "serious" music. By this, it is apparent that Adorno's analyses of the gramophone followed a very traditional definition of what music is and what it should sound like, confined to the regulative function of the work concept; trapped in what Lydia Goehr defines as the "Beethoven paradigm" (Goehr 2007, p. 104 and 205-245). In *The Curves of the Needle*, whilst criticizing the sonic limitation of the phonograph and how it reduces listening to a private consumption, Adorno states: "For now, Beethoven defies the gramophone" (Adorno 2002a, p. 272). In *The Radio Symphony*, Beethoven returns as the prime musical example and is subjected to a detailed analysis of how the radio's limited sonic capacities work against the important qualities of Beethoven's Fifth.

[7] It could be argued that other contemporary writers of Adorno were more positive to avant-garde experiments with technology: for example, Walter Benjamin in his article The Work of Art in the Age of Mechanical production published in 1935. Here Benjamin makes a compelling case for the radical artistic potential in cinema, arguing that mechanical reproduction could liberate art from its bourgeoise constraints (Benjamin 1969). Though he mentions sound recording twice, his entire argument is based upon examples from visual arts. The article has often been cited to exemplify the impact technology has had on aesthetics, but there is nothing in his article that directly describes how recording technology can develop music.

The limited dynamic range and inaccurate tonal details that the radio of that time imposed on its signal, transforms, according to Adorno, the symphony to something different from what it is supposed to be, something opposing the actual structure of the artwork. It flattens out all the colours and nuances of the original live performance (Adorno 2002b, p. 267). Adorno is laboriously pointing out how both radio and recording technology change the music it transmits, both aesthetically and socially (two concepts that are entwined in his understanding of music and art). For Adorno, the medium is failing musically, because of the fact that it does not manage to convey classical musical works adequately. But holding the classical musical paradigm up as a universal standard, Adorno cuts himself off from understanding the possibilities for new musical developments coming out of the new technology. In *The Form of the Phonograph*, he states: "Just as the call for "radio-specific" music remains necessarily empty and unfulfilled and gave rise to nothing better than some directions for instrumentation that turned out to be impracticable, so too there has never been any gramophone specific music" (Adorno 2002c, p. 277). Even if he had known about experiments like Hindemith and Toch´s "gramophone music", acknowledging these experiments would to a large extent force Adorno to depart from his established musical ideals. The motivation behind many of the avant-gardist theories and experiments was to create new sound and new ways of composing music; such a development included a departure from many of the classical ideals that remained central to Adorno's musical thinking.

But as the technology developed, Adorno's view on technology also changed. Thomas Y. Levin has pointed out that Adorno in no way must be seen as opposing technology (Levin 1990, p. 33-36). Though Adorno is suspicious of the industrial aspect of record production, he acknowledges the potential of technology to record and preserve music. Mediating technology could be used to elevate musical experiences as long as it confined itself to classical ideals of music. With the later developments in sonic qualities, recordings turned out to fulfil this criteria even further. In this instance, Adorno arrives at a similar conclusion to Gould and Culshaw, recognising that recording technology can help performers bypass some of the restraints that the concert format imposed on them. As with Culshaw, Adorno points out that this can be particularly achieved within the form of opera, where bad staging and costumes could easily overshadow the musical work (Adorno 2002d, p. 284).

Adorno actually takes this argument further than Gould and Culshaw, arguing that sound recording could have the potential to free music from the shackles of notation, opening up to a new relationship between music and writing. Notation, for Adorno, was an arbitrary signifying system, reducing music to mere signs on paper. With the advent of recording, Adorno speculated that musical events could now be indexically transcribed into the grooves of the record (Adorno 2002c, p. 279-280). To a certain degree, this might seem like the ideas of Moholy-Nagy who talked about inscribing curves directly into the phonographic disc. However, the difference lies in how Adorno emphasizes the lexical potential in such a process: for Adorno, it is how the grooves in the gramophone disc gain importance when they refer directly to an external sound. This actually represents the opposite of Moholy-Nagy's approach and has more in common with Nelson Goodman´s focus on the aesthetic importance of notation. Moholy-Nagy emphasized the possibilities to create new sounds, while Adorno wanted to use the technology to transcribe existing musical sounds. For Adorno, the technology attains its importance in relation to music through its ability to record - sustaining its link to a given external reality. Here we are faced with the two opposing views on interpreting mediating technology. Moholy-Nagy and the composers behind gramophone music wanted to expand upon the sonic palette of music, while Adorno focused on the how the recording technology could work as a lexical transcription of existing music.

Reading Adorno´s text, it seems he might admit that certain music could be made to fit the medium of the record, but the recurring problem is that these musical expressions diverge from what he deems as “serious” music. In describing how the short duration of the record places the music into situations of domestic daily needs, he states that this best suits “dances composed of dull repetitions” (Adorno 2002c, p. 278). This points back to what I see as a central aspect of the understanding of music technology. Even if new technical developments spark a lot of new musical possibilities, our aesthetic approach to music frames how we interpret these possibilities. The reason why Adorno interpreted recording technology the way he did, was probably not because he could not see any other possibilities for its use, but that he defined these applications of new technology as aesthetically uninteresting. The avant-garde artists experimenting with “Gramophone Music” managed, on the other hand, to expand their musical ideals and interpret the recording technology in a different aesthetic framework to that of Adorno. Even if Adorno had known about these experiments, they might have fallen so far away from how he understood music, that his theories and writings may have been unaffected by them.

1.4.3 Experimental art of the post war period

Much of what the early avant-gardes were trying to achieve was not only aesthetically challenging in pushing the boundaries of musical aesthetics, but their ideas and experiments were also difficult to realize with the technology they had at hand. The gramophone technology available at the time was a very simple construction, but with an underlying design principle that most people could understand. This simplicity might have been inspiring for practitioners who wanted to envision new ways of applying this technology, but it also made it both laborious and imprecise to work with. The ideas that avant-garde artists were theorizing and experimenting with, became naturally constrained by the technological limitations of their time. This though, was to change throughout the 20th century.

After the Second World War, spoils from Nazi Germany enabled American factories to produce a functional tape recorder, triggering a renewed interest in experiments with recording-technology. Tape recording had much better sonic accuracy than earlier gramophones and made sound manipulation easier. The tape could be cut and spliced, as Gould did, and multitrack recorders made it much easier to piece together different sonic sources. While the early avant-gardes remained mostly in obscurity, this second revival in sonic experiments with mediating technology gained much more influence on the contemporary music and art scene. With these advances, there were two composers working with technological experiments who become household names in the musical establishment: John Cage and Pierre Schaeffer. Both were paramount in changing our understanding of musical sounds and their novel use of mediating technology was a central premise of their work.

John Cage´s approach to mediating technology was shaped by a larger reorientation within the art world, maturing in the early 1960s. The aesthetic developments in this new art movement sparked a need to approach the mediation of sound in a new way. With a growing focus on happenings, the improvisational aspect of music coupled with text scores and long-duration minimalism, resulted in an artistic practice where each realization of a musical work could sound completely different. This new musical practice was ill suited for the dominant ideals of the recording industries – recordings as a preservation of a musical work (Grubbs 2014, p. 47). Even the more progressive approaches to recording as demonstrated by Gould and Culshaw appeared inadequate, faced with an aesthetic approach in which fluid experiences of a changing performance was so important. Cage was one of the most important exponents for this new trend in music, writing and realising a range of musical works where the performer executed tasks according to written instruction rather than following traditional notations. Often the performer did not utilize instruments at all but used other sonic tools that could produce sound.

If we return to the three dominant actors in defining our traditional concept of musical works; the composer, notation and performer; we see that all three are present in Cage´s music. Yet, based on the score, the performer is much freer to shape the sonic characteristics of music. Here, Cage displays some similarities with how Gould and Culshaw redefined traditional agents within musical aesthetics; but while they maintained much of the traditional focus on a stabile musical works by placing more emphasis on an ideal realisation of sonic aspects of the work through mediating technology, Cage´s emphasis on the role of the performer was probably much more radical. This development had much to do with Cage´s interest in elements of chance as a process for composing music. He was at this point clearly influenced by how serialism strived to free music from any psychological motivations, instead basing the composing process on throwing dice or using the Chinese I Ching (Holmes 2016, p. 106). In many of his works, the elements of chance were not only present in the creation of the score, the score also called for the performer to engage in operations of chance in performing the work. As a result of this attitude, most of Cage´s artistic practice focused on the concept of indeterminacy; musical works that sounded very different in each performance. In this way, Cage clearly questioned the established concept of musical works, but according to Goehr, he did this from the inside.

Even if his control of the performance was very minimal, Cage was still the composer who defined the work. According to Goehr, Cage is a typical example of how composers challenging a regulative concept such as the work concept, often find themselves situated within the praxis they seek to challenge (Goehr 2007, p. 260). Whilst Cage might instruct the performer to play how they wanted within a defined parameter, this is not the same as an improvised performance. The performer of Cage's work is always complying to the composer's instructions that constitute the musical work, while a performer improvising is acting on his own behalf motivated by the musical ideal residing outside of the specific work, as we see for instance, in the musical genre of Jazz (Goehr 2007, p. 262). Cage´s critique of established ideals in music therefore becomes paradoxical, since he is still calling for the performers to exert fidelity towards realising his work. The material that constitutes music might be changed, but the formal structure of the Romantic musical work is still intact.

Even if there are many elements in Cage´s work which place him firmly within the Romantic ideals of musical works, his focus on indeterminacy places his artistic praxis at odds with the dominant ideal of High Fidelity in musical recordings; an ideal that otherwise fulfilled the Romantic concept of musical works. Cage was determined to understand music as a process of shared experience between the audience and the performer, unfolding in a definite time and space. The central aspect of these new experimental musical works could therefore not be covered by a single recording (Haskins 2010, p. 383). Experiencing the works by attending the performance was the only way to appreciate the totality of the work. Cage therefore voiced a specific opposition against the influence recording had on music – a stance that repeated itself in many of his lectures/writing. His critique centres on how experiencing music through passively listening to records, conflicts with his ideas and visions of musical works as shaped by active practice. In one instance, he compared recordings with postcards claiming that: recordings ruin the landscape, and warned: "There are two great dangers for / Magnetic tape: one is music (all the /history and thinking about it); and the other /is feeling obliged to have an Instrument" (Cage 1961, p. 179). He also claimed: "remove all records from Texas and someone will learn to sing" (Cage 1961, p.

126). Cage points to how recording could be understood as the direct opposite of musical praxis.

As a consequence of Cage's aesthetic ideal, the established way of using sound recording was not relevant for him. Recorded music would, just as a postcard, not be able to capture how it was to experience music or a scenery first hand. However, within his artistic praxis, mediating technology found a new role working against the grain of the established purpose in music (Grubbs 2014, p. 74). Not so different from the earlier avant-garde composers, Cage started to use recording technology as a means for creating works, not preserving them as a stable sonic experience. *Imaginary Landscape No.1*, was written as early as 1939, and called for the use of two variable-speed turntables with frequency test recordings, together with muted piano and cymbal. This was a work where the performers played back test-records and recordings of single tones, manipulating the speeds so as to create different glissando tones. Even though writers like Grubbs name this as the first musical work to use recording technology as a means for composition, it shows clear similarities to the works of the earlier practitioners of "gramophone music". When tape technology appeared, he used this medium to create "William´s Mix". Realising this work, Cage collected and categorised different sound, that then was spliced together based on drawn score depicting how the different tape fragments was to be used (Pritchett 1993, p. 91).

Cage´s use of recorded material in performances not only enabled indeterminate musical works that broke with the established concept of music, it also led to a new attitude towards musical sound. He can thus be seen as somewhat in opposition to Adorno. Instead of using sound recording to document performance, sound recording became a means to introduce sounds into the musical realm that transgressed those of traditional musical instruments. In this regard, Cage is often mentioned together with the French composer Schaeffer. At first glimpse, there seems to be great resemblance between Cage's music and Schaeffer's experiments with what he called "Musique Concrète". Both of them continued the avant-garde tradition of using recorded sound as a means for creating new musical works, but according to David Grubbs there was a huge difference behind their motivation to use recorded sound as a material in composition. This is a difference that once again exemplifies how the choices one makes in response to existing musical traditions, steer the direction of the practitioner's experiments. Schaeffer was relentless in his search to reconcile established musical ideals with the new world of sounds that became available through the use of mediating technology. He was always working to find a natural passage that could organize the sounds from our environment, so they could be used in line with traditional compositional methods. Cage rejected this aspect of "Musique Concrète", since it relied so heavily on established concepts of music. His fascination with using mediating technology to incorporate different sounds into his music, came out of its possibility to break with a traditional concept of musical composition and musical sounds. Cage was intrigued by how the use of mediating technology broke with established methods of composing, encouraging him to combine different elements of sound freely (Grubbs 2014, p. 58-59). The concept behind Musique Concrete was very much based on the opposite, how to systemise and categorise extra musical sounds so it could be utilized along more established ideas of composition.

Schaeffer, in his search for Musique Concrete, was especially interested in how sound could be separated from its original source at a semiotic level, severing it from any external references. The idea was to create a situation of "reduced listening" where the audience would listen to the sounds in themselves, without contaminating their experience with any knowledge of the provenance of the sound (Schaeffer 2004, p. 78; Demers 2010, p. 26-27). He was relentlessly experimenting with recording sounds and transforming them into elements that he saw as pure and composable in a musical sense (Schaeffer 2012, p. 13). His first epiphany came when he removed the attack (the initial strike) from a bell sound, rendering it into something new. In this creative process, the structuring of these new elements was also very important: “It’s clear that, whatever the sound material arising from pure chance, a will to compose is manifest in the imposition of structure. To put it another way, the same thing has to be repeated twice” (Schaeffer 2012, p. 25). Repeating a sound transforms it, in Schaeffer´s opinion, from coincidental events into the domain of music. The essence of Musique Concrete, to a great extent resides in *transforming* the sounds often found in our everyday sonic environment into elements that can be organised in a musical composition.

If we compare Schaeffer´s approach to mediating technology with how Cage and like-minded composers used it, the differences between them becomes very clear. The most important legacy from Cage, is how recording technology was deliberately used to break the established ideas of structure in music. Cage and many of his followers were attracted to mediating technologies since it allowed them to work within the total field of sound: “allow for a representation that points beyond the symbolic grid of music” (Grubbs 2014, p. 96). What they discovered was that microphones and recording technology pick up a wider array of sounds, not only the ones we would understand as musical. Background noises from the instruments and the performance room are just as easy to record as the actual tonal sounds of a performance. What in a traditional recording session would be deemed as errors and faults, represented the sounds that interested Cage and his followers. This is especially apparent in his work Cartridge Music where contact mics were used to amplify sounds otherwise impossible to hear (Iddon 2013, p. 167). Schaffer, on the other hand, saw this same unpredictability in sound recording as an obstacle to overcome (Schaffer 2012, p. 16). Working with shaping the sound recordings according to a fixed idea of creating concrete sound objects, he found the background noise captured by the microphones as problematic and also complained about how the technical manipulation process in itself could affect the sonic characteristics of a sound.

While Musique Concrete and much of Cage´s work was based on redefining the purpose of recording technology from merely reproducing sounds to actually creating new sounds, there was of course a growing interest in applying mediating technology as a source for *synthesizing* sounds. Instead of using recordings on magnetic tape or a gramophone as a sound source in composition, the sound could be directly synthesised through electronic circuitry. This approach to using mediating technology became associated with the German idea of "Elektronische Musik" in the 1950s. Even if this approach to musical sound can be seen as radically new, it shared some of the ideas that Moholy-Nagy introduced earlier.

In the early phase of "Elektronische Musik", established aesthetic ideals from serialism and 12-tone music were very important. The idea behind these earlier movements in music was to explore the relationship of notes to one another, not in relation to a chord as earlier practised. Controlling the tonal element in accordance to strict rules becomes a key factor in serialism, a development that could be approached from two different directions. One way was to focus on notes as the smallest unit in the structure of notation: an aesthetic of music that actually turned attention away from the sonic result of music back towards the notational structure of the score (Cook 1990, p. 204-205). The other direction in interpreting the ideals of serialism was to move away from the note, as a sign in notation, and instead focus on the actual tone in its realisation as the smallest unit in composition. This second direction inspired artists to seek out technical possibilities for asserting total control over the production of sound (Holmes 2016, p. 63-66). The studios for "Elektronische Musik", were therefore equipped with tone-generating devices and filters, enabling the composer to control all the elements of the tones in their work.

These tendencies inspired by serialism, had significant effects upon the relation between two very important agents within the concept of the musical work, that of the composer and the performer. The control the composer in the field of electronic music could exercise in the realisation of the final work, eliminated much of the traditional dependence on the performer. The technology to synthesize sound guaranteed a sonic result that was in accordance with the composer´s intention, but at the same time this fact also made the work less accessible for many audiences (Manning 2013, p 41-42). The lack of a performer in the presentation of the music represented a conceptual problem to overcome, since it placed the presentation of the music outside of established musical practices. Looking at the Darmstadt Summer School for New Music in 1951, that was to become an important event in shaping the experiments that later came out of Cologne, we see that the program included a work by Bruno Maderna: described in the program as a work for flute, percussion and loudspeaker (Luening 1968, p. 47). The problem with the lack of traditional performers in this new electronic music, urged practitioners to define the loudspeaker as a performance instrument. The output from the loudspeaker was not controlled by a performer in the same way as a traditional acoustic instrument, but it was in some way the physical entity that created the sound in the act of the performance.

One of those who attended the Darmstadt Summer School was Karlheinz Stockhausen, who came to signify the developments emerging from the studios of Cologne. In 1953, he composed *Studie I,* one of the very first works created entirely from electronic sine waves. He gradually departed from the very strict rules of just working with synthesised waveforms and started to include other sound sources in his process of "composing sound" (Holmes 2016, p. 72). With his work *Gesang Der Jünglinge* (1956) mixed recordings of human voices together with synthesised waveforms.

The way that Stockhausen utilized mediating technology for musical creation continued the emphasis on the composer's control of the sonic result of music, altering the way the musical work should be realised and also expanding on how music would sound. In this way, Stockhausen continued a tradition that was envisioned by earlier artists like Moholy-Nagy and his ideas of carvings sound directly into the gramophone disc. Other writers like the Mexican Carlos Chavez, had theorized about much the same things in his book *Toward a New Music* (1975), first published in 1937.

It is however clear, that the conceptualisation and actual appliance of mediating technology to strengthen the composer's control over the artwork is a continuation of ideas established even earlier. Before the emergence of mediating technology, we find a desire among artists to explore the possibility of eradicating the imperfections of a performer when realizing a musical work. A composer of classical music was always restricted in his creativity by what a performer was in reality capable of playing. Stravinsky was, for instance, fascinated with the possibilities that emerged with the Pianola[8], to empower the composer to eliminate the imperfections of human performers (Ross 2007, p. 117; McFarland 2011, p. 87). In many ways, this focus on the composer´s control over the work can been seen as a broader take on Goodman´s theories about the musical work, a stance that became more and more important with the developments of mediating technology as a tool for music production (Goehr 2007, p. 33). In the

[8] The Pianola was a mechanical piano that used a piano roll to store and replay the music. Holes in the paper of the piano roll corresponded to notes, and when the paper ran through the mechanism in the Pianola, the notes were replayed on the piano (Bourne 2012).

same way with notation, the emphasis on the composer's control over the musical work, underscored the importance of a defined and repeatable work of music. But while composers working with notation had to base their praxis on the performer's ability to execute the work correctly, new mediating technology would make it possible, if desired, to eradicate even this form of uncertainty. The electronic works of Stockhausen and other composers of "Elektronische Musik" is of course a direct reference to this.

At the level of musical production, Schaeffer had much in common with Stockhausen. Even if Schaeffer can be criticized for being too connected to traditional ideals of musicality, he had a very radical approach to the division of labour in the creative process. For him, the traditional performer was more or less eliminated from the realization of his work, since Musique Concrete used the recorded sounds as a starting point. The realization of the musical work is not achieved through performance, but through studio work. Schaeffer quickly came to the realization that the sound engineer was much more important than an instrumentalist (Schaeffer 2012, p. 9). Cage on the other hand, advocated a strong role for the performer. His work was very much defined by how the performer would interpret his instruction that was often open to variation. In this way, I would argue that the tables have shifted when it comes to the performer's role. Cage, with a radical and novel approach to sound, had in my opinion a very traditional understanding of the framework of labour in creating the work. Schaeffer and Stockhausen, who from an aesthetic point wanted to improve the existing ideas of musical sound, were radical in breaking away from the tradition of musical performance.

Even though both Schaffer, Stockhausen and Cage are understood today as mighty figures in experimental music of the 20th century, they were not alone in pushing the boundaries of musical creativity. Especially when it came to the reconfiguration of creative practice, Bebe and Louis Barron were perhaps more radical than their academic contemporaries. The Barrons made a name for themselves when producing the soundtrack for the Sci-Fi blockbuster *Forbidden Planet* (1956). Besides presenting new sounds for the listener through this soundtrack, the composers' take on the well-known leitmotif was especially unique. Instead of composing a melody to accompany each character through the story, Bebe and Louis Barron constructed small sound producing circuits to create the sonic representation of each character (Brend 2012. p. 62). Based on how the circuit was constructed, each device would emit a different timbral and tonal palette. By doing so, they took a great leap away from what the public expected to be composer's practice. The resulting soundtrack for the *Forbidden Planet* was not so much a result of how the composers weaved together melodies and chords, but was instead a result of how the Barrons envisioned different electronic devices for sound production. As with Goehr's discussion on musical works, the composer's role in shaping the work has always been a central part in defining a sonic event as music. In the case of the sound track to *The Forbidden Planet,* the result was based on the active choices of the composers, but they did not compose in the traditional way. Rather than instructing the performers, they instead substituted the performer with a specially designed sound production device. The way the Barrons asserted their role as "composers" thus fell outside of the traditional understanding of this role. The Barron's approach to the composer's role was so radical, that they were not given credit as composers; instead they were named as sound designers on the end titles for the movie.

1.4.4 Recording popular music

In the realm of classical and experimental music, practitioners such as Gould, Culshaw and even Cage were openly responding to established ideals of music when they approached mediating technology. Either they were working to improve on established ideals by applying new technological tools, or they were attempting to critique, or break away from traditional aesthetic norms. All these examples are easy to include into a larger context of academic writing on Western music, but the 20th century was significantly a period where the record industry sparked a range of new musical genres; in academic circles this formed the basis for studies in popular music. Within these new genres of Jazz, Rock and Pop, for example, new musical and aesthetic ideals developed with an unprecedented pace and in many different directions. I will detail many of these developments at a later stage in the discussion, but I feel the need at this point to give a short historical backdrop which sketches out the important features that became identified with these musical developments.

One of the earliest popular genres to develop was probably Jazz. Several cultural developments lay behind the emergence of Jazz, but recording technology was doubtless one of the most important factors. In opposition to Culshaw's use of recording technology, Jazz recordings placed more emphasis on the musician's ability to improvise and go beyond the strict framework of an established musical form. The difference has to do with how Jazz musicians went far beyond the performative scopes that could be established through notations. The essence of Jazz was not only the notes that were played, but rather how the musician performed these notes. For these new musical ideals to be able to spread beyond the concert hall, the medium of sound recording was essential. Through the recordings of Jazz, both audience and fellow musicians could study the performative skills of the artist (Hennion 2002. p. 5). Using the medium of sound recording, musicians could document rhythmic complexity and tonal nuances that were impossible to convey through the notations (Chanan 1995, p. 10). Compared to classical music, the recordings became what constituted the musical works in Jazz, not the notation (Hodeir 1956, p. 3). The result was that totally new performance practices could be shared, evolving into novel approaches to how a traditional acoustic instrument could be played.

This development of Jazz is, of course, counter to what I focus upon in this dissertation. I concentrate more on the development away from performance of acoustic instruments. However, it does show the complex network of practices that mark the musical landscape, and I will later return to how the focus on improvisation can be seen as departing from the classical focus on music in the form of established works.

In other areas of popular music from the 1950s onwards, the recording studio was used to bring new sounds to life, rather than just as a means to document musical performances (Chanan 1995, p. 104). Simon Frith concludes that practitioners in popular music are not seeking the same sonic ideals in recorded music as in live music (Frith 1996, p. 233). Such a dichotomy between live and recorded music can in part be understood as working counter to the ideals of High Fidelity and embracing Eisenberg's idea of "Phonography". Phil Spector and his "Wall of Sound" is probably most famous in exemplifying this approach. By using the technology he had at hand, he combined the sounds of different instruments in such a way that the individual sounds were no longer distinguishable, creating a massive hybrid sound (Milner 2009, p 152-153 and Tankel 1990, p. 40). With the new musical ideal, it became apparent that the work done by technicians in the studios was just as important as the performance on traditional instruments. These developments in recording urged Edward Kealy to claim that mixing audio evolved into an art form in its own right (Kealy 1979, p. 17). Zagorski-Thomas argues that this should also refer to the creative capturing, editing and manipulation of live recordings as well as mixing (Zagorski-Thomas 2012, p. 66).

If, however, we are to seek out the most important developments in popular music in the 1960s and 1970s, we stumble upon a problem that haunts much of academic writing on music. When approaching popular music in academic writing, one must be aware that our viewpoint as researchers is, to a large extent, shaped by the academic discipline within which we work. A major problem with much of academic writing on experimentation with electronics and music, is that we often get stuck within the established discussions on Western art-music. One of the reasons why Cage and Schaeffer appear as such prominent figures in academic literature is because they themselves were part of this context, working in association with established universities and cultural institutions. Most importantly, they were both writers themselves, equally able and willing to contextualize their own work through writing. The field of popular music is therefore significantly underrepresented in the literature on sonic experiments and mediating technology, and this is particularly a problem with non-Western popular music.

One important historical development that, in my opinion has been seriously underrepresented in writing on music, is the development that happened within Dub Reggae in Jamaica in the late 1960s and early 1970s. If we look more closely at what was happening in Jamaica, we clearly see this development represented some of the most radical developments in music in the last century. The unique characteristics of this development centres on how the recording medium becomes the prime format for presenting and experiencing the music, departing from the traditional ideal of live music and concert. Musical practice in Jamaica in the 1960s was to a large extent focused on different “sound systems”; mobile sound systems that DJs used when playing records at parties. Live music was not the main source of musical entertainment, rather it was the DJs playing records. This meant that recorded music was not only restricted to private consumption, but entered the social environment that had been dominated beforehand by the concert format. Compared to developments in the more academic realm of music, this development happened without having to resort to derivative concepts like “Electro Acoustic Music”. The musical style of Reggae was the first to value recorded music over live performances (Brewster and Broughton 2006, p. 116). A crucial part of this cultural environment was the "Dub Acetate", a record existing only in one copy, enabling the DJ to possess signature tracks[9] that only they could play (Prendergast 2003, p. 457). This development represents a very peculiar incident, where the ability of mediating technology to reproduce identical copies of a musical recording is suppressed. Instead, you have a focus on the exclusivity of the media. What, in my opinion, happened in this development was a radical reorientation in the purpose of mediating technology when it comes to sound recording. The purpose of sound recording thus became the creation of something unique both for the artist and the audience.

The use of Dub Acetate in the 1960s was decisive in spawning a new artistic practice: that of "versioning". Studio recordings of popular songs would be edited and manipulated in the mixing process, creating a new expression, with reference to a known tune but still something unique for a particular DJ to play (Brewster and Broughton 2006, p. 116). The Jamaican producers King Tub and Lee "Scratch" Perry developed this into the genre of Dub, where original studio recordings were radically altered through the use of echo effects, filters and dropping musical elements in and out of the mix (Hebdige 1987:83). With this praxis, the mixing console, tape recorder and other more passive tools for music production such as equalizers, became the tools for creating a sonic and artistic expression in their own right (Williams 2012, p. 236-237). This is, of course, very similar to both Schaeffer's and Cage's use of similar tools, but Dub developed out of a specific need to create music for the DJ and his sound system. The changes did not originate from intellectual discussions about the nature of music and sound, but

[9] I will throughout this dissertation use the term "track" to describe a section of sound as it appears in a mediated form, on a record, a cd, tape or as an audio file. It can of course be a recording of a musical work, but it can also be a specific version of this work or just a recording of a jam session. The word "track" does not therefore specify anything about the aesthetic or artistic status of the recording, just that it is a piece of sound recording that is available to be replayed.

developed as a result of a new “performance practice” of DJs and their sound system.

What the praxis of Dub in Jamaica illustrates, is that changes in how music is evaluated results in a variety of musical praxes. The happenings in Western pop- and art-music has to a great extent shaped our understanding of such historical developments. The emergence of Dub is therefore rather special, since it evolved out of a very different cultural environment. There are clear similarities in all the examples I have given in this historical account, that mediating technology has been a force for changing the sonic ideal of music, broadening the sound to include not only acoustic sounding instruments. This development has been connected to changes in the creative process of music, where the role of the composer in relation to the performer has changed. With Dub however, there are few indications that these changes have happened as a result of negations of the established ideologies of musical work as we have experienced in Western music.

Exploring the ideologies emerging within Jamaican Dub, is a complex task that will form part of the coming chapters. At this point, however, we can conclude that it is a very different scenario from the musical developments we saw with Culshaw, Gould, Cage, Schaeffer and Stockhausen. In all these cases, developments of new artistic praxis based on a novel use of mediating technology could be explained as alterations of the existing ideals of music. The music that emerged in Jamaica, however, did not emerge out of the ideals that were governing Western music. So even if King Tub and Scratch Lee Perry can be compared to both Cage and Schaeffer in the sense that they used sound recordings as a source for their creative praxis rather than a means to preserve music, it does not necessarily follow that they were working along the same aesthetic trajectories.

2. Beats that broke the law- Musical renewals through synthesized drum sounds

In the beginning of 2014, Roland Corporation, a Japanese-based company and one of the leading producers of musical instruments released a new series of electronic instruments: the “Aria” series. Though the instruments were branded with the slogan “a musical revolution”, the key element for these instruments was a focus on clearly retrograde features taken from drum machines and synths made in the early 1980s. The most sought-after device in this new line of products was for many the TR 8, a new drum machine featuring sounds from two of Roland´s earlier machines, the TR-808 and TR-909: both these machines had been discontinued 30 years earlier.

The TR-808 and TR-909 are two historically important but also rather peculiar, electronic instruments; both in the way they sound and in the manner in which they were designed to be used. During the 1970s, many commercial electronic instruments that utilized mediating technology to synthesize sound had already been released, mirroring technical developments witnessed earlier in studios for experimental music in the late 1950s. The TR-808 and TR-909 continued this trend of electronic instruments, but formed part of a small group of instruments with the defined purpose of being a percussion instrument. Furthermore, as drum machines, they were not marketed and designed to be “played” by a performer like acoustic drums, they were designed to be *programmed*. This led to them being discredited by many artists and audiences at the time of their release in the early 1980s, both for their synthesized sound and their functionality.

However, they did eventually become part of a musical revolution defining a new sonic aesthetics in music, as Roland claimed in their later marketing slogan.

By analysing how the TR-808 and TR-909 went from shame to fame, I will tap into the very core of my research question for this thesis: how the new sounds that mediating technology make possible, engages practitioners and audiences in an ongoing reconceptualization of musical sound. In this specific chapter, I will discuss how the success of these two drum machines was a result of their role in gradually redefining sonic aesthetics and musical ideologies. For these two drum machines to become popular, I argue that two important cultural changes had to emerge. Firstly, there had to be a growing acceptance for a break with established norms of musical performances; secondly and most importantly, there had to a growing acceptance of synthesized sounds, thus representing a break with the traditions of acoustic instrumental sounds. Together, these two cultural developments established a new artistic environment concerning the timbral qualities – the sonic aesthetics of music - where the sounds of the TR-808 and TR-909 could be reinterpreted and used in unforeseen ways. Eventually, the design principle behind the sound producing circuits in these machines was repurposed in many new tools for musical production, both as hardware instruments and software. The TR-808 and TR-909 therefore have many features that came to play an important part in the later developments of music and music technology. In this analysis, I concentrate primarily on the sonic qualities of the machines, more precisely, the sound of their kick drums. I will focus on their sound, why they sound this way, and most importantly how their sound inspired new approaches to musical aesthetics.

In the first part of this chapter, I explain how the technological conditions that emerged in the 1980s influenced the relationship between musical practitioners and technology, establishing a new type of creative environment that was crucial for how the TR-808 and TR-909 could be used. My analysis of the history of the two drum machines, will therefore exemplify how the 1980s represents a schism in mediating technology's connection to developments in musical aesthetics.

In the second part of this chapter, I then identify the ideological and aesthetic norms that made the TR-808 and TR-909 artistically unsuccessful in the early years. In the third part, I move on to analyse the kick drum sound of these machines in detail, demonstrating how the design of the sound production circuits gave the kick drums a unique sonic character, that in turn enabled artists to produce a distinct and very bass heavy sound in their music. What is particularly interesting here, is how the musical and cultural ideologies developed so that artists and audiences were able to embrace the possibilities offered by these electronically produced percussion sounds on a much larger scale. In the fourth part of this chapter, I thus sketch out the cultural and musical developments that finally led to the status that these drum machines have today.

In the final part of this chapter, I demonstrate how the TR-808 and TR-909 continued to assert their influence on music through newer tools, both digital and analog, that have reproduced the sound production architecture of these machines. Here, I also go into more detail about the aesthetic changes in music that can be traced back to the use of these techniques for creating kick drum sounds.

2.1 Music and technology in the 1980s

To understand how the two drum machines, the TR-808 and TR-909, became part of a redefinition of musical ideals, it is important to recognize how the use of these drum machines was shaped by the context of music technology and its evolution in the years that followed their release. The 1980s represents a period when artists' attitudes towards the tools for musical creation underwent radical changes, resulting in a constant re-interpretation of many of the technologies that already had been introduced. In the case of the TR-808 and TR-909, these machines therefore became subject to different re-interpretations, even after the drum machines went out of production.

2.1.1 The democratisation of technology

What I see as the most important aspect within music technology in the 1980s is that it represented a schism between two different extremes in the conditions for music production. As I stated in the historical introduction to this dissertation, the early developments in sound synthesis happening in the mid-20th century, were very much confined to expensive studios set up by universities, radio-stations and diverse public funding. In 1968, Otto Luening estimated that there were about 100 studios around the world dedicated to making music through electronic means (Luening 1968, p. 145). Whilst technology had been available for musical experiments, the organizations running the studios for electronic music at that time functioned as gatekeepers, deciding what the tools should be *used* for. Douglas Kahn points to the fact that there was a lack of support from institutions towards musicians who wanted to develop the aesthetic possibilities through experimentation with early mediating technology (1999, p. 123-124). As I exemplified in the introduction with both Musique Concrete and Stockhausen's Elektronische Musik, even if the music was defined as experimental, their practice had clear links to established norms about musical ideologies and aesthetics. This continued a conservative trend that haunted musical development, including those areas outside of experimental electronic music in the middle part of the 20th century. Compared to other art forms at the time, for instance visual art and literature, music generally had relied on rather expensive means of expression, such as symphony orchestras and string quartets. According to Kahn, this meant that musicians had to play along with the institutions that controlled these means of expression.

> "The artistic and literary avant-garde looked like a cottage industry when compared to the big factories of musical modernism. To gain access to their technologies, composers were required to circulate in the upper reaches of society, participate within the formal rites of high musical cultures, and speak through the discourses attending these scenes (Kahn 1999, p. 104-105)."

Thus, practitioners in the mid-20th century were often dependent on support from a community that was not so interested in breaking the musical rules, at the same time as attempting to realise their musical experiments.

During the 1960s and 1970s, a growing commercial industry for electronic and later digital tools for musical production, meant that the big factories of musical modernism that Kahn describes, gradually lost its influence upon musical culture. Today, we have in my opinion, reached such a state of access to musical tools that we have the very opposite situation of that which Kahn described. Musician and software developer, Robert Henke, claims that the means for music production are so widely available to those who want to use them, that it is now as easy to make music with electronic means as it is by playing the guitar (Goldmann 2015, p 41). The economical and institutional obstacles that restricted practitioners from experimenting with tools for musical production have more or less vanished today. Both complex technological tools for musical creation and the skills to use them, are now within the reach of most people in the Western world.

The early 1980s, the years that the TR-808 and TR-909 were in production, represent a crucial breaking point between these two extremely different conditions of musical production: the institutional restriction of means of musical production as Kahn describes, and the easy access of electronic and digital tools as Henke describes. The TR-808 and TR-909 therefore entered the realm of musical creativity just at the time when the norms and possibilities for musical creation were changing considerably. Comparing today's situation with the years before the 1980s, it is evident that earlier music production was a much more divided task: songwriters and musicians on one side; technicians and studio engineers on the other. During the 1980s, the increased availabilities of digital and electronic technologies made it easier for musicians to gain excess to the tools themselves and individually acquire impressive technical skills; beforehand, these skills were confined to the professional few working in expensive studio environments (Burgess 2013, p. 13).

2.1.2 Focusing on the use of tools

As I mentioned earlier, in the 1960s there was a growing acknowledgment of studio work and mixing as an actual artistic practice (Kealy 1979, p. 17). With the rapid democratization of music production in the 1980s, a new creative environment for music evolved where these technical aspects of music production became an even more integral part of the actual artistic creation of music. As a consequence, the *use* of tools for musical creation became more diverse and subject to different artistic interpretations on behalf of the actual composer/producer using them. There was no longer an institutional gatekeeper or class of technician who granted or declined your access to the tools based on what you wanted to use them for. The act of creating music thus became more and more integrated with an explorative *use* of these tools. The TR-808 and TR-909 entered a new cultural environment for musical production: the question of how to use them became gradually more important for their success in relation to the changing ideals in popular music.

Shifting the focus towards how technological tools and musical instruments are *used* in musical production is a direction that has been advocated in much of contemporary literature. Pinch and Trocco state in their book on Moog synthesizers: "…the way to understand musical instruments is not from their essence – what their theoretical possibilities are – but from the way people who actually make the music put them into practice" (2002, p. 10). David Morton states much of the same in his book *Off The Record*, but also underscores that the question of *use* is also a result of a *process*: "In many cases, the life cycle of an invention has two distinct phases, one involving all the decisions and events leading up to the invention, and the second beginning as customers or users begin to interact with it" (2000, p. 173). For the forthcoming discussion in this chapter about how the TR-808 and TR-909 developed from being discredited to playing an important role in establishing a new sonic aesthetics, Morton's description of two distinct phases is very important. As I will explain, there appeared radical changes between how the intended purpose of the drum machine was first understood by audiences and musicians, and how these machines were eventually put to use in the later years. But we must also acknowledge in this discussion that a clear-cut dichotomy between "design" and "use", is a grave over-simplification. How musical instruments, especially in the case of the TR-808 and TR-909, end up being used in musical praxis is a result of both how musicians choose to utilize the machines, as well as how the inherent possibilities in the design enables these choices.

In the dynamic relationship between *design* and *use*, Morton identifies one particular factor as playing a decisive role: the practices and ideologies of the musical establishment. This factor is, according to Théberge, important for both the developers of tools and the musicians choosing to use them. A new "invention" or "product" is often defined by a clear reference to existing musical conventions. In most instances, the construction/design and commercial marketing of a new tool for musical creation, is clearly motivated by possibilities identified within existing musical ideals. As a consequence, musicians who are approaching a new tool will always be “invited” to bring with them their accumulated sensibilities to music making (Théberge 1997, p. 159). This underscores to a great extent the point I illustrated in the historical introduction, that musicians experimenting with new musical instruments always do this within the background of established conventions. This is very much in line with what Morton defines as the initial phase of the invention (Morton 2000, p. 173).

When we look at the history of commercial mediating technologies in the realm of musical production, we find numerous examples even before the 1980s of how important existing musical practice was for the initial design of these new tools. Most new inventions were designed and marketed with the established musical practice in mind, the focus being on practical renewal and improvements. This was often aimed at making it cheaper and more convenient to produce and perform complex music. For example, when showcasing the “Ondioline”, an early electronic music instrument from the late 1940s, the focus was on its mimicking abilities; how good this new instrument was in sounding like the traditional version. While other early electronic music instruments like the Theremin, Novacord and Trautonium became rare oddities, it was the smaller keyboard instruments with a clearly defined musical use, that became most popular amongst contemporary musicians (Brend 2012, p. 17-21). Another example of how important it was to use a recognized instrument as a starting point for creating something new, is the Hammond organ. It was originally produced as a substitute for the much larger church organ and was primarily marketed towards churches and auditoriums in the 1930s. It took until the end of the Second World War before it gradually moved into the field of popular music, competing with the piano as the keyboard instrument of choice for band musicians (Théberge 1997, p. 31).

In the same way as the established musical praxis came to play a role in developing and selling new instruments like the Hammond Organ, the story also repeated itself with the commercial development of the first real programmable synthesizers. The outcome of this can be exemplified by the differences between the Moog and the Buchla synthesizers. Both developers were making great progress in synthesizer design in the 60s, but things really improved for Moog when they added keyboard controllers as a standard feature for their systems, thereby defining it as a keyboard instrument. With the introduction of the Minimoog, first produced in 1971, the Moog Company struck an essential chord with the musical establishment and branded the synth as a performing instrument (Pinch and Trocco 2002, p. 41 and p. 217-221). Buchla on the other hand, chose not to take this step. Instead, they pursued other and more experimental types of interfaces that did not fit the expectations of traditional musicians, therefore never reaching out to a large audience.

2.2 Technology and Musical Ideology

Connecting new musical instruments to an established musical tradition can be a decisive factor for commercial success, but in the history of electronic musical instruments, this very same connection often represented a starting point for cultural and ideological disagreements. What I identify as a reoccurring problem for new electronic instruments was that they were extensively marketed as an easy solution to practical problems associated with music production. For example, the logistical problem of dealing with a big instrument such as the church organ could be resolved by substituting it with a Hammond Organ. Many instruments were also marketed as a means to make the creation of music more cost-efficient by reducing the number of musicians you would need for the “work”. Thus, while earlier experiments with new mediating technology in music, especially the works done by Schaeffer and Stockhausen, represented an intention to expand the possibilities of the composer, the way the newer commercial tools were marketed and designed framed the process of using them very differently. Instead of being a means to expand the praxis of musical creation, the new tool often became understood as merely a means to overcome a lack of artistic skills amongst performers, thus making the creative process cheaper. This fact established a negative ideological attitude towards such tools that needed to be challenged if the tools were to have any hope of acceptance as a means for artistic expressions.

2.2.1 Challenging the roles of instrumentalists

The trend of creating new instruments as substitutes for traditional instruments, is considered to be a direct cause of anxiety amongst musical practitioners. To protect the employment of professional musicians, the American Federation of Musicians fought a long battle against any means of synthetic production and reproduction of sound (Swedien 2003, p.261). This tension was fuelled, as already mentioned, by the way many electrical instruments in the 1960s were often marketed as means to make the performance of music easier. By adding chord buttons, the new electronic organs were advertised as easier to learn and play than its traditional counterpart, the piano, turning the performance of music into a leisure activity. There would be no need for extensive lessons; everyone could easily perform music on these new instruments. In sum, such developments created a lasting distrust between people who thought musical skills should require concentrated effort, and developers who saw music making as a form of entertainment. According to Paul Thèberge, this division between the "work ethic" and "leisure" view of musical creation, has persisted as one of the most enduring ideological conflicts in the musical instrument business (Théberge 1997, p. 31). In effect, this established a hierarchy within much of the musical community, where most new and electronic instruments struggled to be accepted as equal in comparison with more traditional counterparts.

If we return to the TR-808 and TR-909, the musical ideologies that dominated at the time of their initial entry into the commercial market played an important role in how they were received by contemporary musicians. This first phase, as Morton would label it, represented a lot of adversity for the machines. In the ideological distrust that existed by the start of the 1980s between the established musical "work ethic" and the "easy to play" technological innovations, drum machines turned out to be especially controversial. Whilst the marketing and construction of drum machines was done with a clear reference to the role of the drummer in popular music, it was an invention that clearly broke with the established musical practice on two fronts. Firstly, it had a sound that differed from the traditional instrument it was meant to reproduce or replace. Secondly, the drum machines had no performativity or physical likeness to how a percussionist would approach a percussive instrument. The sounds in the drum machines primarily came from analog circuits with added digital circuits in the TR-909, thus breaking quite radically with how an acoustic drum-kit sounded. In addition, you did not perform the instrument in the normal way, but instead programmed the rhythms it would play for you. Théberge describes the problem with performance like this:

> "When a drummer, for example approaches digital drum machines for the first time, it´s not primarily an unfamiliarity with the functioning of the device that is the source of certain discomfort; it is, in part, the apparent loss of that entire "field" of physical/spatial/aural potential, so intimately tied to their sense of musical style and purpose, that is perhaps most disquieting" (Théberge 1997, p. 168).

Peter Manning voices the same negative attitude towards the new electronic percussion devices in his book "Electronic and Computer Music" (2004). In the chapter named "Beyond the keyboard: Alternative performance controllers", he claims:

> "… with the advantage of hindsight it is now clear that one of the most unfortunate developments of this period in musical terms was the introduction of keyboard based percussion facilities. Whereas these tools undoubtedly allowed rock and pop musicians easy access to such resources as a simple extension of keyboard technique, they also completely destroyed any practical link to the art of percussion playing" (Manning 2004, p. 305).

It is not clear exactly which devices Manning is trying to criticize, but he clearly emphasizes that a break with established performance praxis is seen as the destruction of the art of percussion playing.

2.2.2 Challenging authenticity

While the sound of synthesizers largely gained acceptance in popular music through Moog´s choice to market it as a keyboard instrument, the drum machine had a much more dissonant relationship with many musicians. In his 1986 article *Art versus technology*, Simon Frith describes the controversy surrounding the introduction of drum machines in the early 1980s as a particularly hostile environment. As an example, he uses the story of a young band who were refused entry into a "battle of the bands" by the organizing Musicians' Union, on the basis that they used a drum machine instead of a real drummer (Frith 1986, p. 264). The Musicians' Union's hostility towards drum machines has allegedly been around since the first devices were commercially available in 1959 (Mansfield 2013, p. 14). Frith echoes in part Thèberge's division between "work ethics" and "leisure", but takes it further and builds it into a broader discussion of authenticity. According to Frith, the hostility towards drum machines was to a large extent based on a long developed ideological dichotomy between the truthful musicians, both morally and aesthetically, with a clear link to their musical "roots" on one side, and the "fake" musicians aided by new technological means on the other side. In his view, this had fuelled an ideological divide in the history of popular music between the "authentic" rock musicians and the "unauthentic" pop musicians (Frith 1986). Frith´s discussion draws us back to my opening example with Jonzun and his use of the vocoder. As Jonzun explained, he made a distinction between the "real music" he used to do, and the "noise" the kids wanted (Tompkins 2010, p. 109).

The problematic relationship between technology and authenticity has, however, a longer history within popular music. One of the most well-known examples of this, is of course Bob Dylan´s infamous concert at Newport festival in 1965. At this concert Dylan entered the stage with a band playing electric instruments, and this was subsequently met by shouts from the audience. Lee Marshall explains this by pointing to how Dylan's performance at this festival broke with the audience expectations of an authentic musical performance. Attendees were primarily part of a purist folk music movement that defined authentic musical performances as linked to an aesthetic derived from an idealisation of poverty. The artist should work and perform in relation to a traditional way of living. The electronic guitar was by them, viewed as a symbol of capitalist ideology and was therefore in direct opposition to their aesthetic ideals (Marshall 2006, p. 19-22). With his concert, Dylan broke with the structural connection between the material basis of musical praxis and the aesthetic expression, and instead moved the focus towards a more personal and individual understanding of this relationship.

In comparison with some of the earlier experiments with electronic tools for music production, the ideas of authenticity as it manifested itself in popular music represents a radical break. As I explained in the introduction, there were several composers and writers in the early 20th century who advocated the development of new tools for musical production: the purpose was to eradicate the performer and give the composer a tighter control of the realization of a musical work. However, later ideologies in popular music still placed a great deal of emphasis on the importance of the performer. According to Frith, this ongoing debate about musical authenticity had an unquestionable impact on how technology was used in music and how this again was reflected in different styles of popular music. However, Frith calls this “a first world problem”. For example, musical styles deriving from Afro-American societies have a much more positive attitude to new, and also laboursaving, technical devices. The same can be said about music from the Caribbean. As I explained in my opening chapter, Reggae and especially Dub, were musical expressions that thrived on music technology both by manipulating recordings in studios and distributing the music on records.

2.3 The difficult “first phase” of the TR-808 and TR-909

When the TR-808 went into production in 1980, drum machines had actually been around since 1949 (Brend 2005, p. 60). But it was not until the 1960s that they started to gain attention in the market for musical instruments. These early machines were promoted with the amateur musician in mind, as part of an emerging market for instruments designed for home use. This commercial segment can, to a large extent, be understood as part of the manufacturers’ “easy-play” ideology aimed at the “leisure” segment of the musical instruments market. The use of these early rhythm machines immediately caught on amongst people playing electric organs, but they were also used by other amateur musicians as a tool for improving one’s timing (Brend 2005, p. 63). A feature that was shared by all these early devices like Wurlitzer Side Man, Maestro Rhythm King and Ace Tone Rhythm Ace, was that they only featured pre-programmed rhythms. They were in effect, standalone devices, similar to the rhythm sections we today associate with cheap electronic keyboards: buttons with foxtrot, rumba, and rock, would produce a rhythm which often referenced popular musical styles of the time.

Even though the drum machines saw a steady commercial sale, they very much stayed within the confines of amateur music. With only a few exceptions, like Sly and the Family Stone´s, *Family Affair*, the drum machine was not a part of mainstream music in the time before the 1980s (Brend 2005, p. 67). The drum machines were instead mostly used to accompany musicians while practising, or for amateurs performing at home.

When the TR-808 was released in 1980, technical developments had reached such a level to enable the production of machines with a quality and complexity that could represent an artistic potential amongst more professional musicians. The first new possibility the user noticed with this drum machine, was that programming your own rhythms was much easier than with earlier machines. The front panel layout was designed to help the user visualize a metric division of pattern-measures. In addition, it had easy user access for manipulation of the individual sounds of the drum machine (Vail 2000, p. 281-282). Though the TR-808 gained a wider use when it was released than most of the earlier machines, it was not an instant commercial success. The explanation for this can be found in the ideological resistance towards drum machines. As I explained earlier, the drum machine represented a break with established musical ideologies in two ways: firstly, it did not sound much like its acoustic counterpart; secondly, it broke with musicians' expectations of how percussion instruments were played. The problem these established ideals represented for the TR-808, is ironically best demonstrated through how it was outrivalled by other drum machines. There were, at the time, other drum machines whose construction gave them a musical advantage when facing the negative ideological attitudes that existed towards such machines at that time. In the late 1970s, sampling technology was migrating into the field of popular music, a development that was to put its mark on the sound of pop in the 1980s. The year before the TR-808 was put into production, Roger Linn announced the LM-1, the first drum machine with digital sampled sounds (Vail 2000, p. 290). The sampled sounds in the LM-1 were recordings of actual acoustic drums, giving the device a much more “realistic” sound, more in tune with the dominating musical ideals. The Roland machines, on the other hand, had synthesized sounds created through analog circuits, making them sound rather different from an acoustic drum kit. So, in the year of its release, the sound of the TR-808 was in many ways already “outdated” aesthetically.

It soon became evident that the further development of affordable samplers like the Emulator, gave sound engineers a powerful tool to create their own sampled drum sounds out of previous recordings. This inspired other companies to produce sample-based drum machines. Thus, the early 1980s saw a great expansion in synthetic pop music, especially in Britain. But artists such as The Human League and Depeche Mode mostly complied with the established tradition for drum sounds, using sample-based drum machines. It is important to point out that this aesthetic of sampled drums, did not reflect the ideals of an authentic acoustic drum kit, but was rather designed to achieve the loud and reverberating sound emerging from studios like the Power Station and the Townhouse; drum sounds that were immensely popular in the 1980s (Milner 2009, p. 325-330). Recording drums and achieving the fat sound that was popular at that time, was a technically difficult process. Sampling technology, either built into drum machines or implemented through other means, gave producers a tool to skip this laborious process by simply using pre-recorded sound. The popularity of sample-based drum machines in pop-music in the 80s, seems to have gradually transgressed those problems of work ethics that Frith described. On the other hand, the fact that these machines were sample-based points to the fact that the sound ideal of these machines was strongly bound up with its acoustic counterpart: the physical drum kit.

But in spite of overwhelming competition, there were some musicians who chose to use the TR-808, going against the popular aesthetics of acoustic and sampled drum sounds. By far the most important of these early appearances of the machine can be found in one of Hip-Hop's ground-breaking tracks, Afrika Bambaataa´s *Planet Rock* from 1982*.* Arthur Baker, the producer of the record, was inspired by the German band Kraftwerk and their electronically produced rhythms and wanted to fuse these with the rhythmic structures of Hip-Hop (Mansfield 2013, p. 176). The problem was that he himself had no experience with programming drum machines. According to Bill Brewster and Frank Broughton, Baker's solution came in the form of an advertisement in *The Village Voice:* "Man with drum machine, $20 dollars a session" (Brewster and Broughton 2006, p. 265). Before the release of *Planet Rock,* the few Hip-Hop recordings that had been released featured live drum kits in the style of funk and disco. By using the TR-808, Arthur Baker, with the help of an anonymous drum machine programmer, planted a seed that gradually gave the TR-808 a prominent place in what was to become one of the most influential styles of popular music: Hip-Hop.

Despite the TR-808 being outmatched by the sample based LM-1 in terms of popularity, Roland was not ready to abandon the synthesized drum sounds. In 1984 they gave it a new try and released the TR-909. This drum machine featured drum sounds synthesized with the same type of analog circuitry as the TR-808, but the concept was more developed, adding a more realistic "feel" to the sounds. According to Roland's advertisement campaign, these sounds were generated using computer analyses of real sounds (Johnson and Poyser 1995). Besides the synthesized drum sounds, the cymbals, hi-hats, ride and crash, were actual samples. But unfortunately for Roland, in the years before the TR-909's release, competitors had progressed even further with purely sample based machines like LinnDrum (1982) Oberheim´s DMX (1982) and E-mu´s Drumulator (1983). To make things even worse, Roger Linn released his latest creation of sample-based drum machines, the Linn 9000, the same year as Roland´s TR-909. Faced with this competition, Roland gave up on the TR-909 after just one year in production and replaced it with an all sample-based drum machine, the TR-707 in 1985 (Vail 2000, p. 284).

In retrospect, it is clear that the artistic and commercial failure of the TR-808 and TR-909 when they were in production, was a consequence of the two issues I mentioned earlier. Firstly, they presented a break with the traditional praxis of musical performance; the “work ethic” ideal that dominated much of the musical establishment. This was a problem shared with all other drum machines. But secondly, the TR-808 and TR-909 also broke with the dominant sound ideals of their time. The sample-based machines by Roger Linn, E-mu and Oberheim accomplished a more realistic drum sound, and therefore gained more acknowledgment from recording artists, while the TR-808 and TR-909 failed on this issue due to their synthetic sound generation. This could easily have been the end of the story – the TR-808 and TR-909 ending up as two amongst many musical tools fading into oblivion. But this was not the case, and maybe because of their problematic childhood, their journeys to the pinnacle of popular music became one of the biggest success stories in the history of music technology.

2.4 The sound of subtractive synthesis

Despite the modest impact that the TR-808 and TR-909 had in their time of production, the machines have seen more use in the years that followed than any other drum machines. What eventually gave Roland´s machines an advantage over other drum machines, was in fact the very thing they lacked in comparison with their contemporary rivals: a realistic sound. The kick drum sound of both these machines was made with analog circuitry: the sound that was produced through the use of filters and waveform generators only partly resembled an acoustic drum. This way of producing a percussion sound, however, allowed for a sound with a very different timbre than its acoustic counterpart, permitting a different approach to sound in popular music. In order to understand the specific qualities and possibilities of the sound, it is in my opinion important to understand how this sound is created. Thus, I now explain how the sound is made, and then analyse two musical examples to illustrate how these types of sound can represent a different approach to musical production.

2.4.1 Synthesizing sounds

Analysing sounds through text can be a difficult discipline. Using sonograms is one way to solve this, but this method also has its limitations. By analysing how the sounds are designed synthetically though, I believe we can get a more accurate understanding of the sonic qualities of the kick drums in the TR-808 and TR-909. But analysing such technical applications of technology in music is not as straightforward as one may think. Writings on music technology, both popular and academic, tend to redefine the meaning of many technological terms into descriptions of surface-like qualities of sound, qualities associated with how we perceive the sound created by the technology in question. There is too often an emphasis on how the technology sounds, instead of paying attention to how the technology *works*. The most obvious example of this is the use of the term "analog" as a description of "warm", "fat" or "Low Fi" sounds, whereas the term "digital" represents "cold" and "static" sounds (Barlindhaug 2007, p. 78). The technical term "analog sound", is however only a description of sound technology that possesses the signal through electronic resistors and capacitators. "Digital" on the other hand, is defined as the quantizing and discretization of signals before storage or manipulations[10]. To a certain degree, these technologies can colour the sounds they process. Analog technology is renowned for adding a slight amount of warm saturation to the sound, due to inaccuracies inherent in the different analog components. Digital sound processing, on the other hand, is not prone to

[10] I will return with a thorough definition of digital sound technology in the next chapter.

these types of errors, and is therefore often experienced as "cold" in comparison (Warner 2003, p. 21).

The sonic result of a tool is the most important feature of its influence on musical aesthetics. But this effect cannot be reduced to a handful of technological categories such as analog vs digital. The sonic characteristics can in fact be very diverse, due to the ways in which designers and practitioners choose to apply the technology in question. The application of the technology is what actually creates the sound. Depending on how you use a specific technology, the sonic result can turn out to be something new and unfamiliar. Used in a specific way, digital technology can create weird and distorted sounds, rendering analog technology as cold and precise in comparison. Since this dissertation aims to emphasise the importance of reinterpretation and changing aesthetic ideals concerning music technology, we need to clearly define on what level these changes and interpretations actually take place. To answer these questions, I therefore want to reintroduce some technological terms used in discussions on tools for music production as actual technological descriptions, rather than as perceived sonic qualities. Beyond this well-worn discussion about analog vs digital sound production, that often takes precedence on a discussion about the sound of the kick drums in the TR-808 and TR-909, I want to focus on an aspect of even greater sonic importance: the choice of synthesizer architecture.

When you want to synthesize sound, either digital or analog, you can choose a variety of different techniques. These different techniques have a long history, but the changing price, precision and overall availability of technology has meant that different approaches to sound synthesis have been more prominent in different historical periods. The concepts of synthesizer architecture are covered extensively in various technical books on music production and technology (Creasey 2017; d'Escrivan 2011; Roads 1996; Russ 2004). Though many of these techniques have specific names, different authors have grouped them and described the relation between them in slightly different ways. In other words, there are no clear-cut taxonomies in the realm of synthesized sounds, but rather a handful of criteria that can be used to identify the different approaches. In my view, Julius O. Smith III has one of the most useful definitions, carving out four broad categories of sound synthesis (d'Escrivan 2011, s.72).

The first is what he calls "processed recording". This technique consists of creating new sounds through the use of pre-recorded sounds. Today, this approach is mostly associated with the term "sampling", and therefore strongly linked to contemporary digital technologies. But as with all ways of synthesising sound, the different strategies can be applied independently of material categories such as digital and analog. As I illustrated in the opening chapter of this dissertation, there are several accounts of recorded sounds being used as a basis for new sonic expressions in different variations of analog tape technology.

The three other ways to create sound, according to Julius O. Smith III, are all based on creating the sound from scratch. One is creating sound though abstract algorithm, using complex mathematical formulas to create waveforms. Another approach is to simulate the physical properties of material, and through this recreate their sound. Both these approaches are technically advanced and have mainly come into use with the proliferation of digital technology.

The fourth way to synthesize sound is what Smith III calls "Spectral Models". This is based on highlighting or selecting certain characteristics of the frequency spectrum or timbre of a sound to sculpt them into new sounds. One of the most common ways to do this is through a technique called subtractive synthesis. This technique often uses waveforms like squares, triangles, sines and white noise, and shapes these sounds through resonant filters (Russ 2004, p. 75). This way of producing sounds was the primary sound production architecture for the first analog synths, and was popularized through the synths of Moog and Buchla in the 1970s. With these synths, the speed of oscillators, the units producing the waveforms, could be controlled by changing the voltage, enabling the production of different tones. Envelope generators (ENV) could produce variable voltages in time, resulting in both temporal variations in amplitude, sectioning of notes, and variation of the filter. A schematic illustration of the basic principle in subtractive synthesis is shown in figure 1. The wave forms pass through a filter, and finally an amp that controls the volume of the sound. Both the amp and the filter is controlled by envelopes (ENV) and low frequency oscillations (LFO).

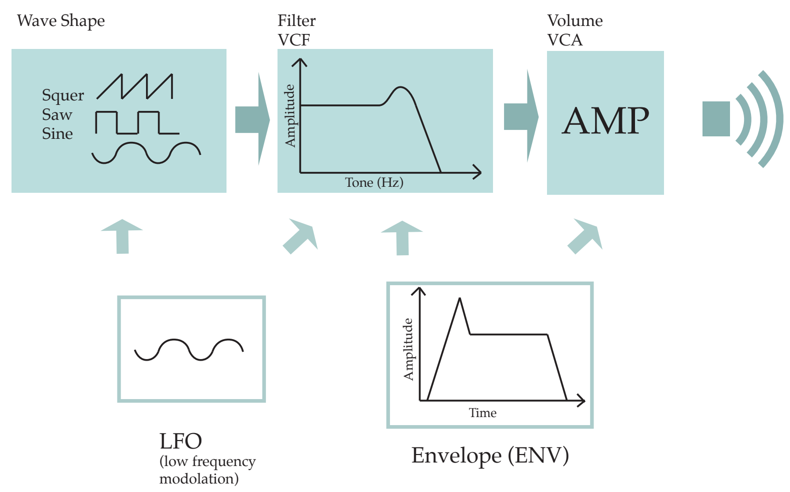

Fig. 1

The sound architecture behind the kick drums of both the TR-808 and TR-909 is quite similar and bears the distinctive marks of the same method of subtractive synthesis we find in the synths of the early 1970s. Though the TR-909 sound is more technically complex than the TR-808, they both use two simple waveforms (sine and white noise) as a starting point to sculpt the kick drum sounds. The service notes of the TR-909 describe the construction of the percussion sounds in this manner of subtractive synthesis (fig. 2), whereas the TR-808 manual just presents a block diagram, far harder to understand for people who lack the skills of building electronics. I will therefore use the TR-909 as a starting point for this explanation. Within the technical description that follows, lies the actual ingredients that enabled musicians to pursue new directions in how popular music was to sound.

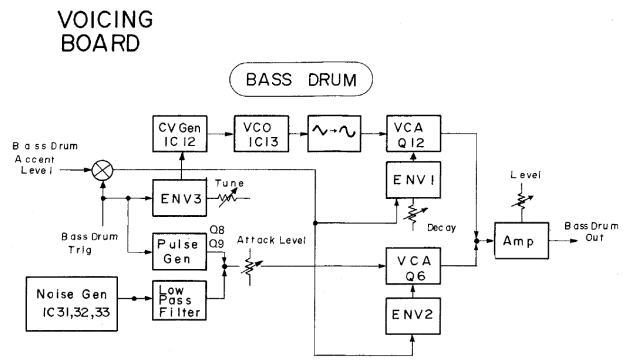

Fig.2

In the TR-909, the kick drum starts out as two waveforms: one “white noise” and one “sine”. These two waveforms are manipulated by three envelopes (Roland service notes for TR-909 page 4). ENV1 is set to open and close the volume of the sine wave. By turning the button named “decay” on the panel of the TR-909, the release time of ENV1 is prolonged and the sound will appear longer. If turned in the opposite direction, the drum sound will appear muted and shorter (TR-909 owner’s manual page 8). ENV2 shapes the volume of the noise generator but this envelope cannot be manipulated by the user of the TR-909. If you turn up the “decay” on the kick drum, only the sine wave is prolonged not the noise. Since the noise part of the sound is set to be very short, it is this that gives the kick drum the “snappy” attack sound at the start. The knob marked “attack” on the panel of the TR-909, is in fact only increasing the volume of noise in the drum sound. The way that the architecture assigns different “functions” to the noise and sine wave, is a feature that I regard as a decisive design element; its broader implications I will return to later.

The third envelope, the ENV 3, is a defining feature in creating the synthetic kick drum of the TR-909. This envelope manipulates the pitch of the sine wave, giving it a declining tonal characteristic. In his article “Moved by the Groove” (2010), Zeiner-Henriksen examines in detail the declining pitch of the TR-909 kick, attributing it to giving the 4/4 beat common in popular dance music, a more stomping feeling. Comparing the TR-909 kick drum with sonograms of earlier disco kick drums, he clearly shows that other acoustic drums playing the 4/4 beat have these declining tonal characteristics, but that the TR-909 produces this effect significantly more. The importance of this feature is something that Zeiner-Henriksen links to dancers’ physical movements, arguing that the declining bass drum corresponds to the dancers’ downwards movement on the beat (Zeiner-Henriksen 2010, p. 132). But relying on a sonogram does not show *why* the pitch is declining, and maybe obscures the fact that this sound is a direct consequence of technological design, making room for what I consider to be unfounded interpretation. In the book *How to Make a Noise* (2007), Simon Cann provides a more functional explanation for this tonal decline in the kick drum. He attributes it to giving the sound the “hitting” characteristic: depending on the range of the declining tonal slope, the “harder” the kick drum will sound (Cann 2007, p. 246-248). In the service manual for the TR-909, it is shown how the “tune” knob on the machine adds value to the ENV3 and increases the range of the tonal decline of the sine wave. By using this knob, the user can adjust what can be described as the hitting characteristic of the sound. The TR-808, due to simpler technical design has less of this tonal decline, and therefore a more even pitch to its sine wave.

The important aspect with both the TR-808 and TR-909 kick drums is that it is the sine wave that makes out most of the actual sounds, giving the kick drum a very different character compared to an acoustic drum. Synthesizing sound by analog circuitry in this way, gives the percussion sounds a simple but very tonal characteristic, creating a very stylized sound. An acoustic drum, on the other hand, has a much more complex frequency characteristic due to it being a physical instrument that resonates (Vail 2000, p. 243). The advantage of this simple and tonal sound is, as I will show, the ability to add more bass to the music.

Acoustically produced sounds are a result of the physical vibration in an object, be it a string or a skin around a drum. In this process, the string or drum skin will vibrate at different lengths. Depending on the properties of the actual vibrating material, this physical effect will generate a range of overtones that adds a degree of "fatness" to the sound. While the acoustic sounds always have a range of overtones, the synthesized drum sounds such as the kicks of TR-808 and TR-909 are defined by their total lack of harmonic frequencies (Izhaki 2008, p. 211-212). When working with sounds in the low bass register, this lack of overtones can be a great advantage. First of all, it gives a cleaner and more precise sound, whether you use the more straightforward TR-808 sound or the declining tonality of the TR-909. But in addition, it gives the musician a greater degree of freedom to manipulate the sound. If you want to tune down an instrument or sound to gain more low-frequencies, the presence of overtones can complicate the matter. This is because the human ear does not perceive different frequencies equally.

Contrary to general belief, the decibel scale is rather inaccurate in describing how the human ear perceives the energy (volume) in sound waves; a better account of how human hearing functions is explained by the phon scale. Whereas the decibel scale measures sound pressure mathematically, the phon scale takes into consideration the fact that humans best hear frequencies in the upper midrange between 2000 and 4000 Hz. When the frequencies drop, we lose our ability to hear them, meaning that low frequencies need to be boosted with more than four times the physical pressure in order to experience them at the same volume as the midrange frequencies (Everest and Pohlmann 2009, p. 47). Therefore, when you take a recording or a sample of acoustic sound and tune it far down, the low frequencies of the sound start dropping out of the ideal hearing range, and you are left with only the overtones. If you boost the volume of the sound, the overtones become even more audible (this of course also occurs when you tune an acoustic instrument). Using equalizers to filter out the upper frequencies will usually result in a rather distorted sound depending on what equipment you are using. Yet, with the sinewave-based kick drum sounds you find in the early Roland drum machines, this type of problem does not occur since there are no overtones in the sound.

2.4.2 The practical appliance of the synthesized kick drum

Technical explanations about frequencies and sine waves might not be comprehensible to people without practical experience in music production. Therefore, to illustrate how the differences between a synthetic kick drum and a sampled acoustic kick drum manifest themselves in the sound of music, I look at two tracks which utilise the potential of the different sounds: the single *Kiss* by Prince and the Revolution and Run DMC´s track *Peter Piper*, both from 1986. The common feature is a focus on the kick drum as a defining element in the musical arrangement.

In an interview with *Kiss´s* producer David Z, he describes how the sampled kick drum from the Linn 9000 was manipulated to work as a substitute for a bass instrument (Buskin 2013). Listening to the track, you notice there is no bass guitar or synths in the lower register, it is mostly guitar, and a DX 7 playing a marimba-like sound, the bass register of the song being dominated by a "booming" kick drum. This sound is achieved by adding a substantial amount of reversed reverb to the kick. The kick sound created by using a sampling of an acoustic drum, has in this example clearly less of a bass character and more of a warmer mid-tone character. On *Kiss* we hear the harmonic overtones in the drum, added with the digitally created "early reflections"[11] from the digital reverb machine. This gives a rich texture in the lower mid-frequency range, taking up much of the soundscape where we might have anticipated hearing other instruments.

Just like *Kiss,* the track *Peter Piper* lacks any traditional bass instruments; instead the lower tonal register is dominated by the kick drum. Besides the rappers, the track is mostly compromised of a rhythm from the TR-808 and repetitions of the first four bars of percussion from Bob James´ *Take Me to the Mardi Gras (1975).* The TR-808 rhythm runs more or less continuously throughout the track, while the percussion from Bob James weaves in and out. Though there are numerous examples of Hip-Hop artists taking up the TR-808 in the mid-1980s, *Peter Piper* clearly shows the uniqueness of the kick drum, both on its own and in combination with other percussion instruments. Rick Rubin, who produced the record, approached Hip-Hop with a desire to capture the music as if it were a record played in a club, not as a recording of a band. To achieve this, he worked on maintaining a raw sound, avoiding the pretty and perfect: "The drum machines were supposed to sound like crummy drum machines" (Brown 2009, p. 34). Comparing the two tracks it is easy to notice how the TR-808 kick of *Peter Piper* fills out a much lower tonal register than the kick in *Kiss.* The "decay" knob of the TR-808 produces a clear bass tone compared to the mid- tone characteristic of the reverb used to extend the Linn 9000 kick in *Kiss.* This clear low frequency tale of the TR-808 kick is due to the way that only the sine wave, and not the noise wave, is extended in time when the user turns the "decay" knob. As I explained earlier, the noise part of the drum sound is only apparent in the very start of the kick, generating the snappy feel to the sound. The result in *Peter Piper* is therefore a much more low-frequency focused "boom" than that of *Kiss.*

[11] Early reflections are the part of the reverberation that are created when the sound bounces between the walls in a room, creating something like a rapid series of echoes.

The second important aspect of the TR-808 kick drum in *Peter Piper,* is how its sound blends with the percussion from *Take Me to the Mardi Gras.* To a certain degree, it can be claimed that the TR-808 drum sound does not sound as snappy as the kick of the Linn 9000*.* Run-DMC counteracts this by blending it with the acoustic drums from *Take Me to the Mardi Gras.* The most important rule when mixing sound, is that every element should have its own frequency. Different instruments playing in the same octave tend to clash (Owsinski 2009, p. 14). In *Peter Piper*, an important feature is that the booming "decay" of the TR-808 populates the frequency register that is below that of the acoustic percussion (fig. 3). The sounds are not filtered into each other, something which could represent a hazard for interference, but rather occupy two different parts of the soundscape. This shows how synthetic kick drums can occupy a much more precise part of the soundscape than an acoustic drum, therefore representing the possibility to make new combinations of sound in music production.

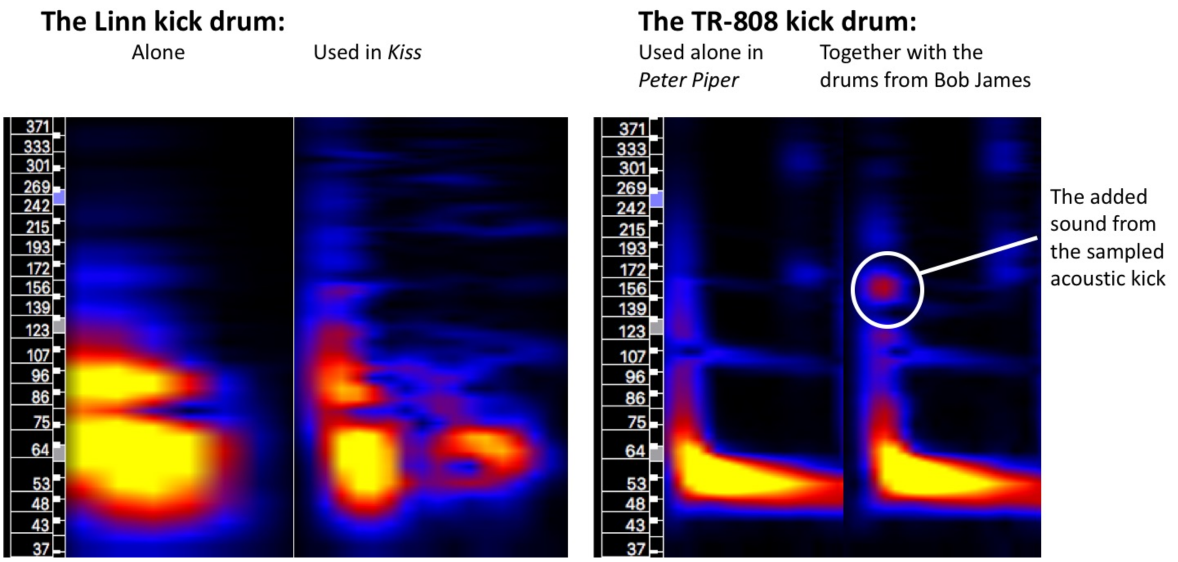

Fig. (3)

The description of the design architecture of the sound producing circuits of the TR-808 and TR-909, highlights how these two devices represented a sonic capability that enabled a different aesthetic to the one mainstream 1980s pop music embraced. The use of synthetic kick drums based on sine waves, did not have the same "authentic" feel to it as sampled based sounds would have, but the clean tonal characteristics of these synthetic sounds gave the users new ways to use the kick drums in their music.

The special features of the kick drum sound as used in *Peter Piper* became very important in relation to the development of a specific musical aesthetics. The place where this use of synthesized kick drums was most prominent, was in the genre of club music. When looking into club music where tracks are made to be blasted out on large speakers, the driest, cleanest and simplest bass sounds are often the ones that work best (Clouser 2011, p. 118). Since the large speakers in clubs are the main conveyor for club music, technological mediation of sound was the main format of working. The ideals of acoustic sound can therefore easily be abandoned, if a more intense sonic effect can be achieved through other means instead. The result is like Kurtis Blow says: you get this "sonic boom". It again enables the mixing technicians and producer to have much more control in adding low frequencies to the music. This base drum sound is what gave the TR-808 such a prominent place in modern pop music (Mansfield 2013, p. 136).

When Roland Corporation started the production of the TR-808 and later the TR-909, sampling technology was available, but they instead pursued analog circuits in order to synthesize sound. We now clearly see that this approach, especially when used to create a kick drum sound, represented new possibilities in music production. However, the real reason for Roland´s resistance to applying sampled sound in their drum machines probably had little to do with sonic possibilities and was more likely to do with the technical difficulties and expenses associated with sampling sounds. When interviewed recently, the designers at Roland in charge of the development of these drum machines, admitted that they had little idea of the importance these machines would come to represent in the development of club music (Rothlein 2015). Instead, they stress how the products were shaped by a desire to achieve musical developments within the existing technological constraints of the time.

If we look more closely at the digital technology available around 1980, the technological constraints that the designers at Roland were up against become obvious. When Roger Linn was to record his sounds for the LM-1 in late 1970s, the technology at hand limited him to record at a sample rate of only 27 kHz. According to the Nyquist-Shannon[12] theorem, this meant that he could only reproduce frequencies accurately up to 13,5 kHz, leaving him with a sound that could not fully deliver the punch and complexity of an acoustic drum sound. Dissatisfied with these limitations, and maybe because of limited technical skills, Linn decided to tamper with his A/D converter. To sample a sound "correctly", one needs to filter out the frequencies that exceed the accuracy of the sampling frequency. Linn, on the other hand, decided to let in more frequency. When doing so, the digitalization process generates a slight aliasing effect, adding a subtle distortion to the sound. This light saturated feeling presumably gave back some of the "snap" and "sizzle" to the sound that a limited sampling rate would omit from the recording. As Roger Linn himself humorously explains: "A pirate and a rebel I was, casting engineering rules to the wind" (Swedien 2003, p. 261).

[12] The Nyquist-Shannon theorem is actually a collection of several theorems developed in the first part of the 20th century to explain the conversion between analog and digital signals (Lüke 1999). The easy version of the theorem is that to sample a specific sound wave frequency, you need to have the double sampling rate. If you however have an analog sound wave with a higher frequency than the half of your sample rate, the sound will be distorted by what is referred to as aliasing (Creasey 2017, p. 31). I will discuss this process in more detail in chapter 3.

In light of the inadequacies of early digital sampling technology, it is understandable that Roland wanted to use subtractive synthesis as a basis for creating "snappy" and functional drum sounds instead of manipulating the Nyquist-Shannon theorem. Roland had, at that time, already produced a range of synths based on analog subtractive synthesis and gained the reputation of being one of the best in this field (Jenkins 2007, p. 87). It is therefore likely that they were more eager to capitalize on this established expertise than moving into the field of digital sampling.

The unique sonic qualities associated with the sounds of these two Roland machines were not so much acknowledged by the actual designers, but gradually grew to fame amongst specific groups of music producers. The special bass characteristics of the synthetically produced kick drums in the TR-808 and TR-909 were first noticed on the African-American dance music scene. Dance music produced for discos and clubs has always been obsessed with bass, so quite early on the TR-808 was noticed for its qualities in this field. Tricia Rose explains how rap producers chose equipment based on the quality of its low frequency sounds (1994, p. 75). She argues that the users in this instance found features inherent in the technical device that enabled them to pursue this specific aesthetic direction. As a result, the TR-808 became the rappers' drum machine of choice because of its fat sonic boom. She continues by citing 1980s rap producer Kurtis Blow: "The 808 is great because you detune it and get this low-frequency hum. It´s a car speaker destroyer. That's what we are trying to do as rap producers – break car speakers and house speakers and boom boxes. And the 808 does it".

The subtractive synthesis of the TR-808 and TR-909 produced kick drums that met the club music´s criteria for dry and simple bass sounds. The significance of good drum sounds is one of the most important parts of modern music production. If the drums do not sound right, it can ruin an otherwise well-made recording (Owsinski 2009, p. 111). Placing the drums in the mix, is an essential part in producing popular dance music; giving the kick drum a prominent place in the sonic arrangement is often a main focus.

It is clear that the designers at Roland made several technical choices to make the drum machines sound as good as possible. In hindsight however, it is difficult to imagine them picturing the same possibilities as I have described. I would argue that the success the machines experience today is more the result of musicians pushing the boundaries of use for these instruments, than a stroke of foresight at the Roland design department.

2.5 The growing acceptance of synthetic drum sounds, second phase of the TR-808 and TR-909

As I concluded previously, the synthesized drum sound of the TR-808 and TR-909 may have represented new sonic possibilities, but at the same time posed a challenge to established musical praxis. It took some time for practitioners and audiences to interact and use these machines, eventually realising the new sonic possibilities in the kick drum sound of the TR-808 and TR-909. This crucial development is what David Morton defines as the second phase in the life cycle of an invention. In this phase the invention often gains a new purpose and use, a purpose often different from the initial definition of its use (Morton 2000, p. 173).

In the case of the TR-808 and TR-909, this second phase was a very gradual process. Before achieving the fame that they experience today, a change in popular musical sensibility had to be realised. In this context, the unique conditions concerning development and accessibility to technology, which I previously argued defined the 1980s, played a crucial role. As I have explained, this period represented a schism: increasing access to technological tools coupled with the changing attitude to these technological tools amongst musicians, evolved into a new era for musical production. In the case of the TR-808 and TR-909, two developments that happened in the 1980s came to play an important role for the later use of these drum machines. The first, as I already have touched upon, was a growing underground scene of African-American musicians, open-minded to sounds that differed from the established pop ideals. The second, was a drop in price of second-hand drum machines, leaving the old Roland drum machine as the cheapest means to make music.

2.5.1 Club and dance music

As I exemplified through my discussion of Run-DMC´s *Peter Piper,* Hip-Hop artists were amongst the earliest to see the unique artistic potential in Roland´s old drum machines. This was, however, part of a longer continuous development concerning the acceptance of such novel sounds in music. An important starting point for the gradual cultural acceptance of synthetic drum sounds, can be seen in the popularity of such sounds in the late 1970s dance music and disco scene. In this case, it was European bands and producers who were influential. One of the most ground breaking amongst them, was the German band Kraftwerk who made music from purely electronic sounds. Even if they were not strictly a disco band and considered to be far away from the artistically light entertainment associated with dance music, their releases *Trans-Europe Express* and *Metal on Metal* from 1977, became sought-after tracks in discotheques in the United States (Lawrence 2003, p. 253). The band developed in part out of the Kraut Rock movement, but Kraftwerk´s line-up in the 1970s included two classically trained percussionists, giving their music a strong rhythmic character. The track *Trans-Europe Express* that seamlessly blends into *Metal on Metal*, is a composition based around repeating rhythmic patterns inspired by the sounds of a running locomotive. Most importantly, all the percussive sounds are synthesized electrically.

Producing music in their own Kling Klang studios, they released the album *Computer World* in 1981, including amongst others the track *Numbers*. This track contained no melody, only drums played on programmable synthesizers.

It is important though to point out, that Kraftwerk, even with its clear European legacy, was a band that was strongly influenced by Afro American music. By the turn of the 1980s, the band's rhythmic sensibilities had developed through a growing interest in African-American dance music, analysing tracks by the likes of James Brown and George Clinton (Bussy 2005, p. 99). The more mainstream but synthetic sounding dance music from Europe, gradually evolved into a specific strain of music at the end of the 1970s, known as "Euro Disco" (Sicko 2010, p. 23). One of the most important figures in this development was the German-Italian producer and composer Giorgio Moroder.

Both Kraftwerk´s and Moroder´s releases became an important inspiration for later musicians to experiment with electronic instruments, especially those who took up the TR-808 and TR-909 (Gilbert and Pearson 1999, p. 123). Unfortunately, the electronic aesthetic in dance music received a blow to its popularity with the demise of disco in the early 1980s. The "Disco Sucks" movement and its grand finale of the Comiskey Park vinyl bonfire, eradicated much of the 1970s dance music from mainstream culture, especially in America (Brewster and Broughton 2006, p. 291). In Tim Lawrence's view, this public denotation of disco music had very clear cultural connotations. The dance music scene that laid the foundation for disco's success in the 1970s, was primarily dominated by gays, African-Americans and Latinos. Much of the hostility towards disco can therefore be explained as white middleclass American prejudice against gays and blacks (Lawrence 2003, p. 376-377). What however happened in the 1980s, was that disco music retreated back into the cultural scene that had invented it in the first place. The marginalized groups of African-Americans, gays, and Latinos provided a safe haven to carry on the experimental electronic legacy of disco in the 1980s. Timothy D. Taylor points out, that the contributions from these groups in laying the foundations for the electronic music of today, have often been omitted in favour of a clearer focus on European avant-gardes of academic contemporary music (Taylor 2001, p. 67). In my view, it is therefore important to underscore that the music from these marginalised groups represented a crucial force in developing our contemporary approach to using music technology.

This environment that nourished the legacy of electronic sound from the late 1970s and very early 1980s, can been seen to oppose much of the claim to authenticity that existed in other areas of popular music. As Simon Frith argues, the question of authenticity in relation to production, is not present in all genres of music. Euro Disco, which had a profound influence on practitioners in the late 1980s through its use of the synthetic drum sound, is according to Frith an example of a genre that is clearly unauthentic in its modes of production and performance (Frith 1996, p.71). The African American communities represented a very different attitude to using technology as a means in artistic production. Whilst the folk communities that had protested against Bob Dylan´s electric performance viewed mediating technology as an obstacle in communicating a true artistic expression, African American communities took the opposite view: they actively used new technology to get their message across (Frith 1986, p. 276). The cheap technology becoming available at the start of the 1980s gave artists the means to create artistic expression without being dependent on a large commercial record industry. African Americans were therefore able to stay true to their artistic ideals at the same time as experimenting with the sound of emerging mediating technology.

The specific attitude to technology found in Afro American communities, is rooted in the inspiration they took from the Jamaican culture of sound systems. The concept of DJ and club culture as we saw it develop within the African American communities of the 1980s, is directly connected to Jamaican immigrants coming to New York in the 1970s, bringing with them the traditions of sound systems (Toop 1984, p. 18; Prendergast 2003, p. 457 and Brewster and Broughton 2006, p.130). The use of mediating technology in African American culture can therefore be interpreted as a means of collective creativity. As I explained in the opening chapter, Jamaican music traditions focused on the format of records as the primary means of musical expression, and used studio and recording technology extensively as tools for musical creativities, even as musical instruments (Williams 2012, p. 236-237). Tricia Rose therefore argues, that the use of recording technology in such cultures does not work along those lines of industrial standardization that cultural theorists like Adorno had warned against (Rose 1994, p. 71). In sum, technology often associated with the music industry becomes, in this instance, the means by which black culture works against the market forces[13].

Another clue to understanding this departure from earlier ideals of authenticity in music production, lies partly in the fact that we are faced with the different genres of dance music. In the context of dance, the music serves a social purpose; people are intended to get together and dance. In this instance, Ferreira focuses on the audience as the actual performer. That the sound that one hears is not derived from a musical performance is unproblematic since it is the audience who takes on the performative role when listening to the music (Ferreira 2008, p. 20). The problematic issue of how earlier electroacoustic music broke with the

[13] This has much in common with Steve Goodman´s description of the “Shanty House Theory”, explaining how several urban communities use media technology to establish alternative networks of musical creativity (Goodman 2010, p. 173-175).

expectations of traditional acoustic sounds, was not necessarily an issue with the dance music of the late 1980s. As with the Jamaican sound systems, the audience did not expect to see or hear a band playing traditional instruments, they listened to the record. Dance music, especially as it emerged through House Music and Techno, clearly represented a musical genre where the focus moved away from how the sounds in music were created, to instead emphasise the subjective experience of the audience (Prendergast 2003, p. 367). In some ways, we can argue that we are back at what Glenn Gould was arguing for in his article *The Prospect of Recording* (1966): the evaluation of music should be based on what the audience heard, rather than its process of creation.

The examples I mentioned earlier regarding the use of the old Roland drum machines, both originate in the Afro American musical communities. However, the Afrika Bambaataa track *Planet Rock* (1982) also underscores how important the European influence was for these communities. This track used both the main melody line and the rhythmic patterns from the previously mentioned Kraftwerk track *Trans-Europe Express*. It is important to remember that Hip-Hop in the 80s was still very much outside of the musical establishment and developed its own individual attitude to music technology. With hip hop's slow journey into the commercial limelight, its signature sounds including the TR-808 also gained acceptance.

While Hip-Hop gradually severed its stylistic ties to disco early on, there were other musicians amongst the Afro American communities who more openly worshipped the disco legacy. One of the places that disco, especially the synthetically driven European strain lived on, was amongst African-American youth and their high school parties in Detroit. Besides Kraftwerk and Moroder, the Belgian trio Telex and the French artists Jan-Marc Cerrono and Martin Circus were important influences on the Detroit music scene in the early 1980s (Sicko

2010, p. 22-25). A track like *Shari Wari* by the Detroit band A Number of Names from 1982 shows clearly how European music influenced Detroit musicians. Gradually the music would evolve in a new direction, as the European influences became merged with local musical styles. Juan Atkins, recording under the name Model 500, was one of the first to merge these early European influences with a more funky African-American feel (Doerschuk 2011, p. 56). In 1985 he released the track *No UFO´s*, utilizing the TR-909 drum machine. This was the start of a musical style that in 1988 became known as Techno, that turned the TR-909 into its signature sound through tracks like *Strings Of Life* (1987) and *It Is What It Is* (1988) by Rhythim Is Rhythim. Not far from Detroit, in Chicago, a similar development was taking place amongst the African-American gay community. This development would eventually become the foundation for House music. Attending the Warehouse and Power Plant clubs, audiences would listen to resident DJ Frankie Knuckles weaving the TR-909 into his DJ-sets (Johnson and Poyser 1995). As with the Techno producers, many of the House pioneers also name Kraftwerk as an early reference point in developing their styles (Sicko 2010, p9).

2.5.2 Reusing second hand technology

What further fuelled the increasing popularity of the TR-808 and TR-909, was the increasing availability of digital and electronic tools for music production. As I explained earlier, whilst the TR-808 and TR-909 were outmatched by a string of newer drum machines that featured more realistically sampled sounds, on the commercial market this meant a substantial reduction in the second-hand price of Roland´s early drum machines (Johnson and Poyser 1995). In an environment where factories were pushing out new designs to compete in a growing commercial market, the TR-808 and TR-909 become part of a long trail of obsolete technology available to anyone who wanted to find a use for it. Even though both machines were effectively taken off the market, Roland had already managed to put a large number of units into circulation. The TR-808 sized production at approximately 12000 units, while a total of 10 000 TR-909 rolled off the production line (Butler 2006, p 63). So, in the second half of the 1980s, the growing house, techno and Hip-Hop scene found the drum machines they liked both cheap and available. Though new musical gear in the 1980s was not as cheap as it can be today, the pace of development meant that this period saw a growing range of rather sophisticated and affordable second-hand equipment available (Gilbert and Pearson 1999, p. 124). The economical barrier for producing music was thus significantly lowered.

At one point however, the popularity of the old TR-808 and TR-909 machines outgrew the availability of second-hand machines. Subsequently, new strategies had to be applied so the machines could continue to proliferate. There was of course a growing fetish for the physical instruments themselves, but what most practitioners were seeking was the sound of these machines. Within the realm of mediating technology then, sampling the sounds of the old drum-machines became an effective strategy to keep using the sound even if the actual machines were hard to get hold of.

Through the process of "sampling" the drum sounds, it became ironically the very technology that had out-matched the TR-808 and TR-909 that played a key part in keeping the machines alive. The sounds from these machines gradually established themselves as the sonic ideal that other machines aimed to reproduce. The sample-based Roland R8 (1989), the last pure drum machine to be manufactured by the Roland corporation in the 20th century, could be fitted with two extra soundcards containing sampled sounds from the TR-808 (SN-R8-04 Electronic) and TR-909 (SN-R8-10 Dance). Later, in the mid-1990s, Roland released their first "reproduction" of the TR-808 and TR-909 with the MC-303 (1996-97), the first in a line of products known as the "grooveboxes". Copying much of the design and sampling sound of both the TR-808 and TR-909, it can be seen as a crude predecessor to the "Aria" products.

2.6 Broadening the horizon for sound: TR-808 and TR-909´s contemporary legacy

By the start of the 1990s, the cultural status of early Roland drum machines had totally changed. From failing to find a place amongst established musicians in the early 1980s, both the TR-808 and TR-909 became the "it-sound" of pop. The sound of underground dance music had been accepted into the established music industry, paving the way for the aesthetics of synthetic drums. With the popularization of dance music, first with tracks like Technotronic's *Pump up the Jam* (1989) and later with bigger artists like Madonna[14], the old Roland drum machines became a part of the pop charts all over the world, ending up in 2008 with Kanye West naming his studio album *808s & Heartbreak*. The significant changes that happened in this period indicate a larger break with the musical ideals of authenticity that had been an obstacle for the synthetic drum sound in mainstream pop in the early 1980s. The creative approaches to mediating technology that had been part of the marginalized and underground African American communities, had through the commercial success of the musical genres Hip-Hop, House and Techno, gradually become a more culturally accepted approach in musical production. This, in turn, gave the aesthetic of base heavy music, as I exemplified in my analysis of Run-DMC´s *Peter Piper*, a larger cultural acceptance and a possibility to further develop. In this final section of this chapter, I will explain how these later developments led to a significant change in the sonic aesthetic of popular music.

[14] Madonna used the TR-909 on the track *Vogue* as early as 1990, it also featured on the *Erotica* album from 1992, particularly on the track *Deeper and Deeper*. The sounds from the drum machines also feature extensively on her 1997 track *Ray of Light*.

To fully understand how such old drum machines could continue to shape the sound of music so many years into the future, a new strategy to deal with the growing scarcity of these machines played a crucial role. As I stated in the previous section, the sounds of the TR-808 and TR-909 continued to spread through the format of sampled sounds. But gradually, practitioners and technology designers went beyond reproducing individual sounds, and instead started to reproduce the actual sound synthesis architecture, especially of the kick drums. In my opinion, this way of approaching the kick drum sounds of the TR-808 and TR-909 is very important in understanding the impact these machines had on the sound of popular music.

As previously stated, the kick drum sound of these machines was created through the use of analog circuitry; by utilizing subtractive synthesis, it resembled the construction of most analog synthesizers at the time. This meant that there were a number of other musical instruments in the form of keyboard synthesizers that could be utilized to create rather similar kick drum sounds as the ones you had on the TR-808 and TR-909. In the early days of Techno and House, it quickly became clear that the TR-808 and TR-909 were not the sole option for synthesizing kick drums: any synthesizer utilizing subtractive synthesis could be used (Clouser 2011, p. 116). The use of the sine wave in the kick drum sound was, as I explained earlier, the feature that made the kick drum sound so different in comparison to the acoustic kick drum, since it gave the sound a much clearer tonal characteristic.

Repurposing keyboard synthesizers to create percussion sounds has, of course, shortcomings. Thus, in recent years, other manufacturers have utilized the same type of architecture for sound design as the TR-808 and TR-909 to create their own percussion-oriented musical instruments. A company like "MFB" has in recent years taken up competition with the old Roland machines, by producing a range of devices, implementing subtractive synthesis through traditional analog circuits to produce drum sounds.

The design of new tools that sounded like the old Roland drum machines, also sparked a new way of using digital technology. In these instances, the sound was not recorded into the machines as with the early digital sample-based drum machines, but instead the sound synthesizing architecture was recreated digitally. The result was that the digital device (computer software or hardware instrument) operated along the same lines as earlier analog synthesizers[15]. Amongst the most famous manufacturers who have used virtual simulation of analog circuitry to create similar systems, are Elektron's Machinedrum[16] (2001) and Clavia´s Nord Drum (2012)[17]. Today, availability of powerful digital production tools in the form of computer software like Ableton Live have made the practice possible even without designated software or hardware. Searching YouTube with the words "kick drums ableton", will bring up numerous videos showing you how to utilize the software for the production of a synthetic kick drum. One of the more enlightening examples is *How To Make a Tuned Fat Punchy Dance Kick Drum* by StereoSurgeon (2012). Here, the video explains how to generate a kick drum based on a sine wave, and add "punch" by using an "envelope" to create the declining tone similar to that of the TR-909 kick drum.

A crucial aspect with these new designs, is that they not only sound like the old machines but also have a greater degree of user flexibility. Many of these new tools devised to produce kick drum sounds, came with more parameters for

[15] This process is, in some cases, referred to as "Virtual Analog".

[16] In this machine they use something called the TRX Synthesis to recreate the sounds from earlier analog drum machines (Elektron 2001 p. A 1)

[17] Se *The Nord Drum User Manual* (Clavia DMI 2019).

manipulating the sound than on the original TR-808 and TR-909. This added flexibility gave the user a greater control in sculpting the sounds of the kick drums, leading them to integrate the sounds more deeply into the sonic experience of the music. In this development, the initial design features of the sound synthesising architecture were exploited even further on an artistic level.

A short recap might be in order to truly understand how the added flexibility in creating synthetic kickdrums, enabled musicians to develop sonic aesthetics further. As I illustrated both with the sonograms and my run-through of the synthesiser architecture, the kick drum of the TR-808 and TR-909 consists primarily of a single sine wave. This results in a sound with a very precise frequency spectrum in comparison to an acoustic kick drum sound. In the context of mix sound, such features can be important since it enables the kick drum sound to occupy only a specific frequency domain in the sound scape. This makes it easy to avoid interreference between different elements in the mix (Owsinski 2009, p. 14). With new tools to create synthetic kick drum sounds in a similar way to the TR-808 and TR-909, the positive feature of such sounds can be exploited even further.

A key new trend that appeared and developed with the increasing popularity of the sine wave based kickdrum sounds, eventually inspired musicians to get the tone in the kick drum to harmonize with the bass instrument. In this way, the low frequency part of the music achieves an even more precise and clean response when played at loud volume. Such effects were possible with the old TR-808 and TR-909, but modern tools utilizing similar design principles give the user greater control in achieving this effect. Snoman explains how this works in today's dance music:

"…….kicks are now being carefully engineered to induce bowel movement and/or give the listener a particularly large punch in the chest, a kick will often feature a discernible pitch at some point during its cycle. Identifying the point at which the notable occurs is difficult to quantify since there are many variations depending on the creation of the kick, but if this pitch does not match the key of the music and in particular the bass, it can produce a low-end groove that appears dissonant and unsettling" (Snoman 2013, p. 209).

Fig. 4 Sonic Academy Kick 2

A tool for music production that I think exemplifies this artistic development is the software plugging Sonic Academy Kick 2. This is a computer program that synthesizes kick drum sounds in a similar way to the sound synthesizing architecture I explained in the TR-909. Where it differs, is in how the development of greater user control has resulted in important new features. As explained earlier, the TR-909 kickdrum consisted of both a short burst of white noise and a longer sine wave with a tonal decay. Instead of the short white noise burst, the Sonic Academy Kick 2 is equipped with something they call a "click": this has the same function of creating the "snappy" attack of the sound as the white noise in the TR-909. As a user you can choose different click sounds, not only that of white noise. In addition, you can blend up to three different "click" sounds adjusting the pitch and length of each of them (fig. 4). What however is most important, is how the sine wave in Sonic Academy Kick 2 can be controlled. With this software, the user can control in detail the descending pitch of the sine wave, by drawing up a graph. In this way, the user can easily decide what tones the kick drum will be tuned to, where it starts out and where the declining tonal slope will end. Harmonising the tonal characteristic of the kick drum with the rest of the tonal element in the music, as Snoman describes (2013, p. 209), thus becomes very easy with such a tool. It is also important to point out that within present-day popular music, most of the melodic sounds are created by synthesizers, often applying the similar sound synthesis architecture as that of the kick drum. This enables producers and musicians to precisely control the waveforms and tonality of *all* the sonic elements in the music, with a precision that far outmatches what can be achieved in a performance with acoustic instruments.

These new tools for music production that took the sonic concepts from Roland´s old drum machines further, gave the practitioner unprecedented control in shaping the sounds used in their music. The development has clear similarities to how Elektronische Musik was seeking to give the composer greater control of all the tonal elements in the music. The difference lies though, in the motivation behind achieving this control. As I explained in the previous chapter, many of the earlier developments in achieving such a control over the production of sound, were inspired by Modernism and Serialism as ways to explore the smaller units of music. The kick drum sound is also a small unit within musical construction, but the motivation behind controlling these units came from an urge to achieve a specific sound in the music, a sound that responded particularly well to a specific situation: that of dancing. Filling the rooms with loud and bass-heavy music in order to give the audience a physical punch in the chest, becomes a vital goal for the use of this technology. The musical aesthetics become centred on the physical sensation of sound, overshadowing other musical ideals.

This difference in motivation behind seeking to control the sound, had a direct influence on how the audience approached the music. The early music of composers such as Stockhausen was met by contempt from the audience, since his music broke with how they felt music should sound and be performed (Manning 2013, p. 41-42). The same problem also manifested itself in the early days for the TR-808 and TR-909; the ideology of popular music was strongly connected to the performance of music. But eventually the synthesized sound of the drum machines found a safe haven within dance music, an environment where the audiences´ subjective experience of sound was more important than established ideals of musical performance. Following Ferreira's claim that the dancing audience had taken over the performative role in music (Ferreira 2008, p. 20), the physical sensation of the music – the punch in the chest - becomes an artistic companion in this experience of music.

2.7 Conclusion

To link vintage musical equipment to a fascination with old musical aesthetics, is in many cases natural. But through this chapter, I have demonstrated that in the case of the TR-808 and TR-909, it is quite the opposite. What happened with these two drum machines, was that their sounds did not correspond with the dominant musical aesthetics of the time when they were manufactured. However, these machines were taken up by more marginalized communities of practitioners who often had musical ideals that were in opposition to the established norm. In these communities, the mediated and synthetically produced sound was not defined as second rate in relation to the live performance of acoustic instruments, but instead celebrated for its ability to generate bass heavy sounds for the clubs. This approach to sonic aesthetics was mainly found in African American communities and was crucial in developing Hip-Hop, House and Techno. These communities were influenced by how the

Jamaican culture of sound systems and Dub defined the purpose and use of mediating technology in musical creation and experiences. Many have focused on how these machines historically were important for the early development of Hip-Hop, House and Techno, but my point is that the story did not stop there. By recreating not only the sounds of these machines, but also the synthesizing architecture, developers could create new tools that enabled artists to integrate the kick-drum into the tonal harmonics of the music. By utilizing the sine-based kick drum, a new approach to making bass heavy music was developed, a process taking more than twenty years. This illustrates how the possibilities inherent in the design of the instruments, resonates with aesthetic ideas within particular groups of musical practitioners. Had Roland used the technologies popular at the time to produce their drum machines, the instruments would not have used subtractive synthesis to create the kick drums. If this had not happened, the African-American dance music scene would not have been able to play with this technology to add more bass to their music. This clearly shows how the changes in music that occur with new musical technology is a gradual process, and that this process is a result both of the musician's and the developer's choice in how to utilise the technological possibilities at hand. This development is about changing the established musical ideals, and when these ideals change, the way musicians view music technologies also develops. Even though the technology stays the same, changing cultural practices will always represent a dynamic factor in how technological possibilities are understood.

3. Sampling - Mashing up quotes and found objects

In the previous chapter, I described how Roger Linn managed to create a more naturalistic sounding drum machine that featured recordings of real drum-sounds by utilizing sampling technology. The drawback with this technology at the end of the 1970s, was that it was considerably costly. However, throughout the 1980s, sampling technology became significantly cheaper, making it almost omnipresent in the production of music. The technology was put to numerous uses and had great repercussions for the development of musical sound from the 1980s to the present day. What I am going to discuss in this chapter, is how sampling technology was utilised in the musical instrument called the “sampler” and how the subsequent praxis of using this tool, called “sampling”, has influenced the aesthetics of music. The sampler originally emerged on the commercial market in the very early 1980s, but even though the machine itself is rarely used today in its original design, the praxis of “sampling” has continued to be a central element in present day musical creativity.

Understanding sampling practice has probably been the most debated topic in discussions on popular music and technology in the last thirty years; both in the popular press and academic writing. The reason is, undoubtedly, a direct consequence of the diverse artistic outlets this praxis has fostered. Over the years, the term “sampling” has been given different attributes amongst practitioners applying the technology, academics trying to make sense of its use, and manufacturers producing “samplers” as a commercial tool for musical creation. Defining what “sampling” actually is, thus becomes difficult when the term is used to encompass the diverse praxis of using the sampler. As a consequence, academics have struggled to come up with an adequate and unifying explanation that can make sense of the various aesthetic changes that "sampling" has stirred up within popular music.

In this chapter, I want to get closer to an in-depth understanding of "sampling praxis" and its effect on the aesthetics of music, by shifting the analytical focus more towards the underlying factors that have framed the praxis of "sampling". In line with the research question for this dissertation, I will approach the praxis of sampling from the point of mediating technology and examine how the variety of sampling praxes can be explained through different ways of defining sound recording in relation to musical aesthetics. In my opening chapter, I explained how artists used the technology of sound recording to pursue rather different aesthetic ideals in music. These differing aesthetic ideals interpreted the purpose of the technology and the artistic potential in the sound it produced in a variety of ways. Since the sampler can be defined in part as a repurposing of recording technology, the coming chapter explores how similar tendencies played into the development of different sampling praxes.

The problem with establishing an adequate explanation for sampling praxis, was raised in one of the first in-depth attempts to analyse "sampling": Andrew Goodwin's "Sample and Hold" (1988). Here, Goodwin pointed to how the sampler, even as a novel development, continued to be used and understood as wedded to earlier aesthetic concepts (Goodwin 1988, p. 37). At the centre of the debate at that time, was the established question of "Authorship" and "Authenticity", fulfilling some of Benjamin´s predictions of art in the age of mechanical reproduction[18]. Due to its ability to record and repurpose sound, the sampler was seen to announce "the age of plunder", where the postmodern pastiche was establishing itself at the centre of pop aesthetics. For Goodwin, however, there

[18] Here Goodwin is referring to Walter Benjamin's seminal text *The Work of Art in the Age of Mechanical Production* (Benjamin 1969).

was a sneaking suspicion that these explanations were too simple and perhaps too abstract to describe what was actually happening with the introduction of samplers in popular music (Goodwin 1988, p. 48). “Sample and Hold” concludes that “pop might be eating itself, but the old ideologies are still on the menu”. Goodwin argues that to fully understand what was going on in 1980s pop, one needs to depart from earlier established ideals of music.

Similar to Goodwin’s argument that sampling praxis should not be analysed in line with traditional musical concepts, more contemporary works have increasingly acknowledged that new technologies often break established musical ideologies. In her book *Listening Through the Noise*, Demers argues that “electronic music can be seen as wreaking havoc with pre-electronic music rituals” (2010, p. 42). But the question is, how successful have writers on music technology, especially on the subject of “sampling”, been in describing the drastic changes that Demers defines? According to Nick Prior, discourses of authorship and authenticity continue to lubricate popular music´s sense of itself (Prior 2009, p. 81). He explains this by pointing to how post-modern theory managed to sustain its hold over much of the discussion; a set of theories that were perhaps inadequate to describe what was going on in pop music:

> “Indeed we might speculate, twenty years after the orgy, that the term postmodern was always a lazy, totalising and fashionable shorthand that could never have captured the full complexity and range of phenomena its was supposed to cover” (Prior 2009, p. 81).

Prior’s statement repeats much of the same sneaking suspicions Goodwin voiced about the state of affairs in the late 1980s. Thus, despite Demers claim that new technology has the ability to radically change music, it does not naturally follow that academics and critics manage to develop their analytical concepts at the same pace.

In this chapter, I will use Goodwin and Prior's statements as a starting point to discuss new ways of understanding the aesthetics of sampling. In this process, it is important to first of all discuss how the question of "Authorship" and "Authenticity" have shaped the analysis of sampling praxis. What is especially interesting, is the way in which this analytical framework has steered much of the analysis of sampling praxis towards the concept of musical appropriation and quotation. As an alternative approach, I will provide artistic examples where music and sounds are sampled in order to create a larger sonic landscape rather than to evoke the experience of quotation. Through this, I will suggest a second analytic framework for sampling that focuses upon the sonic qualities of the sounds sampled, rather than its provenance. I must, however, emphasise that I am not attempting to establish a new all-embracing definition of sampling aesthetics, but rather draw attention to two different analytical frameworks that represent distinctive ways of defining the aesthetics of sampling praxis.

A central aspect to understanding the difference between these two frameworks for analysing sampling praxis, is how they have developed out of two different ways to define sound recording in relation to music. This fact links the discussion of sampling praxis to the research question of my dissertation. As I have explained in my introduction, different ways to define sound recording arise from different approaches to musical aesthetics, specifically concerning the concept of the musical work. What makes this such an important analytical angle, is that the digital "sampler" that sparked this praxis, must be understood, like most other digital tools, as a "meta-tool". The "sampler" was designed and marketed for a variety of commercial products, ranging from the 80s keyboard, to drum machines, into early music computers, to our contemporary DAW software. What I see as pivotal to this discussion, is acknowledging that sampling technology developed as a hybridization of different established ideals of music technology. The important point to focus upon is how the sampler was in reality a recording tool that was moulded into a device for both sonic creation and musical performance (Oswald 1985). As a result, the sampler became a tool that in a cultural sense fused aesthetical ideals traditionally associated with musical performance, with aesthetic conceptions derived from the larger history of sound recording. We can therefore argue that different ideals used to explain the aesthetics of sound recording, can form the basis for how sampling praxis is framed within the aesthetics of music. That there have been numerous different praxes of sampling, is something that has been pointed out already (Rodgers 2012, p. 95). My point is, however, to explain how these different praxes can be understood through diverging definitions of recorded sound.

I begin this chapter with a section to explain the technical development of the sampler, what different uses it was put to and how that in turn resulted in different meanings of the term “sampling”. Through this technical account of the sampler, I will also explain how the praxis of “sampling” became strongly associated with the analytical framework of musical appropriation and quotation, establishing this as the dominant approach to interpreting sampling praxis.

In the second section, I discuss in detail both the positive and more problematic aspects of analysing sampling praxis in line with the framework of musical appropriation and quotation. I will also demonstrate how references to previous musical praxes together with an accentuation of a limited number of empirical examples on sampling praxis has strengthened this analytical framework. In line with my argument of how different sampling praxes develop out of different definitions of sound recording, I will explain how the examples used always base their aesthetic analyses on High-Fidelity ideologies as explained in the introductory chapter. I will show how understanding sampling in line with High-Fidelity ideologies were important in the early years of sampling praxis, but also how this subsequently created a precedent for analysis of much later examples of sampling praxis. The point I want to make is that the precedence this analytical framework gained, resulted in a rather inadequate analysis of later instances of sampling praxes, such as that which emerged with the genre of Mashups in the late 1990s.

In the third part, I will turn my focus towards examples of sampling praxis that have not received much attention in earlier academic analyses, examples that in my opinion are best understood by another analytical framework than that of musical appropriation. I will connect these examples to alternative ways of defining sound recording as part of musical expressions, definitions that break away from the ideals associated with High-Fidelity. In the end, I will use these definitions of recorded sound and their subsequent alternative musical ideals to try to come up with alternative approaches to analysing the praxes that arose in the wake of digital sampling.

In the final part of this chapter, I will move to a concluding discussion where I use my findings about more alternative sampling praxes to propose a better analysis for sampling praxis at it emerged in the later genre of Mashups.

3.1 Sampling: connecting artistic practice with commodification of technology

This chapter is an attempt to get closer to understanding the aesthetic repercussions of sampling upon music. Here, I am talking about the praxis of "sampling" as it emerged from the advance of the digital "sampler" as a musical instrument, developed through utilizing digital sampling technology. As I argued at the beginning of this chapter, the numerous artistic outlets that the praxis of sampling has instigated, makes it difficult to establish an adequate and stabile definition of this praxis. In this section, I will explain this fluid aspect of the term sampling, by linking the praxis of sampling to the expansive development, packaging and marketing of sampling technology from the late 1970s up until the present. Coming to terms with how the praxis of sampling has been framed in relation to technological development is vital if we are to discuss how it can and should be analysed in relation to musical aesthetics.

3.1.1 Technical and cultural definitions of "sampling"

In describing the praxis of sampling, it is important to point out that the term "sampling" is not only used to describe the praxis of using "samplers", but is also a term used to describe a technological process in music. The term sampling has a specific meaning in a technological context, describing a process of converting analog waveforms to digital information enabling digital recordings of sound. This technological process is named sampling since the analog waveform is sampled with a set interval in time (frequency), and the numbers are stored for later retrieval, manipulation and reproductions (Creasey 2017, P. 28-38 and fig. 5).

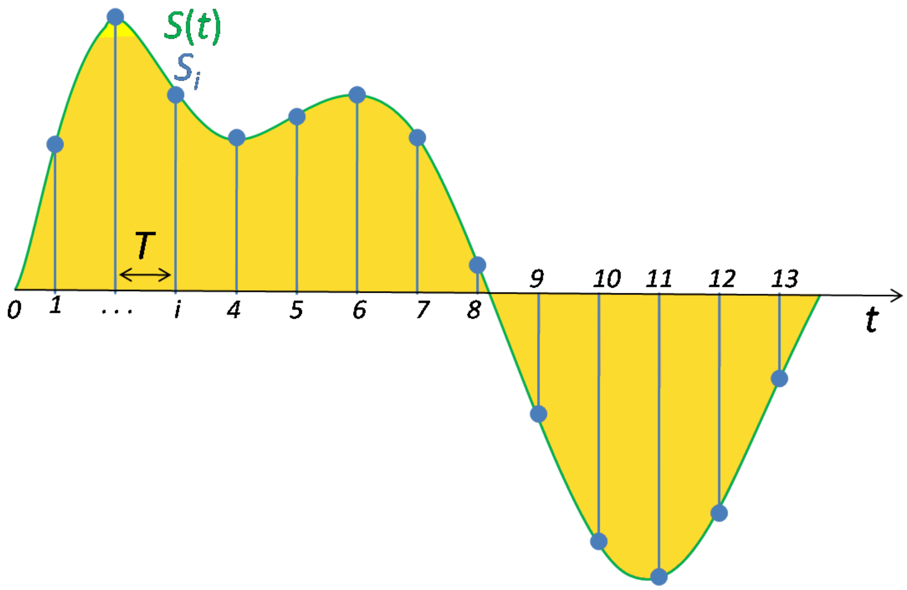

Fig. 5 The S(t) represents the audio, the continuous signal which is sampled by a set frequency of interval T into discrete values S_i. The interval T is normally set to Hertz.

The technology of sampling – digitalising analog soundwaves - formed the basis for digital sound recording. Early versions of this technology started to appear commercially in the early 1970s, at that time storing the digital information to magnetic tape.[19] What came to be known as "the sampler" was a direct repurposing of this recording technology; a fact that I feel is important to how we understand the different ways to use samplers artistically. By storing the digitalised sound data into the RAM of the sampler, it could be easily retrieved and manipulated. This simple but genius design behind the samplers, meant that by changing the playback speed of the sound, you could also change the pitch of the sound (Creasey 2017, p. 473). By using a keyboard (or a sequencing device) to control playback speed of the sampler, you could perform music with whatever recording you made. The first sampler, The Fairlight CMI (computer music Instrument), became available in 1979 (Vail 2014, p. 72); it was developed in an attempt to construct a digital synthesiser capable of making a more complex sound than the earlier analog synthesiser. Its purpose was to create sounds that would be closer to that of acoustic instruments. Using digital recordings of sounds was in reality a final attempt at achieving this result; the designers of the machine actually felt they were cheating to some extent by using recording of acoustic sounds (Ryrie 1996 and Harkins 2015). Originally, the term sampling then, should be understood as referring to the process of digitalisation that formed the basis for the sampler as a musical instrument. Thus, the concept of "sampling" was infused with new meanings associated with operating the musical instrument: "the sampler".

In academic writing on popular music and technology, this dual understanding of the term "sampling" manifests itself in different ways. Some actively address this problem by discussing "sampling" both as a technical term and in its relation to

[19] see Fine (2008) for a more complete history of digital recording.

the diverse praxis of operating the musical instrument: the sampler. In other instances, the problem of defining the term is left unresolved; instead, academics adopt the most dominant use of the term at the time. In his book on popular electronic music "Unlocking the Groove" (2006), Mark Butler uses the technical aspect of sampling as a basis for his definition of the term; he defines "sampling" as the way in which analog is converted to digital technically. In his account, a "sample" is any type of sound that is generated in this way and "sampling" refers more generally to how the sounds technically are obtained (Butler 2006, p. 60).

Butler rightfully goes on to argue that beyond the technical understanding of sampling, the technology has become a part of popular electronic music in many ways, but he does not delve into that so much. However, a writer who explores this on a deeper level and systemises how "sampling" has emerged as a cultural term in music, is Tellef Kvifte. He claims there are three ways to understand the term "sampling" (Kvifte 2007, p. 107). In addition to the technical process of digitalisation (as Butler focuses upon), Kvifte claims the term can also take on *two* distinctive cultural meanings deriving from different ways of using the sampler as a musical instrument. The first cultural understanding of the term sampling is, according to Kvifte, connected to the idea of the sampler as a musical instrument that can emulate acoustic instruments. By using digital recordings of sounds from acoustic instruments, these samplers replay the sounds in desired pitch, creating melodies. Small parts of a violin sound or a snare drum could be recorded into this new instrument, and the sampler could then take on the role as a substitute for the actual instrument in a recording or performance session. As already mentioned, this particular idea was of great importance in the early development of the sampler as a tool for music creation. As the history behind The Fairlight CMI (Ryrie 1996), and Roger Linn´s LM-1 illustrated, the idea was to produce a keyboard instrument or drum machine that sounded more "realistic" in comparison to the analog synthesisers available at the time.

Fig. 6 Emulator advertisement from Contemporary Keyboard May 1981, Fairlight advertisement from Keyboard Magazine February 1982

Even if this cultural understanding was important in the early development of the sampler, this particular definition of sampling was rather shaky. Milner (2009, p. 320-321) describes how the people manufacturing the early samplers for commercial sale, were informed by a mixture of openness and uncertainty about the initial use of their machines. Even if the idea to make a digital keyboard instrument that could sound like a traditional instrument was a driving force, it was also evident to the developers that this new instrument had unlimited potential to do things in new and unexpected ways. One of the first commercials for the E-MU Emulator sampler bore the slogan "Play a turkey", whilst Fairlight chose to brand their CMI with the slogan "Orchestra for sale?" (Fig. 6), underlining their original ideals. In light of this, it is obvious that the initial ideals behind the development of the sampler were open to interpretation.

Early on, the departure away from the imitative aspect of the "sampler" was evident in popular music through producers like Kate Bush and Peter Gabriel. Their use of machines like the Emulator, Fairlight and Synclavier was driven by a wish to broaden the sonic pallet of their works. Whilst they continued to use sampled sounds from strings and traditional instruments, they also included non-instrumental sounds like breaking glass and footsteps (Harkins 2015).

Although using sampling technology to both imitate existing instruments and broaden the scope of musical sounds was common in the early 1980s, what gradually came to dominate the understanding of "sampling" was that of musical appropriation. For most people, sampling became synonymous with the act of recording larger parts of existing music into the sampler for incorporating into new musical works as a more or less recognizable quotation. This is what Kvifte defines as the second cultural understanding of "sampling" (2007, p. 107). This move towards understanding the "sampler" as a tool for musical appropriation has in my opinion become the dominant definition of sampling. Most academics describe "a sample" in line with Kvifte´s second cultural definition: a part of an original recording that is appropriated and quoted by using the sampler. Compared to the original intention behind its construction as a musical instrument and the technical definition of the tool, this definition of sampling praxis is something that is rather different.

3.1.2 The development and packaging of sampling technology for musical creation

What I find especially interesting with Kvifte's two cultural definitions of sampling in musical praxis, is that their emergence runs parallel with changes in the technical developments of the "sampler" as a musical instrument. From the very first sampler that was designed to "imitate" acoustic instruments, the sampler as a commercial musical instrument developed rapidly throughout the 1980s, making it easy to use for appropriation of existing musical recordings. It could therefore be tempting to make the argument that the different ways of understanding sampling praxis are as a direct result of changing technological possibilities. However, this would be a grave over-simplification of what happened. The relationship between the development of the sampler and that of sampling praxis thus exemplifies one of the central points in my research question: how mediating technology engages in a constant negotiation about what sounds are considered aesthetically interesting. As part of such a process, it is also evident that the aesthetic changes that appear, in turn feed back into our understanding and use of mediating technology. This is a complex relationship that urges us to be careful not to collapse such developments together. Nick Prior, writing on digital technology in music production, warns against such a move:

> "After all, there can be no neat overlap of style, context and technology in music precisely because each takes a relative distinct historical journey. Which is not to say there aren't interesting correspondences between these categories, merely that one has to be precise with their usage and be wary of collapsing one term into another" (Prior 2009, p. 82*).*

The crucial point according to Prior, is that the technology and the musical aesthetics develop on individual terms. This implies that a specific technology is subject by default to very different types of interpretation, dependent upon whether the focus is on the purely technological side, or whether approached from the perspective of a particular musical ideology. Even so, interesting correspondences between different musical interpretations and technical definitions of the tools will appear. Since "the sampler" can be defined as a hybridisation between musical instrument and technology for sound recording, such correspondences have therefore occurred frequently since the 1980s.

What we experience in many of these cases is an interdependency and exchange of creative ideals. Since the sampler is a commercial commodity, its commercial success depended on its ability to fulfil an identifiable need amongst musical practitioners. The initial openness in the sampler´s design inspired different artistic praxes that in turn influenced manufacturers to develop the tool in new directions. The sampler that evolved, therefore, became more and more modelled to suit a purpose that the manufacturers could identify amongst musical practitioners.

The development from using the sampler purely to imitate existing instruments to that of using the sampler as tool for appropriation must therefore be understood as a result of both a technical development and a cultural repurposing. On the technical side, developing less expensive memory circuits was an important starting point. As a result, samplers could record larger sections of musical recordings[20], rather than just a small part of a violin or guitar sound. The reduced price of memory circuits also made the sampler cheaper to buy, resulting in a greater proliferation of this tool amongst musicians. Trevor Horn recalls that in the early 1980s, only those who could afford to pay 20 000 £ for a sampler could know what was going on (Warner 2003, p. 144). From being a device confined to large and expensive studios, the sampler gradually become available to less established musicians. These changes coincided with an important cultural development, the rise of a new musical genre: Hip-Hop. American producer Ahmir "Questlove" Thompson calls the introduction of the sampler the single most important moment in Hip-Hop (Thompson and Greenman 2013, p. 66).

[20] One of the early samplers, the Emulator I (1981/1982) could store a maximum of 2 seconds of sound (page 22 of the operating manual (E-MU systems 1982) while the Akai MPC60 from 1988 was advertised as capable of sampling 26 seconds of sound.

The sampler´s move into the genre of Hip-Hop represented a crucial point in the development towards defining sampling praxis as a form of musical appropriation. Whilst the sampler in a European context had been popularised though art rockers like Peter Gabriel, Kate Bush and Art of Noise (Moy 2007, p. 78 and Warner 2003, p. 91-105), Hip-Hop emerged out of DJ culture: the use of the sampler became a logical extension of the DJ ‘s cut and paste techniques (Reynolds 1998, p. 365; Rose 1994, p.73-74 and Katz 2012, p. 122). In Hip-Hop, the DJ used existing musical recordings to piece together a rhythmic and musical backdrop for the rapper to perform to. Within Hip-Hop, recording technology had already been repurposed into a musical instrument with the development of “Turntablism” (Shapiro 2002, p. 164). Therefore, using the sampler for what it actually is - a repurposing of recorded technology – was already established within an existing musical praxis. This link between DJ-ing and the use of the sampler brings the discussion back once more to the legacy from Jamaican sound systems and Dub. As I stated in the previous chapter, Hip-Hop DJs evolved their praxis with inspiration from Jamaica. This use of the sampler within Hip-Hop therefore emerges with a clear legacy in earlier Dub-music from Jamaica (Sanjek 1992, p 610-611)[21]. At this point, the use and definition of sampling technology becomes subject to an important re-interpretation due to the point of artistic reference that practitioners of Hip-Hop come from. As within Dub, recorded music becomes a material that can be used for further artistic creation in Hip-Hop.

[21] Sanjek makes a compelling case connecting the DJ´s use of recorded music with the emerging praxis of sampling within Hip-Hop, but some of his arguments are weakened by the fact that he confuses MIDI (Musical Instrument Digital Interphase) with Sampling. “A MIDI converts any sound into a series of retrievable signals…..” (Sanjek 1992:608). For an explanation of what MIDI actually is, se Roads 1996, p. 972.

The move into Hip-Hop also coincided with a new design of samplers to hit the commercial market. The type of samplers that saw most extensive use in Hip-Hip were initially designed as drum machines, only with the added feature to record your own drum sounds (Schloss 2014, p.46). Therefore, the design of the sampler had developed beyond a mere replacement of traditional instruments, to that of music production stations for rhythms and grooves. The first machine of this kind to hit the market was the Emu SP-12, later replaced by the SP-1200. Hip-Hop producer Hank Shocklee talks of this as his favourite tool (Rose 1994, p. 76). An important milestone in this development was the Akai MPC60 released in 1988. This machine, marketed as a "Production Studio in a Box", blended the function of sampling with the sequencing abilities of the drum machines (see Fig 5). This particular machine was designed in collaboration with Roger Linn, the designer of the earlier Linn Drum machines. What made the new MPC stand out in comparison to earlier similar machines like the SP-12 and SP-1200, was superior user-interface with several pads that could be used to trigger different samples (Exarchos 2019, p. 40).

Fig. 7 Ad for the AKAI MPC60 in Keyboard Magazine February 1988

The sequencing possibility was obviously an important feature within these new sample designs, but the possibility to record a total of 26 seconds of sound (see fig. 6) was also important when Hip-Hop producers used the sampler. Instead of recording just a singular drum sound into the sampler, users chose to record whole bars of music into the machine. A bar of a baseline taken from an old funk recording, for example, could therefore be merged with their own programmed drum patterns.

An interesting aspect of the sampler in Hip-Hop, is that it was introduced into the genre from outside of the context that previously had defined how the technology was to be used in popular music. Whilst a white European audience might have heard the sampler in various experimental art rock bands, it was an episode of the *Cosby Show* that, in Thompson's account, introduced the technology to African American youth (Thompson and Greenman 2013, p. 66). Thus, the way it was used in Hip-Hop was not inspired by how the sampler had been used previously in other musical genres, but as Reynolds and Rose point out, inspired by the use of the record player by Hip-Hop DJs.

The samplers that Hip-Hop producers used in the late 1980s, established a clear link between the sampling technology as commodified by the manufacturers and the artistic practice of musical appropriation. This link was furthered by new designs and marketing of samplers. In this ongoing development, one special technical innovation was critical for both galvanizing and expanding the concept of sampling as musical appropriation. This novel innovation was a newfound ability to manipulate the tonality and length of the sampled sound independently. Whilst early samplers could only change the pitch of the sound by simultaneously changing its playback speed, the samplers that came in the early 1990s had an expanded ability to manipulate sound, enabling them to also change the tonality of a sample without affecting its playback speed[22].

The significance of this development becomes clear if we look at the practical use of earlier samplers. With the hardware samplers produced in the 80s and early 90s, appropriating one sample from an existing musical recording into one's own musical composition was easy. But since most samplers could only change tonality by changing the playback speed, merging parts of different musical sources that did not share matching tempo and tonality demanded a great degree of technical expertise or a good portion of luck. Some of the later samplers of this period were equipped with a function called "time stretch"[23], giving the operator the ability to manipulate the length of the sample independent of its pitch. But the problem was that this function was only accessible through the function of percentage, not BPM, which is the standard tempo measurement in music. To calculate the correct percentage factor necessary to achieve the correct BPM manipulation, required extensive skills in mathematics. In addition, time-stretch, as it was available on samplers in the 1980s and early 1990s, was a hidden feature in operating menus. As a result, the use of time-stretch to retain the right tonality when synchronising samples, would in a best-case scenario be a laborious process of trials and errors. These technical shortcomings of the samplers meant that the easiest thing was to sample from one tonal source and build the rest of the new tune around this. Blending small fragments of tonal elements could also work without time-stretch, but merging larger melodic

[22] This function was included amongst others in the AKAI S-1000, see operation manual v.2 p. 45 (Akai Professional 1988).

[23] For a detailed technical definition of this function, see Creasey 2017, p. 383.

sections of existing tunes would probably result in either tonal or rhythmic chaos. [24]

The possibility to use time-stretch functions as a means to blend together several musical “samples” into one new musical piece, was something that commercial manufacturers of samplers identified, motivating them to develop these possibilities further. But for these new technological possibilities to really make a mark on music, the sampler, ironically, had to die. The big game-changer for the time-stretch function, easing the possibilities for mixing and integrating elements form different tonal sources, came when sampling technology together with the established sampling practice migrated from the chunky hardware boxes of the late 1980s, into a special group of computer software: the DAWs.

DAWs (digital audio workstations) is a type of computer software that started to emerge in the early 1990s enabling the use of PCs and Macs as recording devices for sound (Milner 2009, p. 337). If we return to the technical definition of sampling, we can conclude that a DAW is a software that gives the computer the ability to sample sound: rendering sound waves into digital information. The DAWs were therefore based on the same technical principle central to the design of the “sampler”. But whilst the “sampler” was repurposing digital recording technology into a tool resembling a musical instrument, the DAWs developed more in line with the initial idea behind digital recording technology. The purpose for the first DAW software was in fact to replace the old multi-track tape recorder with a tool to record music digitally, direct to hard drives. As with other

[24] From my own experience of working with the early Akai samplers (S-950 all the way up to S-3200), it required a good knowledge of mathematics to calculate tempo and pitch into percentage of time. Since there were no decimals at hand when choosing the percent, the time manipulation was not always as accurate as one wanted.

commercial music technology, it is clear that early on, DAWs were understood to be a practical improvement of existing music technology.

Since the DAWs were based on recording sound digitally, they had the advantage of doing away with the "tape hiss" and distortion that had always been an issue with analog recordings (Manning 2013, p 248-249). In addition, the graphical user interface of a computer meant editing different takes and cutting out unwanted sounds was much easier than previous tape splicing. In the same way as the interfaces of PCs were designed around "tool metaphors" taken from traditional office work which dealt with desktops, files and documents (Nelson 1990, p. 237 and Mountford 1990, p. 25), the user interfaces of DAWs were based on metaphors from traditional studio work with multitrack recorders and mixing consoles (Tresch and Doland 2013, p. 279-280). This focus on virtually recreating a traditional studio environment has always been the basic design principle behind the DAW, but as the processing power of the computers increased, the graphical user interface developed and new features for manipulating sounds were added. Inspiration was taken from the way musicians had previously used the hardware sampler to appropriate musical recording, but now this praxis was established in a much more flexible working environment.

The revolutionary change achieved when the praxis of sampling migrated from the hardware sampler to the world of DAWs, is best exemplified with one specific software: *ACID Music* released in 1998 (it was originally designed by Sonic Foundry but was later taken over by SONY and renamed ACID Pro). The important feature of this program was the way it traced the BPM, the tempo, of the different "samples" and instantly matched them to a set master tempo. The sounds imported to the program were "ACIDized", either by automatically or manually defining the tempo and tonal key, enabling the automatic adjustments of "samples" to fit a defined tempo by applying a time-stretch function. This was a feature that changed how to make music. As Sonic Foundry claims in the user manual: “ACID music allows you to take the tedious hours of Loop and sample matchmaking out of the music-making equation and open the doors wide for creativity” (Sonic Foundry 1998, p.1). This description points to the fact that the software was developed to fulfil an identified need amongst musical practitioners: to make appropriating musical elements from different musical sources easier. What had earlier been a time-consuming process with hardware samplers was implemented as the main function in this program, enabling the user to fluently manipulate tempo and tonality independently on every single sample. As with other DAWs, the samples in *ACID* were linked to audio tracks, in this instance called “Loop Tracks”, that in turn were linked to a master clock, sectioning each sample into bars, fourth or sixth. The samples were not triggered by a drum machine or keyboard but became a visual entity on the screen that could be moved, rearranged and manipulated within an audio track in the software. You could easily repeat parts of the “sample”, synchronising it to the master clock and with ease change its pitch without affecting its tempo. What you could not do however, was play the sound like you could “play a turkey” on earlier hardware samplers.

With the move into DAWs, the praxis of sampling severed itself to a great extent from what Kvifte saw as the first cultural understanding of samplers: an instrument to simulate traditional instruments. Similar functions to those introduced by *ACID* were gradually introduced in other DAWs such as *Pro Tools,* but in this software, the function was hidden more within the user interface aimed at correcting recordings (Avid Technology 2010, p. 293 and p. 855). In 2004, the software *Ableton Live* was released, taking over much of the market share from *ACID.* The important difference between the two programs was that while ACID defined its possibility to synchronize tempo and change tonalities on samples as a special new feature, *Ableton Live* had this as a default possibility on all the audio you import (Ableton 2019, p.33 and 38). It is evident then, that these two software programs can be seen as a logical extension of the later hardware samplers in the way the program facilitates the reuse and manipulation of musical recordings (d'Escriván 2011, p. 84). However, it must be pointed out that the legacy of the very first sampler, whose purpose was to simulate traditional instruments, is still living on in the world of software through what is called VST (Virtual Studio Technology): the sampler is recreated as a program within the different DAWs and is often used to imitate and recreate the sounds of existing instruments[25].

3.2 Sampling technology, musical ideologies and the ontological status of recorded sound

In the previous section, I showed how the two cultural definitions of sampling that Kvifte identifies - simulating traditional instruments and musical appropriation/quotation (Kvifte 2007, p. 107) – has overlapping points of interest within the commodification of sampling technology as a commercial tool for musical creation. The first hardware samplers were originally designed to imitate other instruments, while the later DAWs went further, taking inspiration from the way many practitioners had already used the samplers, to design a software that treated the praxis of sampling as an act of musical appropriation/quotation. Together these two cultural approaches form the basis for what I identify as the dominant analytical frameworks for interpreting sampling, establishing the most common way of defining sampling praxis in music as seen in analysis and writings on the topic. We could easily wrap things up at this point, arguing that we have proven how technical development turned sampling technology into a potent tool for musical appropriation. However, what I see as the problem with this analytical framework is that it confines our

[25] The most used VST sampler today, is probably Native Instruments´ *Kontakt*: as with the early hardware samplers, it enables the user to create complex sample based instruments (Native Instruments 2019a, p12.)

discussion of sampling praxis to the concepts of authorship and authenticity. Defining sampling as an imitation of traditional instruments will always raise questions about the authenticity of musical sound (as was the case with the early drum machines). Musical appropriation/quotation will, in the same way, provoke discussions about authorship in music. This analytical framework therefore points us back to what Goodwin, as early as 1988, found rather unsatisfactory as a way to describe the musical praxis of sampling (1988, p. 37)[26]; a critique that in part was repeated by Nick Prior in 2009 (Prior 2009, p. 81).

If we look into the variety of artistic examples of sampling praxis, it is clear that many of them can be adequately explained through a discussion on authorship and authenticity. However, as I will show in the following section, there are examples that do not fit neatly into this discussion. I am not the first person to point this out, but what I attempt to do here, is to conduct a more thorough discussion on aesthetic implications within both the established analytical framework and alternative analysis of sampling praxis. A central focus will be to explore how the different approaches to sampling praxis can be explained by recognising different ways of defining recorded sound in relation to the aesthetics of music. In my introductory chapter, I explained how the artistic possibilities in sound recording were subject to a variety of interpretations, thus defining the purpose of this technology in rather different ways. Some defined it

[26] An interesting aspect with Goodwin´s article is how much of it is dedicated to the question of authenticity in relation to the early sampler's ability to simulate the sounds and performance praxis of existing instruments. The Akai MPC60 was released the same year the article was published, so Goodwin was writing in a context where the samplers were still confined to an original design of simulating instruments. He exemplifies this with the discussions that emerged around the band Frankie Goes To Hollywood (produced by Trevor Horn), asking: "what did Frankie and their lead singer Johnson actually *do?"* (Goodwin 1998:39). Frankie Goes to Hollywood dominated the UK charts in 1984, but most of their records were pieced together by Horn in the studio and not performed by the members of the band (Lester 2014).

in line with High-Fidelity traditions working as a transparent conveyor of a musical performance. Others, like Cage, Schaeffer and King Tub, took it in the opposite direction, using sound recording as a means to create new artistic expressions. Hence, the next section discusses how different approaches to sampling praxis can be understood as a continuation of these developments.

I begin this discussion by taking a closer look at the dominant analytical framework of sampling as musical appropriation, and then examine how this has often been defined through the use of existing theories about musical quotation. This connection is important for understanding the extent to which analysis of sampling praxis is rooted in High-Fidelity ideals for sound recording. I will then engage in further aesthetic analyses of this type of sampling praxis by examining two musical examples from the 1980s. After that, I move on to highlight the problematic issues associated with this analytical framework by explaining how these problems became more apparent when used as a starting point in analysis of the later musical genre of Mashup, which emerged in the late 1990s. Finally, I examine musical examples that use sampling, but engage in this praxis in a very different way to that explained by the dominant analytical framework: sampling as musical appropriation. My point is, that in these cases we are faced with yet another understanding of sampling praxis; to a great extent this emerges from a definition and understanding of recorded sound that differs from that of the High-Fidelity ideal.

3.2.1 Sampling as musical quotation

A reason why many academics have used the dominant analytical framework for sampling praxis as a form of musical appropriation, is that it enables them to take advantage of strong musical traditions to supply theoretical concepts that seemingly can help in contextualising this analysis. Additionally, theories of intertextuality taken from literature studies are often used as a foundation for such discussions. Through this approach, the sampling praxis is explained as continuing an existing tradition in music. In the article *Intertextuality and Hypertextuality in Recorded Popular Music* (2000), Serge Lacasse discusses the application of such theory in relation to sampling praxis. But the coupling of theories taken from different cultural praxes are not without complications.

In an attempt to normalise the praxis of “sampling” with the theories of intertextualisation from both traditional music and especially Genette’s literature theories, Lacasse encounters certain obstacles. The problem lies in the fact that sampling centres upon the reuse of actual sound recordings, whilst earlier praxes of musical quotations were based on musicians re-performing parts of the music in question. Lacasse resolves this by introducing the concept of “autosonic quotation”. This term describes the type of quotation that is based upon the reuse of actual recorded musical material; a concept that clearly connects sampling to the conceptualisation of sound recording as a copy of existing music. “Allosonic quotation” on the other hand, describes the instance when the quote is played again by performing musicians (Lacasse 2000, p. 38). Even if these two concepts seemingly align two comparable musical praxes, the difference between re-using musical recording and that of re-performing parts of music is far greater than it might appear at first.

A look into the literary theories of Genette, from which Lacasse takes his inspiration, reveals that the actual re-performing of parts of earlier works - the way in which musical quotation worked before sampling - had a very specific characteristic; that of *transformation*. In his book “Palimpsests: Literature in the Second Degree” (1997), Genette writes thoroughly about the unique characteristics of intertextuality in music; this is not sampling, but something Lacasse defines as “allosonic” quotation. Whilst literary texts are confined to the strict linearity of the verbal signifiers, music is much freer in terms of possible manipulations (Genette 1997, p. 386). The way music is unbound by the structures of language means that intertextuality within music can operate more flexibly. The possibilities of transformation are, therefore, in a totally different range than that of a literary text. Even a single sound can, according to Genette, be altered through performance by at least four different parameters: pitch, intensity, duration and timbre. Altering a known melody line can take on an array of possible transformations in the hands of a musician or a new composer. Digital sampling as "autosonic quotations", on the other hand, is restricted to utilizing previous musical recordings, and thus does not enable the same level of transformative flexibilities existing within traditional live musical praxis.

Based upon this, we can argue that the quotation-based reading of sampling that appears in line with the dominant analytical framework, has little in common with earlier forms of musical quotation. Rather, we are left with what Genette calls *allusion,* where the meaning of an annunciation relies only on the identification of a clear reference to another text (Genette 1997, p. 386). According to Genette, the true potential in musical "intertextuality" lies instead within the field of "hypertextuality", where not only the identification of the annunciation is important but the *transformation* of the earlier text is central to the resulting aesthetic expression. Moving concepts originating in the realm of performed music into the realm of digital sampling can therefore often result in a rather narrow analysis.

The reason why sampling as "autosonic quotation" ends up focusing primarily on *Allusion,* is in my opinion, a direct consequence of the fact that the sampler as a musical instrument is based on repurposing recording technology. How recording technology is understood, therefore creates the foundations for interpreting the purpose and artistic possibilities inherent in the sampler. In the case of quotation, the functionality and purpose of the sampler becomes defined in line with Sterne's explanation of High-Fidelity, as a means to represent a transparent representation of a musical performance (Sterne 2003, p. 216).[27]Manipulations of sampled sounds can of course occur (as I will demonstrate later), but the problem is that such a process easily breaks the transparent representation, thus obscuring the identity of the sample and leaving much of the concept of quotation out in the open (Grubbs 2014, p. 57). Manipulation of sound recordings does not happen along the same melodic and musical lines as within traditional performances; it does not facilitate the transparent transformation of melodies as a traditional musical instrument does. As already outlined in my introductory chapter, early practitioners like Cage and Schaeffer who experimented with tapes and gramophone discs, focused upon achieving exactly this effect; obscuring the sound's provenance. In these experiments which both expanded on and broke with established ideas of musical sounds, this effect of obscuring was the primary goal. To stay within Lacasse's definition of "autosonic quotation" we therefore need to treat the sample as a transparent recording of sound that at all times represents a given external musical work and musical performance. When recorded sound on the other hand is manipulated, the link between the sound and the musical performance can be broken, diverging from how High-Fidelity defines the purpose of sound recording.

The possibility to digitally manipulate sound recordings, creates an important tension in response to the concept of musical quotation, that again can become a focal point for further artistic exploitation. This happened even within the dominant interpretive framework of sampling as musical appropriation.

[27] This refers back to my discussion in the introductory chapter where Sterne pointed to the fact that the High-Fidelity ideal emerged with the commercialisation of gramophone technology. In this instance, it was important to uphold a direct link between the recorded sound and the actual artist performing the music. In this way he claims that concept of High Fidelity works to staple together different pieces of sonic reality (Sterne 2003, p. 219).

However, to explain this, we have to reapproach the concept of quotation from a slightly different angle to the one Lacasse takes. The apparent one-dimensionality of analysing "sampling" as musical quotation is also a topic for Joanna Demers. However, her writing on contemporary electronic music points especially to the way in which academics' understanding of sampling as quotation depends too much upon the construction of an idealized informed listener:

> "Once scholarship begins the act of classifying and identifying references, whether in Shakespearean sonnet or a hip-hop hit single, the end result is a contest of connoisseurship in which the assumed reader is an idealized, thoroughly educated, and primed one who identifies and translates references on command. The ideal reader is virtually synonymous with the author since it is assumed that all quotations are intentionally included." (Demers 2010, p. 53)

What Demers points to is probably the most fundamental shortcoming of interpreting sampling as a form of musical quotation. This way of analysing sampling praxis only makes sense for an audience who have prior knowledge of the musical works sampled and can identify the elements as quotation. If you do not have that prior knowledge, you would consequently miss out on the appreciation of the music. In its defence, we must not conclude that this is a "wrong" way to approach sampling in music, it just limits us to a very specific type of aesthetics. The emphasis on an ideal listener, urges us to approach this definition of sampling through what often is called "conceptual" aesthetics.

Within conceptual aesthetics, the decision made in the process of production becomes just as aesthetically important as the actual sonic result[28]. Recognising

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[28] The development of conceptual aesthetics is often ascribed to the visual artist Sol LeWitt who in the late 1960s stated that artists were more and more interested in the concept or idea behind their creative work, than the actual visual result (Colpitt 2004, p.28). This movement within art is, of

how the artist has worked to create the art piece, is an element that the audience has to acknowledge when experiencing the finished art piece. In the case of sampling, the audience's knowledge of both the technological process and the existing musical works that have been quoted, can represent the central element in what I will identify as a conceptual aesthetic approach.

One of the most well-known and discussed examples which I think represents this conceptual approach to sampling as quotation, is probably the work of John Oswald. In 1993, he released *Plexure,* album that was allegedly based on more than 5000 samples of other musical works taken from different hit singles form 1982-1993 (Duguid 1994 and Gans 1995). What made this release stand out in relation to other sample based musical expressions, was that he used such short "samples" that the identity of the original work being "quoted" became obscured. The samples were transformed to such a degree that the original provenance of the sounds was difficult to recognize. Listening to the music would not automatically alert the listener to the reuse of an existing musical work. To experience this, the audience would have to have some knowledge about the creative process that Oswald had applied in creating this release.

As Demers pointed out, quotation-based analysis of music relies heavily upon a concept of the ideal listener (Demers 2010, p. 53). Oswald's work also relies upon an ideal informed listener, but since we are faced with conceptual aesthetics here, the listener is not supposed to recognize the quotations simply by listening to the finished musical work. The audience has to have prior knowledge about Oswald's creative process of using the 5000 samples in order to understand that what they are hearing is in fact multiple small quotes from music. In this instance, as clarified in the writings of Oswald in the form of articles and interviews he has

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course, also related to the emergence of performance and events in art as discussed earlier in relation to John Cage.

given, it forms a crucial piece of the artwork. Such elements are what Genette defines as paratextual elements; a text that is not included in the work in question but exists externally (Genette and Maclean 1991). The paratext is not included in the actual artwork, but functions as information that the listener brings into his interpretation or understanding of the work.

The most significant explanation of Oswald´s artistic work can be found in his own article *Plunderphonics, or Audio Piracy as a Compositional Prerogative* (1985). Here, he explains the motivation behind his creative process by questioning both legal and musical repercussions of quotation in light of the concept of musical works.[29] He asks: "can the sounding material that inspires the composition, sometimes be considered compositions itself?" (Oswald 1985). In this way he directly invites us to discuss the "old" concepts of "authenticity" and "authorship". Significantly, he does this within the framework of debating the definition of sound recording. Central to all of Oswald's work, is a focus upon the specific transformative process made possible with recording technology. You might have a finished recording of a popular song, but the technology enables the transformation of this song into something else through active engagement by a practitioner. Oswald therefore questions our assumption about the ability of sound recordings to function as a stable representation of an existing musical work - to document and preserve this work - thus undermining the aspects that are fundamental for the High-Fidelity ideal. Oswald's work therefore links back to the argument I made about Lacasse´s concept of "autosonic quotation". In both cases the transformative possibilities of sound recording are problematic in relation to the High-Fidelity ideals.

[29] After the article, Oswald released a series of releases under the tagline "Plunderphonics" where *Plexure* was the last one.

The transformative aspect of recording technology is something that Oswald started to explore even with analog tools. One of Oswald's earliest pieces *Pretender* (1988) (Released under the name Plunderphonic is a piece that consists of Dolly Parton´s recording of "The Great Pretender", replayed and re-recorded while Oswald is manipulating the playback speed. The voice of Dolly Parton becomes transformed and new details in the soundscapes are audible as the playback speed is gradually slowed down and turned back up again. The piece, whilst recognisable as Dolly Parton´s song, becomes a new highly concise piece through Oswald´s manipulation (Cutler 2004, p. 139). In relation to traditional definitions of musical works, Oswald´s practice thus stands as a direct criticism: it defies much of the integrity of the work, claiming that through manipulation, a recorded piece can still be recognizable but at the same time be turned into a new piece.

This focus upon the transformative possibilities of sampling technology is something that makes Oswald stand out in relation to more conventional uses of sampling. As I mentioned earlier, one of the key differences with quotation through sampling technology compared to quotation through performance of music with traditional instruments, is that sampling praxis often ends up as much more static. As Genette argued, musical quotation within instrumental performance traditions are shaped by how the actual quotes are transformed in the hands of the performer or a new composer. John Oswald´s work closes in on this form of musical transformation, but his use of recording technology and later digital sampling underscores how recording technology takes this transformation in another direction. As I described, a crucial point is that the transformation of sound recordings does not necessarily accrue along known musical parameters, which is the case when transforming melodies through performances. If one tries to add some significant degree of manipulation through sound recording technology the process often ends up rendering the original sound unrecognisable (Grubbs 2014, p. 57).

The mismatch between the sonic experience of Oswald's work and the sound of the musical works being quoted, raises questions regarding the relationship between musical recordings and the concept of musical works. Though the audience cannot recognize the musical works being transformed, focusing on a conceptual aesthetics leads the audience towards the underlying process of creation. The listeners become aware of the mismatch between the recordings "quoted" and the sound heard, through information available in the peritext of the work. According to Cutler, Oswald is one of several artists who turned the art of plagiarism into "a self-reflective process, raising vexed debates about ownership, originality, copyright, skill and cultural exhaustion" (Cutler 2004, p. 138). The case of Oswald´s "plunderphonics" shows how an artist can play with the act of sampling as quotation and through that question the hegemony that the concept of musical works imposes on the analysis of sampling. It highlights how fragile and unstable this connection is. Oswald´s works are musically so far away from the works intentionally quoted that it clearly has no link to earlier forms of musical quotation. The idea of intertextualisation through sampling can therefore be something that breaks with a large part of the historical tradition of musical quotation – it is not so much an aesthetics of sound and melodies but more a conceptual approach that questions established ideals of musical works and musical sound.

Oswald´s own writings which document his artistic approach, gave his work an important place in academic writing about sampling, by exemplifying how the actual act of sampling enters the artistic domain as a conceptual approach to music aesthetics. But since his work was based to such an extent upon the sonic transformation of the original sound, his work was probably less accessible to a broader audience. This conceptual approach to sampling however, also flourished in more commercial music as an allusion-based quotation, where the origins of the quotes were easy to recognize. Well-known examples of such sampling as musical quotation are found within writings on American Hip-Hop, where it has often been analysed as a homage to previous African American musical traditions (Sanjek 1992, p. 612-13; Rose 1994, p. 79 and Demers 2003). However, I want to focus upon a lesser known European band, "The JAMs", to exemplify the conceptual aesthetics of allusion-based quotation. The reason for this, is that their praxis can be seen as more extreme and conceptual in its approach to sampling as quotation, and most importantly it also predates most of the legal controversy that later appeared in Hip-Hop (McLeod 2009, p. 114-115). In addition, the motivation behind The JAMS creative process, can be regarded as a forerunner for later analysis of musical appropriation and quotations.

In 1987, the British band The JAMs, also known as The Justified and Ancient of Mu Mu, debuted with the album *1987 (What the Fuck Is Going On?).* Similar to Oswald´s plunderphonics, the actual act of sampling materials from other existing musical recordings became the central entry point into the aesthetics of this release. But whilst Oswald´s work transformed and sonically obscured the source of the samples, the quotations that appeared in The JAMs' release were obvious and easily recognisable. There was no need to publish texts or do interviews explaining the conceptual aesthetics behind the musical appropriation, as with the release of *Plexure*. The conceptual process behind the creation of *1987* becomes evident since the musical works samples are so easy to recognize. But even so, the release of *1987 (What the Fuck is Going On?)* was saturated with external references residing outside of the sonic experience of the work, explaining much of the motivation behind sampling as a creative process.

The JAMs were a band riddled with literate and symbolic cues – a feast for an ideal informed listener who could identify it all. The band took their name from the "Illuminatus! Trilogy" by Robert Shea and Robert Anton Wilson (1975), a fantastic conspiracy driven story, in which "The Justified and Ancient of Mu Mu" are fighting the evil Illuminatus organisation, which amongst other things, is controlling the record industry (Fitzgerald and Hayward 2016, p. 51). Here, there are clear external links which explain the band´s extensive use of sampling as an anarchistic drive against the established economical structures in the music industry. This case is strengthened by the way in which the aesthetic quality of the sounds and melodies being sampled are de-emphasised; foremost is the *provenance* of what has been sampled (Higgs 2012, p. 87-99). On the track *The Queen and I,* The JAMs have sampled a large part of ABBA´s *Dancing Queen*[30]. Listening to the track, the contrast between ABBA´s recording and The JAMs' added music is striking. The smoothly produced groove of ABBA is accompanied by a loud and static programmed drum rhythm. The sample is not an attempt to make the two elements fit together stylistically. ABBA is more or less supressed by The JAMs´ crude rhythm. When Bill Drummond starts rapping with a phony Scottish accent, this contrast is even more evident.

Compared to how we usually perceive quotation in music as elements from earlier musical works being added to a new musical whole, it is more appropriate to describe The JAMs' work as the other way around; rather it is ABBA featuring a contribution from The JAMs (Higgs 2012, p. 106). The overall sonic composition of the track exaggerates the "sample" as an external element of the recording. Thus the "sample" from ABBA does not align into a new musical whole but remains an alien element in The JAMs' release. As an audience, we are no longer faced with just a quotation of a work, but something more in line with musical theft. As a result, it is no surprise that a lawsuit followed, resulting in the destruction of nearly all the copies of the album. Whether the legal problems were something the band had anticipated or not is impossible to know, but they clearly used the development to their advantage. They organised a trip to Sweden

[30] They have sampled the chorus, the intro and parts of the bridge but nothing from the actual verses.

in an unsuccessful attempt to meet with some of ABBA´s members and finished up by orchestrating a ceremonial destruction of the last remaining examples of their album (McLeod 2009, p. 118).

The release of *1987 (What the Fuck is Going On?)* grew into a large living art piece breaking the boundaries of a sonic musical piece as it ventured into the realm of public spectacle. At the heart of the aesthetics lies the fact that the integrity of the appropriated musical work was broken, both artistically and legally. We can read the motivation behind this as an anarchistic protest against the music industry. Within the fight against the established music industry (real or imaginative), the act of sampling becomes a weapon of choice because of its ability to break down the established concepts of musical works. Within such a reading, *1987* is one of the first examples where problems relating to copyright regulations become an integrated part of the artistic project. In this way, The JAMs heralded the debate that came with mp3 piracy in the early 2000s (Higgs 2012, p. 102) that I explore in detail later. The story of *1987 (What the Fuck is Going On?)*, can be viewed as an early example of how the use of digital technology in music was to be interpreted in later instances.

3.2.2 DAWs, Mashups and digital technology as a critique of copyright legislation

The two artistic examples of sampling as quotation, The JAMs´ *1987 (What the Fuck is Going On)* and John Oswald's *Plexure*, emphasise how the artistic approach to sampling praxis can be analysed as a means to criticise the relationship between sound recording and the hegemony of authorship and authenticity. These examples clearly underscore the point made by Andrew Goodwin, that the debate about sampling in the 1980s largely centred on these two concepts. The examples also illustrate the fact that certain artists were themselves aiming at this type of aesthetics. In this next section however, I turn my attention towards the debate about how sampling praxis and musical appropriation developed in the years to come, with a specific focus on the emergence of Mashups in the early 2000s.

My account of how technological advances nurtured the praxis of sampling, highlighted that a key factor in this development was the move from hardware samplers to the use of DAW software. This meant that new features for sonic manipulation were added to give practitioners the ability to sample unlimited amounts of sound. As a consequence, artists were no longer limited to sample "parts" of other musical recordings but could mix together entire pop tunes into new musical entities. This development resulted in a new musical phenomenon labelled Mashups. A good Mashup could mix vocals and chords from different musical recordings with total harmonic precision by applying the advanced new features for temporal and tonal manipulation available in the DAW software (Demers 2006, p. 78). When Mashup arrived on the cultural scene, it was instantly identified as a new stylistic development. In my opinion, it soon however became caught up in an analytical framework much in line with previous analysis of sampling as musical appropriation. Much of the academic and popular understanding of Mashup got tangled up with the same discussions on authorship and authenticity. This framed the whole understanding of Mashup within what Andrew Goodwin had already termed "old ideologies" in the 1980s.

When Mashups started to emerge in the very late 1990s, the readings of sampling as a form of quotation or musical appropriation was already well established. The most convenient way to analyse Mashups, therefore, was to take inspiration from earlier analyses of digital sampling tools, reading it as a self-reflexive critique of recording technology as the likes of John Oswald and The JAMs had done. Why the interpretive framework for Mashups got caught up in this specific interpretive framework, can in my opinion, be found in the particular examples academics and audiences chose to use when exemplifying this specific cultural phenomenon.

Within the emerging understanding and academic analyses of Mashups, one specific example took centre stage. In late 2003, an album started circulating amongst audiences and journalists in the musical press. This was not an ordinary release by an established record label, but a release that was circulated through private copying and internet downloads. The album went by the name *The Grey Album* and consisted of acapella versions of Jay–Z´s *The Black Album* over music made from deconstructions of tracks of The Beatles´ *The White Album*[31]. Behind this work was a DJ working under the moniker Danger Mouse. At the time of *The Grey Album,* the praxis of making Mashups already existed outside of mainstream music, but with this example the phenomenon of Mashups grabbed the attention of both the general public and academia[32].

There were two good reasons why *The Grey Album* garnered so much attention, propelling Mashups into mainstream popular culture and becoming *the* template for Mashups in the future. First of all, it had a strong conceptual framework. Much like The JAMs, Danger Mouse reconceptualised music from famous popular groups, focusing on reworking material from two acclaimed albums. In this case, most audiences fell under the category of the ideal listener, immediately

[31] The official name of the album is however, *The Beatles,* but due to its white cover, it is generally referred to as *The White Album.*

[32] One of the earlier examples of Mashups that became popular amongst DJs was Girls On Top´s *I Wanna Dance With Numbers* (2001), consisting of the vocals from Whitney Houston´s *I Wanna Dance With Somebody (Who Loves Me),* over Kraftwerk´s *Numbers.* The year after 2manydjs released their album *As Heard on Radio Soulwax Pt 2,* presenting a range of Mashups in the form of a DJ-mix album.

recognizing the works that appeared in the Mashup, thus engaging with the album. Secondly it had clear artistic qualities. Unlike earlier examples of Mashups, this album was reviewed by several music journalists[33], even being ranked by some as amongst the best releases of that year (Ayers 2006, p. 127).

Whilst the artistic qualities might have been the initial attraction for audience attention, what really came to shape most people's understanding of the work and subsequently the whole "genre", was the legal conflict that followed. The copyright owner of The Beatles material, EMI, was quick to file a "cease and desist" order against Danger Mouse and his *Grey Album* in the United States court system. The dispute grew in intensity as it was taken up by copyright activists[34], providing them with further reasons to express their protest against corporate control over digital media (Howard-Spink 2004). Just as with The JAMs, a legal restraint against *The Grey Album* was issued. But while *1987 (What the Fuck is Going On)* was a physical release which enabled The JAMs to create a public spectacle when they burned the records, *The Grey Album* was a non-physical release, only existing on the internet as files or through private copying. Even so, the release became the focus of a public spectacle, not instigated by Danger Mouse, but by the internet activist group Downhill Battle. As a response to the court ruling banning *The Grey Album*, they organized "Grey Tuesday", a coordinated campaign where several web pages offered the album up for free downloads (Werde 2004).

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[33] Rollie Pemberton (2004) reviewed it for PitchFork, giving it 7.7 out of 10. In NME Pete Cashmore (2005) gave it 10/10.

34 Much of the negative attitude towards copyright legislation that existed at the time can in part be explained through the writings of Lawrence Lessig. In his book Free Culture (2004) he argues that sharing copyrighted material over the internet should not be sanctioned as it was done by commercial companies, claiming it represents a positive cultural force not damaging the economic interest of the creators of the work (Lessig 2004, p. 66-68).

The result of public uproar, legal controversy and subsequent civil disobedience was that these same issues often became the principal matters focused upon when analysing *The Grey Album;* a situation that prevailed in both popular cultural and academic texts. In my opinion, these legal controversies sparked by *The Grey Album*, evolved to such an extent that the musical qualities inherent in *The Grey Album* and other Mashups became overshadowed by this debate. Subsequently, the typical way to analyse this musical release, was as a protest against the limited creative freedom within the digital domain - a limitation imposed by the growing corporate media control within this field (See for instance Gunkel 2008, p. 490; Ayers 2006; Gunderson 2004)[35].

As a result of the public reception of *The Grey Album*, many writings about Mashups came to evaluate the whole practice in line with what I would call a copyright-as-resistance framework, labelling Mashups as a form of cultural activism in the fight against corporate control in digital culture. Even though *The Grey Album* contained exciting musical qualities, such as blending different musical genres and developing pop-cultural iconology in unexpected directions, it was often the resistance against copyright legislation that established itself at the centre of analyses. Historically, this reading found resonance with the sampling praxis I described earlier, in the works of John Oswald and The JAMs. Yet, at the turn of the millennium, these readings of Mashups were additionally strengthened in other ways. Thus, at the time of its release, *The Grey Album* and other Mashups merged with great ease into a wider debate on digital technology and copyright infringement on the internet.

35 Demers acknowledges the aesthetic quality of The Grey Album, but argues that: "In future years, the Grey Album will probably be seen as a highly visible first step in a public backlash against IP extremism" (Demers 2006, p. 141).

Through the large-scale musical piracy that appeared with mp3 files and "peer-to-peer" networks, digital technology itself took on the status of a tool for musical "theft" and bootlegging. The same digital technology that the established music industries were fighting in court - mp3 piracy through peer-to-peer networks[36] – was understood by some as forming the nurturing environment for the development of Mashups (Shiga 2007, p. 94 and Riddell 2001, p. 341)[37]. It is also worth pointing out that the development of new sampling technology in the form of DAW software also fitted into this larger cultural debate about digital technology and copyright infringement. The open-minded approach to sampling praxis that we found in early products like the Emulator commercial "Play a Turkey", was as I explained in the 1990s, substituted with very specific descriptions of purpose as we saw with the software Acid. In this program, the features were designed with the purpose of syncing and mixing together recordings from different musical sources. Thus, copying and manipulating existing musical recordings was internalised as the purpose of these digital musical tools, both through design and marketing.

John Shiga (2007) has acknowledged that this technical development was important for later musical styles to "come out" of sampling technology, enabling the production of Mashups: "The metalanguage of mash-up culture is a

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[36] In his book, *Sonic Boom* (2001), John Alderman describes how the music industry, entering the 21th century, was caught up in a legal battle against internet services that enabled users to share MP3 files of copyrighted music. Amongst the most popular of such services was Napster, who defended themselves by explaining that they were just providing a service of indexing files the users wanted to share, not storing them on their sites. That people wanted to share music was their choice, not something Napster should sanction (Alderman 2001, p. 141).

[37] Shiga elaborates here on Riddell´s claim that we (in 2001) might anticipate a music that is based on reworking MP3s from the internet, but he does not specifically mention Mash-Ups. This might be due to the fact that Riddell was writing two years before the release of *The Grey Album.*

vernacular form of musicological and sound engineering languages embedded in software like Ableton Live and ACID music" (102).

The overlap between the technical possibilities in DAWs like *Ableton live* and *ACID* and the emergence of Mashup is evident. However, it is impossible to ascertain whether the manufacturers of the programs had these types of musical expressions in mind when they designed the programs. What is clear, as I have already argued, is that the design of DAWs was influenced by how sampling as musical appropriation had emerged within popular music. As I explained, the early DAWs to hit the market were designed to function as a substitute for multitrack tape recorders in recording sessions, a functionality that shaped its interface design. In contrast, *Ableton Live* and *Acid* were clearly designed for the purpose of musical appropriation. You can of course use the program for actual recordings, but its interface is better suited for importing sounds and recording in the form of audio files.

Looking into the design of DAWs like Ableton Live and Acid, it is easy to make the link between the use of digital tools and the breach of copyright in recorded music. However, what we need to ask ourselves is whether this connection formed a part of the artists' intentions as well? Whilst The JAMs themselves turned the destruction of their release into a public spectacle, it was not Danger Mouse who turned *The Grey Album* into a symbol of "copying as resistance"; it was political and social activists on the internet. In fact, in interviews, Danger Mouse has underscored that his motivation for making these Mashups was not to break the copyright (Rimmer 2005, p. 40). Thus, it can be argued that the interpretive framework of copying as resistance, did not necessarily come from the actual artists themselves.

The social spectacle that Downhill Battle instigated when they arranged "Grey Tuesday", to a great extent galvanised the analysis of a new digital musical genre of Mashups, as an outlet of a specific social and political struggle. In this process, the way manufacturers marketed the new possibilities with software like ACID and later Ableton Live, underscored a belief that digital sampling tools themselves were made to challenge commercial rules about authorship. But such connections of social ideals with conceptualisations of technology and the evaluation of artistic practice are clearly problematic. Many of the ideas held amongst people about contemporary digital technology like the internet, are based upon assumptions rather than actual qualities within the technology. What is often left out of such analyses of the artistic use of technology then, is how people choose to use the technology.

One of the most important voices in critiquing these popular assumptions on contemporary digital technology is Evgeny Morozov. He claims that much of the argumentation one finds amongst the online copyright activists like Downhill Battles, is rooted in the mythical ideal of how freedom is supposedly fundamental to how the internet works. The internet has, in his view, become a metanarrative that is used to explain cultural phenomena as a consequence of digital technology (Morozov 2013, p. 18). People can use the phrase "this is not how the internet works" as an argument against a specific practice they oppose, even if they cannot point out technical features that makes this cultural praxis so essential. This is a discussion that takes us back to an "age-old" discussion upon how and if technology can work as a force in cultural and social change; a discussion that dates all the way back to Marshall McLuhan's determinist claim that "media is the message" (McLuhan 2001, p. 7-23). Are there any inherent qualities in technology that drives the cultural changes in any specific directions or are the users in total control, rendering the tools themselves culturally neutral? In Morozov´s view, many users of the internet and digital technology make claim to cultural and political aspects of the internet as inherent qualities in the net itself, not recognising that it is mostly a consequence of how companies and users have chosen to engage with such possibilities. Attacking copyright legislation, as Downhill Battle did, is according to Morozov a typical activity for people who argue for “internet freedom”, upholding an ideal that this legislation is against the fundament of how the net is to work (Morozov 2013, p. 101). The argument is that “internet freedom” will eventually lead to human freedom and is therefore an important goal to fight for.

By introducing Morozov’s critique of “internet freedom”, it becomes apparent that the copying-as-resistance framework of sampling that emerged at the turn of the millennium, represented a change to earlier ways of analysing the relationship between technology and artistic praxis. Whilst the sampler was a part of a novel technological development in the 1980s that was analysed through earlier artistic praxes, sampling technology in the early 21st century was part of a larger technological culture. By the turn of the millennium, the internet had turned digital technology into an omnipresent factor in Western culture and had saturated it with social and political meaning. These meanings further established a foundation for analysing musical expressions that came out of this technology, based on the assumptions that social and political factors were inherent in the digital technology itself. In the case of Mashups, I would argue that the earlier interpretive framework for analysing sampling became fused with these new assumptions about digital tools. The result of this was to read Mashups in line with a copying-as-resistance framework, an analytical framework that had lost track of how artists freely interpreted the purpose of the tools.

The sampling praxis as used by both John Oswald and The JAMs provided - even if it did not represent all ways of engaging with sampling - clear examples of an artistic praxis that focused on critiquing established ideals about authorship and authenticity through engaging in musical appropriation. Analysing a work such as

The Grey Album along the same lines, is not so fruitful in my opinion, since there is little to support that such a reading was in reality the artistic goal of Danger Mouse. As John Shiga states: "unfortunately, the copying-as-resistance framework says very little about the *logic* of mash-up culture, that is, the manner in which mash-up remixes evaluate their own activities, distribute status symbol, deal with internal fissures, and valorise certain individual's work" (Shiga 2007, p. 96). In my opinion, what happened was that cultural assumptions about digital technologies as an assumed social and political force absorbed too much space in the analysis of Mashups. As an alternative approach, in the following section I delve into historical examples of sampling praxis that diverge from the discussion about authorship and authenticity. Through analysing such examples, I hope to establish an alternative history of sampling praxis that can help us avoid being caught up in the later interpretive framework of "copying-as-resistance" when analysing Mashups. Central to this alternative praxis is a different way of approaching and conceptualising the idea of sound recording.

3.2.3 Mashing up found objects, diverging from musical appropriation in sampling praxis

In the previous part of this chapter, I have focused upon how sampling praxis, often rightfully, has been analysed as a form of musical appropriation or quotation that centres on a discussion about authorship and authenticity. What all of these analyses have had in common, is that they focus on the act of sampling as re-contextualizing recorded parts of musical works which are informed by High-Fidelity ideals when understanding sound recording. In the next section, I turn our attention towards the fact that sampling praxis does not have to be defined and analysed as a reuse of recorded parts of musical works.

In her critique of quotation-based analysis of sampling practice, Demers points to the fact that many practitioners “deemphasizes the actual provenance of samples in favour of other sonic qualities such as perceived age” (Demers 2010, p. 55). Mark Fisher, writing on modern electronic music, has for instance a good analysis of how the artist Burial samples cracks and scratches from vinyl as a reference to the past. The sampled sound creates a comment upon the whole idea of storage and reproduction of past events, without re-contextualising any musical work at all (Fisher 2014, p. 20). In this instance, Fisher points to aspects in musical aesthetics that enable specific types of intertextual readings. In contrast to literature, musical aesthetics are to a much greater extent dependent upon a range of stylistic elements, including ways of using recording technology. Repeating and reusing pre-existing templates and patterns in style does not need to be intertextual. But if these stylistic elements are played with or used against audience expectations, they can be understood as intertextual (Hatten 1985, p. 70-71). Musical discourse can therefore be seen as urging us to approach concepts of intertextuality in a slightly different way, engaging in analysis where the identity of the musical work takes less space. Thus, media specific sound can be understood as a stylistic element, drawing the listener’s attention towards a specific historical period and even an artistic style of recording.

The use of sampling technology can also allude to all intertextuality by moving from what can be defined as “macro” sampling to the concept of “micro” sampling. According to Paul Harkins, longer sections of music that contain identifiable melodic structures operate on a macro level. But with digital technology, musicians can now zoom in on parts of the sound recording that does not contain any of these recognizable features, hence creating “micro” samples (Harkins 2010). This is a framing of sampling praxis that totally bypasses any concept of recontextualization, since it destroys most of the signifying potential in the sampled sound[38]; very much a process resembling Schaeffer's reduced listening (Schaeffer 2012, p. 13).

Isolated macro samples are often abstract. However, they can sometimes be sounds that are media specific like the crackle and hisses used in Burial´s release[39]. In some instances, these macro samples can even be musical elements like chords, rhythms and melodies, but they appear in such isolation from the original context that it is impossible to recognise its provenance. Thus, the sound is not necessarily abstract, but it cannot be identified as part of a specific musical work[40]. However, the point I want to make in this section, is that it is not necessarily the length of the sample that alerts us to intertextuality in musical works. I will argue that artists using macro samples can sample longer sections from sound recordings without evoking the concept of quotation. An artist can of course use recordings unknown to the listener, but what is just as important is the way in which artists and listeners frame the concept of recorded sound. Instead of defining sound recordings in line with the High-Fidelity traditions as a representation of a performance of a musical work, the sample can be defined in line with other conceptualisations of sound recording. We here arrive at the crucial argument in this chapter: that artistic praxis of sampling is a result of how the artist defines the technology of sound recording. Returning to Sterne, he argued that the High-Fidelity-Ideology is used to stitch together separate pieces of sonic realities (Sterne 2003, p. 219). In the following section, I will focus on

[38] This is very similar to Oswald's work, but as I explained he reintroduces the concept of quotation through identifying the music in paratextual elements.

[39] This is appears on most of his releases, but is probably most audible on the album *Untrue* (2007).

[40] A typical example is the "Amen Break", a drum rhythm from the The Winstons´ *Amen, Brother* (1969), that has been reused and manipulated to such an extent that it is not necessary identifiable as the rhythm form The Winston's track (Harrison 2004)

artistic examples where praxis of sampling is founded on exploiting these different sonic realities as unique and flexible materials for sonic creations.

The example I begin with is especially unique in relation to the development of sampling praxis, as it actually predates the commercial hardware sampler. Here, I am referring to Brian Eno and David Byrne´s album *My Life in the Bush of Ghosts* (1981 Sire/Warner). This album mixed recordings of Arab folksingers, radio announcers, exorcists and elements from non-Western folk music, with funk beats and sounds from contemporary pop (Moorefield 2005, p.59-60).

By the start of the 1990s, this way of incorporating non-Western music into Western pop had become a more or less mundane way to use samplers, as exemplified by bands such as Deep Forest and Transglobal Underground (Feld 2000, p. 271-272; Hesmondhalgh 2000, p.283). In relation to this, *My Life in the Bush of Ghosts* stands out as unique since it is one of those examples that actually predates digital sampling. Eno and Byrne did not use samplers, instead they used analog tape technology, cutting, splicing and creating tape-loops to sync the pre-recorded materials to the rest of the music (Byrne 2012, p. 160). The practice that Eno and Byrne engaged in was therefore neither linked to any established artistic practice nor motivated by the defined functions of commercially available technical tools.

The way Eno and Byrne incorporated recorded material from external sources into their album has shared features with what later became established sampling praxis, but their primary inspiration for this work-method represented something rather different from what we understand as quotation and what later emerges in the debate on authorship and authenticity. All the tracks on the record were based around what Eno and Byrne describe as “found vocals”. Byrne explains their working process as a search for something surprising and unknown. Byrne and Eno´s initial idea for the album came out of their love of field recordings from non-Western musical traditions. They started playing with the idea of creating a recording in line with the existing ethno-musical traditions but creating a "documentation" of an imaginary non-existing civilisation. This first idea was scrapped but the process led them to the concept of the "found vocals", a concept that ended up tying the release together (Byrne 2012, p. 158). As a result of this, the distinction between *My Life in the Bush of Ghosts* and other later quotation-based sampling praxis is that the musical and sonic fragments in Eno and Byrne's work are deliberately enigmatic. The sonic elements that appear on this record might be interpreted as pre-recorded material from the point of view of the listener, but Eno and Byrne's intention was not to invoke a sense of identity behind these sounds (though the sounds and vocals came from records available commercially, the releases were not familiar to a Western audience). Instead of relying on our notion of recorded sound as a stable representative of a known musical work, the recording in question was meant to evoke a more subjective range of associations. If we compare this to the dominant understanding of musical appropriation, the approach found in *My Life in the Bush of Ghosts* relies on a different and more fluid approach to the status of recorded sound.

My Life in the Bush of Ghosts differs from later sampling praxis that is defined by Lacasse´s concept of autosonic quotation. This is also the case in relation to Hip-Hop, which according to Demers, engages in a game of sample identification (Demers 2010, p. 53). But we are not faced with dialectic oppositions, rather they are overlapping practices motivated by diverging aesthetic trajectories. Compared to an established quotation connoisseurship - using samples to create an intertextual connection to another existing musical work - Eno and Byrne's praxis of "found vocals" represents a slight shift in attention towards more fluent aspects of musicality. In his book *How Music Works*, Byrne explains their process by comparing it to earlier traditions in 20th century art where artists used existing objects in their expressions, the most famous example being Duchamp's concept of "readymade".

The difference between Byrne's reuse of sound recordings and the more traditional understanding of "sampling" as quotation, can be explained in the way in which the different approaches take inspiration from art forms outside of music. Lacasse´s analysis of different forms of "quotation" is inspired by concepts from literary theory and text analysis (Lacasse 2000). Byrne, on the other hand, explains his praxis as inspired by concepts from visual and plastic arts. In both instances, it is clear that the interpretations of sampling praxis are established and maintained in part through their connection to theoretical concepts in bordering cultural fields.

Central to Duchamp's work with readymades, was the "de-contextualisation" of objects through re-titling. He wanted to displace the object from its ordinary logical context (Schwarz 2008, p. 125-127). This process is defined as a form of appropriation by some (Rowe 2011). However what marks out Duchamp's use of readymades from the idea of quotes as understood in literary theory, is that the readymade concepts depend upon a transformation of an original mundane object through its journey into the new artwork. This is not an actual transformation, altering the sound or physical appearance of the object/sample as we experienced in Oswald´s work, but a transformational breaking of the external logics we would normally apply to interpret the sample/object. What most scholars have focused upon, is how Duchamp broke down the definition of art by putting mundane objects in its place, in line with the social project of Dada (Goldsmith 1983, p. 198). Whilst a quote can be said to build on the meaning of its original context - referring to an external significance in the new artwork - Duchamp's use of readymades relies on a drastic break with the object's origin. His aim is to engage in a play with the identity of the object. It is also important to acknowledge the historic context where the idea of the ready-made emerged. As part of the Historical Avant-Garde, Duchamp´s use of readymade was part of a strategy to counter the bourgeois ideals of an autonomous institutionalised art. As Peter Bürger points out, the readymades did not become new works of art in line with the bourgeois concept of art, but as avant-garde manifestations (Bürger 1984, p. 52). The resulting interpretation and understanding of the new manifestation, is a result of an enigmatic subjective interpretation of this new appreciation of existing objects. In this way, the idea of readymades can be said to invoke more of the transformative aspects within intertextuality that Genette ascribes to performative music. The readymade is meant to evoke external references, but unlike Genette´s concept of allusion, the purpose of using the readymade is to focus upon how the object in question can take on a new existence.

What really defines Duchamp's use of readymades, is the coincidence of events that leads up to his "meeting" with the object; a rather allusive process that he himself describes as a sort of "rendezvous" (Schwarz 2008, p. 126). Duchamp's *Fountain*[41], his famous piece compromised of a urinal, is not a "quotation" of a piece of plumbing. Compared to the idea of "sampling" and "quotation", Duchamp's urinal comes into the art piece as an object in itself, not as a mere reference to something else. Playing with the borders of art and changing the cultural (and economic) value of an object is at the centre of the artistic strategy of readymade. Quotation in music, as understood by the dominant analytical framework of sampling, on the other hand, is about quoting music within musical works. There is less claim to a radical altering of the cultural status of the object,

[41] Whether Duchamp was actually behind this piece himself, is today disputed (Hustvedt 2019). Something that goes against the "official" story of this piece, is that the original urinal was not a Mott product, hence questioning Duchamp's explanation of the signature (Varnedoe and Gopnik 1990, p. 274-276).

except perhaps between musical styles, but the emphasis is much more upon the relationship between defined entities of musical works.

If we turn our attention back to Byrne and Eno, it is clear that the inspiration from Duchamp's readymade encouraged them to play with the ontological status of sound recording. Their initial idea of making a "documentation" of a non-existing culture plays with a referential notion of sound recording. At first glimpse, approaching the sound recordings as found voices and contextualising them within a new musical setting might come close to "quotation", but the difference lies in how this approach deliberately breaks down any links to an original referential context. Sound recording as documentation as it is defined by High-Fidelity ideologies, is abandoned. Instead the sound recordings are used as a starting point for a range of subjective fictional interpretations by the listener.

My Life in the Bush of Ghosts is full of sounds, speech and melodies which form the material for Eno and Byrne´s work. Our encounter with these sonic elements might raise questions about their origin, but what is at the centre of our experience is their sonic, linguistic and melodic qualities. As I mentioned earlier, the audience will experience this "found object" as pointing back to some external pre-existing material, but the decoding or appreciation of the work is not centred around an act of identification as a "quotation" from a known musical work, but as something else. In a similar way to Oswald´s work, we can argue that *My Life in the Bush of Ghosts* enters into a self-reflexive discussion upon the referential status of recording sound. The difference, however, lies in the fact that *My Life in the Bush of Ghosts* does this through aestheticizing the sonic juxtaposing of unfamiliar sound sources, rather than through a conceptual aesthetics of destroying the referential reading of known musical recording. The further development of this aesthetic approach to sampling praxis that Eno and Byrne exemplify, is something I will discuss in the next section.

3.2.4 Ambient and European club music

The release of *My Life in the Bush of Ghosts* became a major artistic success for Eno and Byrne. In my opinion, the way the album incorporated different sources of sound recordings inspired many later artists in their use of samplers. In this development of sampling praxis, The JAMs, who I previously used as an example of the conceptual approach to sampling as quotation, turned out to take on a central role. At first glance, the story of *1987 (What the Fuck is Going On?)* could seem a minor incident amongst many in the strange story known as "popular culture". But, unlike Oswald´s musical career, the members of The JAMs went on to produce a string of number 1 hit singles under a new name: The KLF. Their more commercial releases continued the iconology of the Illumination Trilogy and their inclination for public spectacle eventually ended up with the burning of a million pounds. What changed significantly though, was the way they engaged in the praxis of sampling. Under the name The KLF, they developed their use of sampling more in the direction of Eno and Byrne´s idea of "found vocals", which became a factor in establishing alternative ways to interpret and use the sampler in popular music. In the years between destroying all copies of *1987 (What the Fuck is Going On)* and the burning of one million pounds, The KLF formed an important part of the emerging Acid House scene in the UK, particularly in the development of a genre called "Ambient House" with the release *Chill Out* (1990).

Compared to its more dance-based "relatives" like House and Acid-House, "Ambient House" was a music to chill out to - more of a sonic dreamscape than rhythmic companion for the dance floor. In this specific environment that emerges in the late 1980s, the sampler was defined with a more open-ended task of blending different sounds. In his book *Generation Ecstasy* (1998), Simon Reynolds launches the term "Sampledelic" (p.364) to explain the impact of samplers on this part of British Club Music as a re-emergence of the experiment done in 60s psychedelic rock where recording technology was used to create out of worldly sonic expressions.

If we look closer into the developments in British Club Music, the nine years that passed between *My Life in the Bush of Ghosts* and the emergence of The KLF saw a steady growth in access to sampling technology. As explained earlier, the technical possibilities and cultural environment had by the late 1980s established the sampler, not as a musical curiosity, but as a norm in many forms of popular music. In this period, a factor that was important for establishing the praxis of sampling, was the praxis of DJing. I argued earlier how the sampling praxis in Hip-Hop could be understood as an extension of how the DJs had cut and mixed beats as a backdrop for rappers (Reynolds 1998, p. 365; Rose 1994, p. 73-74 and Katz 2012, p. 122). The same link between DJing and sampling can also be found within the British club scene and especially in relation to Ambient House. This genre was connected to the emergence of so called "Chill Out Rooms" in clubs. One of the first such "Chill Out Rooms" was the VIP room at the "Land of Oz": Paul Oakenfold´s Acid House night at the London club "Haven" was an important inspiration for the first ambient house projects (Reynolds 1998, p. 167). Alex Peterson and Youth (Martin Glover) recall DJing together with Jimmy Cauty (from the JAMs and soon to be member of The KLF), playing up to five records on top of each other. Playing records in this way could be understood as de-emphasising the provenance of a singular recording and instead focusing on the lush and more enigmatic effect that emerges when different musical recordings becomes juxtaposed.

The attitude to sound that the DJs in the "Chill Out Rooms" represented, can in my opinion help explain the use of sampling we find amongst the emerging "ambient house" artists around 1990. British bands like The Orb and The Future Sound of London created works full of samples from known and unknown sources; the desire being to create complex soundscapes rather than engaging in a conceptual game of quotation. A good example of this use of sampling, is for instance, The Orb´s *Little Fluffy Clouds,* released in 1990. It contained several samples and takeouts from commercially available recordings, amongst them a harmonica from Enio Morricone (*L'uomo Dell'armonica* 1968) and drums from Harry Nilsson (*Jump into the Fire* 1971). But the central elements of the track were a melodic guitar part from Steve Reich's *Electric Counterpoint* performed by Pat Metheny, together with the voice of Rickie Lee Jones talking about her childhood memories of clouds in Arizona (from a rather obscure promo-release of *Flying Cowboys* 1989). Compared to the works of Oswald and The JAMs, there is nothing in the peritexts surrounding the release that points to any political or artistic manifestos explaining The Orb´s artistic practice as a conceptual reuse of pre-recorded music. The samples are not listed on the sleeve note of the recording either[42]. However, most listeners can easily recognise many of the "samples" as segments from previous recordings, even if they are not familiar with the original works. The sonic qualities of the musical elements point in different directions, both regarding "speciality" and recording techniques. The guitar sound of Pat Metheny is transparent, light and spacious, whilst the drums have more of a compressed and saturated character associated with older analog recordings. The voice of Rickie Lee Jones is also subject to repetitions and rapid re-triggering, even used as the material for melodic treatment (the "samples" are used to play a melody as if the voice was a sample of a tonal instrument). The way The ORB used sampling obviously overlaps with how Kvifte defined the second cultural definition of sampling, but the difference lies in how it is framed aesthetically. Whether we as listeners can identify the provenance of the different samples is of little importance to our appreciation of the music. The focus of the artists is in

[42] The Orb did however compensate the artists for the use of their material. Rickie Lee Jones was paid cash, while Steve Riche was a proper gentleman according to Alex Peterson, agreeing on a 20% for all subsequent sales, and asking them to do a remix of one of his tunes (Simpson 2016).

creating complex soundscapes that are achieved through juxtaposing different sonic and melodic elements.

The sample praxis as it appears within Ambient House, demonstrates an approach to the reuse of recorded music and sound very much in line with what we found on *My Life in The Bush of Ghosts*. We can argue that we are still faced with a type of intertextuality of sound, but the important difference lies in the fact that it is not an intertextualization based upon defining recorded sound as a manifestation of musical works. We are not engaging in the conceptual act of musical quotation. We are rather faced with an aesthetic approach where the sound recordings, musical and non-musical, are treated as material for stitching together new sonic soundscapes. The inspiration behind this has clear links to other works by Brian Eno.

The term "Ambient Music" was originally coined by Eno in 1978, to describe atmospheric music that could not be reduced to mere background music. Whilst earlier background music, such as Muzak, was stripped of any types of doubt and uncertainties to keep the listener's mind from wondering, ambient music was to retain exactly such qualities. Eno´s concept of Ambient music was based on an idea of adding stimulus to the environment, and through such a move inducing calm and a space for the listener to think (Eno 1978). His inspiration had historic references to Eric Saties´s concept of "furniture music"[43], but it was also derived

[43] Satie´s concept of furniture music was base an idea of creating music that would be part of the noises of the environment. There is only one known performance of Satie´s furniture music, in his lifetime. Two pieces was composed to be performed in the intermissions of a small stage play, in 1920. The four performers where placed in each corners of the room so the sounds would blend with the noise of the room. But even if the audience was instructed to not pay attention to the music and talk and walk freely around the room, the performance was failed miserably, since the audience sat still in silence during the whole of the performance (Valen 2013, p.17).

from an urge to oppose the pop ideal of catchy short tunes accustomed to people's short attention span. Thus, instead of following the framework of pop music, he created music of long duration with little or no development; music that was as easy to ignore as it was interesting. However, what became important to Ambient House music, was the emphasis Eno´s ideas placed upon sound landscapes. Instead of the traditional way of defining music, as a tightly organised field of sounds presented to the listener, Eno wanted to situate the listener within a larger field of loose-knit sounds. In this way, he wanted to recreate the way in which we would experience a place or sonic landscape. Eno described how he abandoned musical instruments more and more, both electronic and acoustic, working instead with "found sounds" that sometimes even meant incorporating whole existing works into his new songs (Eno 1985).

The importance of Eno´s ideas for Ambient Music is that the listening experience is altered into a more subjective experience of the sounds one hears (Gilbert and Pearson 1999, p. 130-131). Within such an artistic framework, the sample praxis of blending different musical recordings results in a new and very specific aesthetic purpose, that is far removed from the established discussions on authenticity and authorship.

3.3 Returning to the DJ, A "new" Approach to sampling and Mashups

So far in this chapter, I have explained how different sampling praxes evolved in the period from the early 1980s until the early 2000s. This development can be grouped into two different aesthetic approaches. The first - that continued to be the dominant analytical framework for sampling - focused on sampling as musical appropriation or quotation, directing all interpretations of sampling praxis into a discussion about authorship and authenticity. The second one was more focused on the aesthetic experience emerging out of blending different sources of sound recording, both musical and non-musical, into a new soundscape. In this final part of the chapter, I will focus on my underlying aim when discussing sampling praxis: how can the different uses of sampling be explained through different ways of defining sound recording in relation to musical aesthetics? I have already made the point of how the dominant analytical framework for sampling praxis- focusing on appropriation and quotation- shared the same approach to sound recording as High-Fidelity ideology. The question that remains, is to investigate more thoroughly what other conceptions of recorded sounds have nourished the alternative outlets of sampling praxis.

When searching for alternative ways of analysing sampling praxis, I will use the case of Mashup as a primary example. I will attempt to see how the aesthetics of Mashups can be understood differently if we avoid using the High-Fidelity approach to sound recording. As I argued earlier, analysing Mashups in line with the established framework of sampling as musical appropriation and quotation, leads us to interpret that praxis as a protest against copyright legislation. As I concluded, this was a rather unsatisfying explanation. In my opinion, the reason this analysis of Mashups is problematic is related to its foundation on High-Fidelity traditions in sound recording. This link becomes clear if we look at one of David J Gunkel's arguments about these musical expressions. He has gone as far as to state: "that mash-ups manufacture copies from copies" (Gunkel 2008, p. 497). Within such a claim lies a clear dependence on High Fidelity ideals when it comes to the purpose of sound recording. What I want to do in this last part of the chapter, is to reapproach the discussion about Mashups through a conceptualisation of sound recording more in tune with what is found in Ambient House. The way I want to achieve this is to analyse Mashups in the context of DJ-culture and discuss how the concept of sound recording is approached in this environment.

3.3.1 Sound Recordings and the DJ in Club Culture

As I discussed thoroughly in my introductory chapter, throughout the 20th century artists have approached sound recording from many different aesthetic angles. Classical recordings by artists such as Glen Gould and producer John Culshaw, were, as I explained, not meant to be copies of live performances, but rather a use of recording technology to piece together an ideal musical experience. In popular music, this had been the case since the early sixties; in Reggae and Dub music, the record became more important than the live performance. Jonathan Sterne also emphasized that most recordings were in fact not recordings, but rather a piece of music created though technical work in a studio, creating ideal events (Sterne 2003, p. 89). Even agreeing with Sterne's description of recorded music, Gunkel claims that the Mashup is so tied up in toying with the ideas of originality and authenticity that it does not introduce these challenges into our conception of recorded sound (Gunkel 2008, p. 503). These claims by Gunkel have a point; you can value recording technology purely as a conceptual aesthetic as the purpose is to quote other works. However, this can turn out to be very one dimensional and does not acknowledge the way in which recording technology has evolved within the musical culture which developed the genre of Mashups.

I argue that an important factor for understanding Mashups is to incorporate a more flexible understanding of sound recording that emerged within the DJ culture of dance and club music from the 1970s onwards. In some instances, the way DJs have used recordings to entertain audiences – or perform, as we may call it - has similarities to earlier experiments in Western music. As discussed, both John Cage and Pierre Schaeffer utilized recording tools as a means to expand on musical sounds by introducing extra-musical sounds as part of new musical works. But the use of mediating technology and sound recordings as it emerged in club music, represents something different. Pierre Schaeffer made recordings himself for further sonic manipulation, whilst DJs use primarily existing recordings of music. Cage used existing recordings of music, but in his work, they were treated mostly as an element of chance. DJs in club music, as it developed from the sound systems of Jamaica to clubs in the late 1970s, were however focused upon creating a musical experience to fit a dancing audience. The DJs did not approach the existing records as an element of chance, but rather the opposite, as a means to create a particular sonic experience. If we return to Goehr´s account of Cage's work, I argue that we are faced with some of the same differences that exist between his "event" scores and the tradition of improvisation in Jazz (Goehr 2007, p. 262). Jazz musicians whilst improvising, engage in a very different musical activity to those playing freely when the scores ask for it. In the same way, even if experimental artists like Cage used existing recordings as material for new performances, I would argue that the motivation for doing this has little to do with how a DJ approaches the record to be used in a DJ-set.

There was, of course, an element of chance when DJs in the chillout rooms played up to five different records at a time, but they did it with a definite goal: to create a sonic soundscape that could accompany the dreamy atmosphere of the club (Reynolds 1998, p. 167). The DJs made choices about which records to play to maximise the possibilities for reaching a desired result in the combinations of sound and music. Cage, on the other hand, chose records by random and blended them together according to a predefined system. Much of the same opposition towards Cage's chance aesthetics became apparent with more dance orientated DJs in the early 1980s. DJ Frankie Knuckles is, for instance, known for editing tracks together on real-to-real tape recorders, rearranging and combining tracks to make them work better for the dance floor (Brewster and Broughton 2006, p. 316). The unique characteristics of how club-music uses and approaches recorded sound, are in my opinion, important to how we should analyse the aesthetics of Mashups.

With this focus on the DJ, we are back once again to a topic discussed in the previous chapter. Pedro Peixoto Ferreira (2008) makes a compelling case of explaining how club music and experimental Western music are rather different in their approaches to creative potential in sound recording. Club music, as I explained in the chapter about drum machines, established new sonic ideals beyond that of the more traditional acoustic or amplified instruments, basing itself on sounds mediated and created by electronic and digital technology. This was a move that by taking cues from earlier musical genres like Dub, clearly liberated the ideas of musical sounds from earlier concepts of authenticity. This approach to sound as detailed by Ferreira, relates to one of the main topics of this thesis: the changes that occurred in music when sound was severed from its acoustic source and translated, stored and manipulated by the technology of transduction (Sterne 2003, p. 345 see also section 1.1), hence enabling a mediation of sound. In the same way as Schaeffer described recorded sound as creating a form of acousmatic situation as it severed sound from its acoustic source, club music (or EDM as Ferreira calls it) is based upon the same process as it presents its sound to the audience without any reference to any physical treatment of acoustic (or amplified) instruments. The sounds you hear become just "any sounds", attributing all types of sonic perceptions equal meaning (Ferreira 2008, p. 19). Even beyond the purely technological explanations, the fact that club music is a music created for specific social situations, dancing (or Chilling) in clubs, alters our whole conceptualisation of music, thus setting it even further apart from traditions in Western experimental music.

Making music to be used for a specific situation was something Stockhausen deeply opposed. When given the chance to listen to Aphex Twin in 1995, it was the use of repetitive rhythms, or post-African rhythms as he calls it, that he disliked the most. He refuses the idea of dance music, stating that music should not serve any pre-existing demands; this he claims turns music into a whore

(Stockhausen 2004, p. 382). So, when club music embraced these "external demands" in reference to music, they transgressed an aesthetic border that earlier experimental artists like Stockhausen had struggled to uphold. As I pointed out in chapter 2, recorded and mediated sounds in academic electroacoustic music broke with the expectation of a physical counterpart to the sound, as in performers playing instruments (Manning 2013, p. 41-42). Ferreira claims that club music changes this situation since the music is made to dance to. The lack of physical reference in the sound to the act of performance that formed a decisive element of earlier electro acoustic music, is resolved in club music by the physical movement of the audience (Ferreira 2008, p. 20). He therefore claims that the definitive break between acousmatic and acoustic listening is slightly altered within club music, as the link between sound and physical movement becomes re-established by the audience.

It can be argued, therefore, that Club Music reconfigures the ontological status of recorded sound through its focus on the specific situation of listening/dancing. In the same way as Brian Eno and his idea of ambient music connects recorded music to the situation and environment of the listener (Eno 1978; Eno 1985), Ferreira's understanding of club music as existing in relation to a dancing/performing audience, calls for a similar conceptual reorientation. The recorded music does not function as a copy of a previous sonic event or a specific musical work but gains its artistic significance through its meeting with the audience in a specific situation and context. This understanding of recorded sound can be said to weaken the link to the concept of musical works as situated within the ideals of High Fidelity. The actual situation of experiencing music is given more emphasis than the ideal of the musical work as a stabile entity existing outside of this situation.

This exact reorientation in our conceptualisation of musical experience is a development that David Toop also attributes to the emerging club music scene, tracing its roots back to the early disco DJs.

> "Disco mixing, the merging of records by a DJ, denied the musical performance, denied the problems of mixing musical styles or cultural difference, denied the conclusion of a work" (Toop 1995, p. 44).

The whole concept of the DJ is based on the mediation of music, using recorded sound as a primary means to entertain the audience. Of importance to this chapter, is that both within Hip-Hop and Ambient music, the way DJs approached recordings became the inspiration behind how to use the sampler (Reynolds 1998, p. 167 and 365; Rose 1994, p. 73-74 and Katz 2012, p. 122). According to Toop, DJs worked a dancefloor by turning the crowd into a participatory audience; this turns both the audience and the soundtrack into a liquid that could be played. This fact has also inspired Kai Fikentscher to argue that DJs are not only performers, but should be credited with more creative meaning, calling for an understanding of DJs as composers (Fikentscher 2012, p. 84). Such a statement though, points to a rather radical reconfiguration of the established musical understanding. Returning to the three traditional agents of Composer, Notation and Performance, the relationship between these becomes radically altered if we are to reconsider DJing as an act of composing. Such a move would call for a very different understanding of music, framing the concept of musical creativity in a way that would undermine the traditional ideal of a musical work.

In the history of Western music, framing music outside of the concept of musical works is however rather common. If we return to Goehr, her argument is precisely that of the work concept as historical construction. She points to the fact that before this concept emerged within the Romantic era, music was closely associated with the situation in which it was performed. Composers such as Bach and Händel always composed work to fit a certain occasion. This meant that alterations concerning instrumentation and arrangement were common. In addition, the reuse of existing melodies and compositions were not the exception, but rather the norm in musical praxis (Goehr 2007, p. 181). The liquid concept of music as it emerges within DJing and club music has also similar qualities to musical genres that emerged after the Romantic period. Fikentscher argues that DJing shares qualities with composing within orally transmitted music such as Jazz improvisation. This is a view that Fikentscher shares with Paul D. Miller (aka DJ Spooky That Subliminal Kid) (Jordan and Miller 2008, p. 101 and Miller 2004, p. 350). In these orally transmitted traditions, notation has little place, subsequently collapsing the process of performances into the creation of the work.

Making the connection between recorded sound and more orally transmitted music, is also a topic that Chris Cutler discusses. In his opinion, recorded sound negates the importance of notation, instead evoking music in the form of biological memory as it was constituted in the praxis of ritual and folk music. In these instances, the concept of originality is different to how we experience it in classical music. Orally transmitted music does not focus upon the individual, original creator/composer since it is the performance which is considered to be most important. Of course, personal contribution is a part of any performance, but it is then confined to the exceptions defined by traditional forms (Cutler 2004, p. 141). What however is crucial, is which traditional forms the performer actually operates within. Improvisation, as found in Jazz traditions, takes individual freedom far into the creative domain. The same can also be said about DJing.

3.3.2 DJing and the end of the musical work

From my argument in the previous section, we can clearly conclude that the mediation of music as it appears through the praxis of DJing, works as a fluid element in musical praxis. The introduction of ideas taken from oral music traditions such as Jazz and early music, can help us understand how DJs approach recordings. Instead of treating them as stabile and transparent renditions of a musical work in line with the High-Fidelity traditions, the recordings become material for establishing further musical expressions. Such a change is underscored by Lydia Goehr. Her focus on the work concept as a historical construct also draws up its clear limitations of use. Jazz, for instance, works under slightly different musical ideals that are not so much focused upon creating eternal and original works (Goehr 2007. p, 255). However, as I have demonstrated, the dominant approach to sampling praxis has generally been to take the concept of musical work as a given entity and see it as the only way to approach music. To underscore my claim within this chapter that different forms of sampling praxis evolve out of different cultural definitions of recorded sound, I now want to approach the praxis of sampling by means of the DJ's use of sound recordings. By this, I hope to arrive at a better analytical framework for understanding the praxis of Mashups.

The link between the praxis of Mashups and DJing is not difficult to make. It is clear that Mashup evolved as an extension of the remixes DJs made (Demers 2006, p. 78). The most obvious illustration of this is probably *The Adventures of Grandmaster Flash on The Wheels of Steel*, a live DJ-mix by Grandmaster Flash released as a single in 1981 (Shapiro 2002, p. 166). The track is a blend of several different Disco and Funk tunes, cutting between the different recordings[44].

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[44] The label on the record identifies the different tunes as: Chic *Good Times*, Blondie *Rapture*, Queen *Another One Bites the Dust*, Sugarhill Gang *8th Wonder*, Furious 5 *Birthday Party* and Spoonie Gee *Monster Jam*.

Primarily, different parts of the tunes are stacked together in time with only a few overlaying, a praxis that exemplifies that blending different tunes into a new entity was becoming the norm amongst DJs in the early 1980s. The way records are used amongst DJs, often works against the very notion of recordings as a stabile representation of a musical work (Ramstedt 2017, p. 49). Such a statement urges us to include this in our analysis of sampling praxis, especially when considering the explosive development of digital technology.

Commenting on this debate, David Toop returns to the discussion of Oswald´s Plunderphonics, arguing that the whole concept of musical quotation as it has framed the analysis of sampling, has for too long been outdated.

> "Sampling outrages those who believe in the sanctity of authorship and ownership. But, at the opposite extreme, music which attempts to make an exaggerated return to the nineteenth century before Debussy, the huge symphonic expressions of the composer as a single God, at the centre of creation and in control of all his works can only seem ludicrous at a time when computers think faster, clone replications at will and spread information over vast distances in intricate, often unidentifiable webs" (Toop 1995, p. 2613).

The connection between the fluidity introduced by digital technology and the breakdown of our established ideals of musical work, is also a topic Evan Eisenberg discusses. In his book *The Recording Angel* (2005) he discusses the history of recorded music. Originally, it was published in 1987 long before digital media and pier to pier networks changed the structures of the recording industry. For its second edition in 2005, however, two updated "afterwords" were added. In the one originally written for the Italian edition in 1996, he speculates on how digital technology and the loss of thingness in musical recording might bring back some of the spontaneity associated with oral traditions, making the distinctions between truth and falsehood within recording irrelevant (Eisenberg 2005, p. 214).

The point of both Eisenberg and Toop is that the use of mediating technology can actually work against the very notion of the stabile Romantic work concept. If we take a close look into the contemporary praxis of DJing, there are two elements that clearly underscore this notion of change: the music they play and the mediating technology DJs use in their performances.

If we first look at the music DJs play, it is made for the dancefloor with a rhythmic structure and sound that achieves its purpose. We can however argue, that the often minimal composition and arrangements in these tracks makes them "incomplete" until the DJ combines them together with other tracks (Gilbert and Pearson 1999, p. 127). In addition to this, there are clear features in the musical production that allow the DJ to combine different musical pieces with ease. If you, for instance, listen to the beginnings of dance music tracks, especially those within House and Techno, it is a common feature to find only rhythmical elements, maybe just a steady 4/4 kick drum. In general, melodic elements are very sparse at the start. A random example could be Frankie Knuckle´s mix of Hercules and Love Affair´s *Blind* (2008). It starts straight away with the beat, kick, snares and hi-hats for 8 bars before the baseline kicks in and other melodic elements gradually build up. The reason for this is to make it easier for the DJ to blend the track seamlessly into the tune playing beforehand. Stripping away melodic elements in a song makes it easier to avoid any disharmony when mixing it with parts of other tracks, enabling a more seamless blend of different tracks. The end of a track can also be similar, stripping away element after element, making more room for the next track the DJ wants to mix in. Build ups and breakdowns in the middle of the track can also function in the same way, allowing the DJ to cut in and out at different points depending on what parts of the track he finds most suitable for the current state of the dancefloor.

The arrangement of a contemporary club music track is often a result of the fact that the track in question can be sectioned up and blended with other music. Listening to 8 bars of kick drum in the opening of the track is not an aesthetic choice, but a practical element that is included so the track can easily be synched and mixed with other tracks.

The tracks released to be played by a DJ, are in my opinion defined by a lack of borders and internal structure; the track is composed and arranged so that it only comes to its final realisation in a fusion with other tracks played in a DJ-set. There is no set chronology, no definite start or stop that is artistically defined. The track is not a defined musical work but rather a membrane that contains music while still enabling it to merge and interlock with other tracks as part of a DJ performance. This is what allows the DJ, as Toop claims, to turn the tunes into a liquid that can be played.

This liquid approach to music is also in evidence if we turn our attention to the playback devices now being used by DJs. As Reynolds has pointed out, sampling praxis did in some instances evolve as an extension of how the DJ used records (Reynolds 1998, p. 167 and p. 365). In the last 15 years, technical development has gone in the other direction, returning the possibility of the digital manipulation of sound back to the DJ. At the turn of the millennium, the laptop was purposed as a tool for the DJ with the software *Serato Scratch Live*[45]. Primarily, its function was to synch the turntables to digital sound files, letting

[45] This software ware was released in 2004 as a collaboration between the companies Serato and Rane (Serato Web Page, Retrieved 12 April 2019 <https://serato.com/about>)

the DJ use special vinyls with digital codes to control the speed and position of sound files played from the computer. With this development, the DJ could capitalise on the spread of music beyond the physical formats of CD and vinyl and directly use audio files in their DJ-set. Distancing oneself from the physical format, meant the DJ could soon benefit from the vast possibilities of sonic manipulation that have developed with software sampling technology. A key example of this, was Native Instrument's *Traktor,* a software meant for DJing that could be utilised both with Serato control vinyls and USB controllers. The introduction of digital technology meant that DJs could easily loop parts of the tracks, manipulate its speed to fit with other tunes, and easily choose which section of the track to be played (Rietveld 2017, p. 125-126).

Many of the features that came with the software tools for DJs, eventually made their way back into the hardware CD player, turning what was once a standard means of replaying recorded music into an advanced media player/manipulation device. This crucial leap happened with Pioneer's CDJ-2000. It could of course play CDs, but it could also connect to any digital memory format, and access whichever sonic file formats it found. The player was also equipped with a large colour display visualising the sound file you had selected, making it easier to choose your starting point. In addition, you could define loops and automatically track the tempo, and section the file up into bars and beats. Such a process could become rather imprecise if you chose to do it "on the fly"; the players were therefore coupled with a computer software called *Record box,* that would index your tracks in a better way (Pioneer 2016, p 32). It was a sort of "ACIDizing" of them, identifying the tempo more accurately and enabling you to more precisely set the bars and beat for further looping and manipulation.

In this way, the Pioneer *CDJ-2000* returned some of the crucial features of DAWs like *ACID* and *Ableton Live* back into the DJ-tools. In an interview with the makers of *Ableton Live,* they comment upon the number of their users who claimed they actually used this software for DJing and wishing for some added feature that would have made it even more suitable for this purpose (Goldmann 2015, p. 39). This exemplifies how both the tools used for DJing and the contemporary tools for music production use mediating technology as a means to melt down the integrity of the musical work. This ability to mix and manipulate tracks is also something that has developed into a key organising principle for the largest online store for downloading dance music: Beatport*.* Here, you can actually search amongst the music by BPM (beats per minute) and key (F# Minor and so forth….)(se Beatport web page, Retrieved 12 April 2019 < https://www.beatport.com/tracks/all>).

In recent years, this interconnection between digital sampling technology in music production and DJing has moved on one step further. The DJ-software *Traktor* has now introduced a new sound format called *Stems.* This is a format where the tracks are released by the artist in different Stems, a form of multitrack format, where the various parts of the track are separated. Thus, one track actually consists of several tracks which are layered, where drums and different melodic elements can be manipulated independently (Native Instruments 2019b, p. 22). The different parts of the elements of the track can be taken in and out of the mix by the DJ. This introduces an extended possibility for the DJ to define the music mixed together with other music, to suit the dancefloor. With all new digital tools, the act of DJing becomes even more of a creative endeavour, not only playing the right record at the right time, but combining different elements into a live remix (Rietveld 2017, p. 130-131). At this point, DJing becomes more or less identical with the praxis of Mashups. The only difference is that the present-day DJs create mashups "on the fly" - for the specific social situation of dancing. The praxis of blending different tracks then becomes more the modus operandi for DJs; it is clearly not something that is done as a protest against copyright control, as many earlier discussions on this musical praxis centred upon.

3.4 Conclusion

The goal of this chapter was to analyse the different ways in which praxis of sampling has influenced the aesthetics of music. Compared to the previous discussion about drum machines, it is however clear through the artistic examples that I have described, that the samplers did not establish a concrete new sound in the same way as the kick drums of the TR-808 and TR-909. The important aspect of the sampler, however, is that it played an important role in developing new ways for evaluating mediated sound in relation to the aesthetics of music. As I stated in the introduction to this chapter, the sampler has been used for numerous artistic and musical expressions; this makes it difficult to settle upon one satisfactory analysis for the aesthetics of sampling. By exploring a number of artistic examples, I have however argued that the variety of sampling praxis can be explained by the different approaches taken to the concept of recorded sound. The sampler is clearly recording technology repurposed into a musical instrument; the way in which the technology of sound recording is defined and evaluated aesthetically is therefore of great importance to how the sampler is subsequently used and understood.

In this chapter, I have explained that the analysis of sampling praxis has largely focused upon discussions of authorship and authenticity. This is either due to focusing upon the sampler's ability to simulate existing instruments, or the act of appropriating existing musical recording through citation. This established what I called the dominant framework for analysing sampling, an analytical framework that extensively built itself upon the High-Fidelity ideals of sound recording. However, this approach to sampling does not necessarily account for every example of sampling praxis. As I argued, taking this analytical framework as a starting point for discussing later examples of sampling such as Mashups, did not sustain an adequate analysis of this praxis. To suggest a better way of understanding the aesthetics of Mashups, I reapproached sampling praxis by analysing examples that fell outside of the dominant interpretive framework. What I demonstrated, was that many practitioners have used the sampler as a tool to incorporate existing musical recording without engaging in any conceptual aesthetics of quotation or protest against copyright legislation. Neither has the simulation of existing instrumental sound been the focus. Instead, artists were using the recorded sounds and music in order to create new sonic soundscapes, inviting the listeners into a subjective experience of a blend of different sonic sources. This was a praxis that was especially important for the Club Music genre of Ambient House.

To explain and also to elaborate upon this alternative approach to sampling praxis, I looked closely at how the use of the sampler could be understood in relation to the praxis and aesthetics of DJing. Within club music, the praxis of DJing has established a rather unique relation to sound recording. Inspired by the traditions from Jamaican Dub, the sound recordings are not understood as a copy of a musical performance or musical works, they are the actual artistic expressions. As a consequence, the sound recordings are not treated as stabile musical representations but constitute material for further artistic exploitation. In such an environment, manipulating and combining different sound recordings does not constitute a conceptual aesthetics questioning the ideals of authenticity and authorship, but is the prevailing artistic norm.

A key factor in understanding the unique aesthetic approach to sound recording and hence sampling, as found within Club Music, is to acknowledge the focus that it places on the specific situation in which the music is experienced. This makes Club Music different to earlier experiments by Cage and Schaeffer, who used recording technology to create new musical works. Club music is always focused upon creating a shared collective experience of the dance floor and the club environment. The music is confined to a specific setting that adds to the subjective experience of each particular audience. Mostly this has to do with dancing, where the audience can be understood to take on the role of the performer. The DJ thus transgresses established ideals of musical works and authorship to create a sonic environment suited for the situation of the particular audience. In this environment, the praxis of blending existing musical recording is a norm, leading us away from any social and political protest against copyright control as much of the earlier analyses of Mash-Up emphasised.

4. Make some Noise – a critical reflection on hacking and post digital musical approaches

In this chapter, I am going to investigate musical practitioners who build sonic tools in pursuit of their own artistic goals, a praxis I will call: the artistic creation of sonic tools[46]. The aim of this investigation is to discuss how contemporary developments within this artistic praxis are changing our conceptual understanding of music, and thus altering our aesthetical appreciation of musical sounds. In line with my overall research question, I will focus this discussion upon a group of practitioners whom I define as "Music Hackers/Music Makers", who in their artistic praxis use technology that mediates sound to create sonic tools. The challenges that are posed with these types of artistic praxes, become clear if we return to Goehr´s historical account of the work concept and the three agents of composer, score and performer (Goehr 2007:20 and 253). This relies, to a great extent, upon musical instruments as a stable and given entity in realizing the sound of the musical works. Artists who are in search of new musical expressions and turn to designing new sonic tools rather than using existing instruments, therefore break with many of the traditional ideals present in musical praxis.

Even if the artistic praxis of actively designing new sonic tools for realizing new music is clearly at odds with many of the established ideals of musical creation,

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[46] In the Introduction of this dissertation I defined sonic tools as: tools which are used as an artistic means to create sound and music, but differ from other instruments as they do not carry the same cultural connotations. Traditional instruments are designed and culturally defined as being means for artistic musical expressions, while sonic tools enter into this domain without this cultural meaning.

this praxis has been a reoccurring element throughout the history of mediating technology and music. I have already explained how such an approach to musical creativity can give composers and producers further possibilities to explore new sonic aesthetics. In the introduction, I touched upon this topic through the works of Bebe and Louis Barron and emphasized the importance of Russolo's earlier mechanical noise machines. With this in mind, it is apparent that the examples I am about to discuss here, have a much clearer historical dimension compared to the two previous technological examples discussed in this dissertation. To fully understand how the current praxis of artistic design of sonic tools is changing musical aesthetics, a comparison between how artists today engage in this praxis with how it has been approached and analysed previously, needs to take place. My claim, in relation to this comparison, is that our contemporary technological environment is re-establishing the earlier, often marginal praxis of artistic design of sonic tools, into a new and larger cultural environment that in turn frames this praxis differently.

In the chapter 2 and 3, I showed how the proliferation of new technology in the 1980s inspired a great sense of freedom amongst artists. This encouraged them to approach and use the tools in different ways, defining and re-defining their purpose to suit their changing musical ideals. What I demonstrated, was that realizing an artistic idea after 1980 was no longer restricted by the scarce availability of a certain tool. Instead, musical expressions from that time onwards, were increasingly the result of how artists chose to navigate among the growing number of available technologies. Today, this has created a new reality: tools for musical creativity no longer establish a stable backdrop for artistic praxis; rather the continuous presentation of novel opportunities represents a fluid entity that artists have to navigate as part of their creative process. Artists now have the ability to use the tools they want for the purpose they want, and are thus constantly working to change the sonic expression of music. An important factor in establishing this new creative environment, is how society at large defines the use and purpose of technology. Digital technology has been promoted and developed with a great focus upon its flexibility, encouraging the user to develop and modify the technology to serve specific needs. This development has, in my opinion, given artists new inspiration to pursue the development and design of new sonic tools. Whilst I have previously focused on artists redefining the *purpose* and *use* of musical tools, in this chapter I explore examples where artists take the new freedom one step further and design and create their own sonic tools in pursuit of new artistic ideals.

In any historical comparison of the artistic creation of sonic tools, the division between "Noise" and "Music" unavoidably becomes a central part of the discussion. In the opening of my dissertation I defined "noise" as the sound that fell outside what our culture defines as the framework of "music" (Kahn 1999, p. 68). The reason this topic becomes so central to what I am now about to discuss, is that sounds created through the use of new mediating technology, by default, often fall outside of what is culturally defined as music. What historically have been understood as the borders between "noise" and "music", are therefore connected to what tools are used in the creation of music. Demers explains this by pointing out that before the advent of electronic music:

> …the sound of almost any instrument or singing voice would alert listeners within a short amount of time that they were hearing a musical sound and not, say, a sound of nature, chance or a non-artistic machine. The timbres, attack, structures, and syntax of preelectronic music all work together to underscore music´s status as a special type of organized sound that is separated from the sounds of everyday life (Demers 2010:12).

By using known musical instruments, the artistic praxis would automatically be recognized by the listener as music. This underscores the definition of musical instruments that I made in the introduction to this thesis: as tools that bear with them a cultural meaning through their defined purpose in the creation of music.

Musical instruments therefore represent a stabile entity that audiences, composers and performers can relate to; sonic tools, however, lack these connotations. Thus, the development of new commercial tools, both digital software and earlier synthesizers, threw this situation off balance by presenting new and previously unheard musical instruments. The question is, therefore, how firmly this historical dichotomy is able to maintain itself in a present-day society? Today, digital and electronic technology is both omnipresent and at the same time developing and adapting to the point of becoming a fluid backdrop for all cultural expressions. Over time, cultural perceptions change: sonic tools are accepted as part of musical praxis in the same way as traditional instruments; expectations about musical sound adapt as new and previously unheard sounds become more of a norm in music. When I discuss the dichotomy of “noise” and “music” in relation to the current praxis of artistic design of sonic tools, it is therefore important to investigate how current developments have affected and possibly changed our definition of “noise”.

My choice to focus upon Music Hackers and Music Makers, is to emphasize the differences between present day and earlier practitioners in the making of their own sonic tools, and also to gain new entry points into discussions of “noise” vs “music”. What makes these present-day practitioners especially interesting, is that they are strongly influenced by contemporary technological communities who clearly reside outside the recognised musical establishment. This means that the way Music Makers and Music Hackers engage in the praxis of creating new sonic tools, is motivated by different creative ideals to those used by earlier practitioners working from inside the musical establishment. Music Hackers and Music Makers are therefore a good example of a praxis that can challenge the traditional dichotomy between “noise” and “music”.

This chapter begins with a short introduction to define what I consider to be the Music Maker and Music Hacker communities. I thereafter examine the historical context, both in terms of academic music and popular culture, that predates the present-day artists in the creation of their own sonic tools. After drawing a picture of earlier practitioners who artistically engaged in creating new sonic tools, I will return to the Music Hacker and Music Maker communities and articulate how contemporary technological culture may mark them out from earlier practitioners.

In the final part of the chapter, I use my findings to focus upon how the aesthetic ramifications of contemporary technological culture inspires Music Hackers and Music Makers to nourish new artistic ideals. Central to this, will be an explanation of how the contemporary and flexible approach to musical instruments and sonic tools can broaden the horizon for musical aesthetics. To exemplify this, I go into a broader discussion upon how different ways of conceptualizing the artistic design of sonic tools has provided new ways to understand the term "noise".

4.1 The Music-Hacker and Music-Maker Communities

When describing what I would call the "Music Hacker" and "Music Maker" communities, it is important to stress that I am not about to sketch out a new musical genre with shared melodic and stylistic traits. What I find unifies this very diverse group of practitioners, is a specific attitude to producing and making music that bases itself on an in-depth manipulation and design of sonic tools. Today, the praxis of experimenting with new designs for sonic tools exists in many communities of musicians. What, however, makes Music Hackers and Music Makers stand out in relation to the rest of these practitioners, is in my opinion, their motivation behind this praxis. What motivates them is not that their sonic tools are designed and later marketed as a tool to be used within an established musical community, but that it is primarily designed as a realization of a specific singular musical/sonic creation. Furthermore, this shared attitude to musical creativity includes a clear collaborative aspect that often manifests itself in the form of gatherings and workshops: practitioners come together to collaborate on equal terms and across established lines of work-division in musical production. A technician, dancer or clothes designer can share equal roles in making new tools, sometimes leading up to a collaborative performance. What in my opinion defines Music Hackers and Music Makers, is therefore not purely based upon how their music sounds, but is more a result of how they frame their musical activity and creative process.

People who engage in this praxis and meet at these gatherings, originate from a variety of musical backgrounds and different musical genres. Practitioners working both inside and outside of established musical institutions are found to commit to this type of musical activity. The name Music Hackers and Music Makers might not be a term that all involved would embrace as a description of their primary musical praxis. However, the name is a way to loosely couple practitioners who overlap in respect to a shared artistic attitude to creating sonic tools, on my behalf.

What is perhaps the most famous, but not the earliest or only exponent of the Music-Maker/Music Hacker attitude, is an event/organization called Music Hack Day (Music Hack Day web page, Retrieved 13 April 2019 <http://new.musichackday.org/#>). It started with a two-day workshop in London 11th/12th July 2009, organized by Dave Haynes and James Darling. Borrowing its format from other technology workshops and hackathons (I will return to this connection later in this chapter), they invited people from the developer communities and music industries to prototype and create new music tools and apps in just 24 hours (Music Hack Day web page, Retrieved 13 April

2019 <http://musichackday.upf.edu/mhd/2015/?page_id=52>). Locked up in the office of The Guardian newspaper, fuelled with pizza and Red Bull, the results span from hardware percussion machines to dating apps connecting people based upon musical taste. Tim Jonze, who was covering the event for The Guardian, reported that many of the participants happily admitted that they messed around on the project for no other benefit than their own amusement (Jonze 2009). Such a statement from those taking part in the event, points to an important characteristic of the defining collaborative aspect for Music Hackers and Music Makers. The meetings, gatherings and workshops where they get together and experiment with new tools and designs, are not necessarily directed towards creating a finished work (of music); the shared fun and experience of the process often stands out as the main motivation. Some sort of concert or presentation of the workshop results is often included in the meetings/gathering, but this must not be confused with the traditional concert. The work does not necessarily stand on its own feet as a musical expression, but is to primarily be understood more as an endpoint of a creative process that in itself bears the important artistic focus. The process of creating music through new musical tools is the main goal, not necessarily a finished musical work.

Several events which are similar to Music-Hackday have been arranged around the world, both large and well organized as well as smaller spontaneous events. I personally have been following the yearly MusicMakers-workshop at the Berlin based festival CTM (Club Trans Mediale). This is a festival dedicated to experimental electronic music and related arts, including not only performances but also exhibitions, panel discussions, lectures and numerous artistic workshops. Amongst the different events at the festival, is the annual “Hacklab”; described as “a collaborative laboratory” it invites participants from different artistic and technological fields to work together. It is arranged in collaboration with a small organization called MusicMakers, a group dedicated to coordinating such workshops around the world. The first event presumably predated that of

Music Hack Day and was hosted in Brooklyn New York, 22nd of March 2007[47].This first event came to life by collaborating with the web page Etsy and Make Magazine (an important connection I will return to later). Since then, they have held numerous events around the world, but the Hacklab at CTM is the only one to be held annually.

The format of the MusicMakers Hacklab at CTM is an important illustration of the creative ideas behind the workshop. Each annual workshop has two or three workshop leaders and there is an application process for people who want to attend, where artistic aspirations and technical skills are assessed. The participants at the workshops are mostly art-students in relevant fields and practitioners with some sort of expertise in programming or creating their own tools; in other words, this event is not for newbies. At the start of the workshop, which is usually a week long, the attendees present themselves and their artistic work with the aim of forming smaller groups to collaborate on a joint project throughout the week. At the end of the week, there is a presentation of the different projects that have been developed throughout the Hacklab. This presentation includes both an explanation and a technical description of the tool(s) created - describing the aesthetic concept behind the designs - and an artistic staging where the tool is demonstrated. The MusicMakers Hacklab at CTM follows the format of many similar workshops, in its division between the making of sonic tools and a later performance/presentation of these tools (Jo, Parkinson and Tanaka 2013). What makes it stand out is probably its application process for attendees. However, whilst attendance at the workshop is restricted, a series of "input-lectures" throughout the workshop are open to the public, featuring talks with researchers in music and technology who present their artistic work and

[47] According to their Facebook page, Retrieved 13 April 2019 <https://www.facebook.com/pg/musmakers/about/?ref=page_internal>.

technical designs. It is also worth noting that supporting and physically hosting the Hacklab, is the music software firm “Native Instruments”[48].

To provide a more in-depth explanation of the artistic praxis that I associate with Music Makers and Music Hackers, I will focus upon two artists who both have functioned as workshop leaders/facilitators at the MusicMaker Hacklab: The Polish/English artist Ewa Justka and the Mexican art collective Interspecifics. By looking closely at their work, I hope to illustrate the unique and diverse praxis that functions as the defining traits for artists associated with the communities of Music Makers and Music Hackers.

Ewa Justka was one of the facilitators for the CTM MusicMakers Hacklab in 2016[49] Originally from Poland, she moved to London to study piano. She eventually ended up leaving the piano, choosing instead to study computational arts. Trying to explain why she got into making her own sonic tools, she stated that personal problems meant she needed to focus upon something intensely in order to escape a destructive state of mind. Hence, she attended workshops and from there began to learn the complexities of programming music software and designing electronic circuits (Darton-More 2017).

In the years that followed, Justka started to host workshops herself at “Music Hackspace” in London. This is an organization that sums up much of what I consider to be defining traits amongst Music Hackers and Music Makers:

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[48] This is the same company that designed the *Traktor* DJ-software and the *Kontakt* software sampler I described in chapter 3.

[49] See CTM web page, Retrieved 13 April 2019, < https://www.ctm-festival.de/festival2016/calendar/2016/01/29/event/tx_cal_phpicalendar/ctm_2016_musicmakers_hacklab_opening/>.

> "Music Hackspace is a platform for experimenting and interacting with sound and technology. We incorporate diverse methodologies and aim to create an open playground and exchange of ideas and sounds that embraces new and old technologies. Newly available open source platforms, both hardware and software, are granting far wider accessibility to new interactions with music and audio that have not been possible before. It's with these technologies that we base our programme of workshops, artist talks and meetups, and hope to encourage people of all backgrounds and skill levels to create and engage with music in previously unrealized ways." (Retrieved 12 April < http://musichackspace.org/about-us/>)

Most of Justka´s work centres on exploring the sonic potential in different technological material. One concept she has been exploring recently is optoelectronic, where light is transformed into sound; currently she is working on designing a synthesizer built upon this principle (Ilius 2018). Her praxis represents a very broad approach to the use of technology, both building instruments for her own live show and lecturing in hardware hacking at University of The Arts, London College of Communication. But even if she leads courses and workshops, Justka upholds that this is a process of knowledge-exchange; she is not the all knowledgeable teacher telling her students what to do (Lula 2018). In addition to her work with optoelectronics, one of her signature instruments is the "Motherfucker II": a delay effect/noise machine constructed out of two standard delay units that can feed into each other with an additional noise added. As with the optoelectronics, this device also creates sound based upon the material utilized in the tools. In addition to functioning as a delay unit, it can also create its own sounds internally by feeding signals between the two delay units.

Even if artists associated with the Music Makers and Music Hackers communities create instruments for realizing their own artistic ideals, there are of course people who sell their sonic tools so that others can also use them. Ewa Justka sells some of her designs under the name *Optotronics* on the site Etsy (Retrieved 12 April <https://www.etsy.com/no-en/shop/Optotronics?ref=l2-shopheader-name>).

Interspecifics is an artist-collective consisting of Leslie Garcia and Paloma Lopez; Garcia was one of the workshop hosts for the Hacklab at CTM in 2015[50]. Artistically they have much in common with Justka as they both explore the materiality in the sonic tools they create. But Interspecifics has a broader approach to this materiality, exploring the possibilities in living materials like plants and bacteria (CDM 2013) Through different artistic projects, they explore the use of bacteria and plants as a part of a technological system for creating sound. Using different types of sensors, the electronic impulses from organic materials are converted to digital signals that in turn are used to influence the sonic output of their tools. The behaviour of different materials becomes the defining element in their sonic expressions. This work concluded with the development of the Energy Bending Lab, a sonic tool designed as a modular system consisting of different transducers that turns electric currents from microorganisms into sound (Retrieved 12 April <http://interspecifics.cc/work/energy-bending-lab-2014/>).

On their web page, Interspecifics describe themselves as:

> "… a nomadic multispecies collective experimenting in the intersection between art and science. We embrace hybridized praxes among different disciplines and living organisms, open knowledge and precarity as a challenge. Our current lines of research are based in the use of sound to understand the bioelectrical activity of different bacterial consortiums, plants, slime moulds and humans using DIY and custom-made sets of

[50] Se CTM web page, Retrieved 13 April 2019 <https://www.ctm-festival.de/festival2015/calendar/2015/01/23/event/tx_cal_phpicalendar/ctm_2015_musicmakers_hacklab_opening/>

> hardware we call ontological machines". (Retrieved 12 April <http://interspecifics.cc/work/>)

A strategy that Interspecifics uses for developing these sonic tools, is utilizing open workshops. Through connections to a larger community of practitioners, they seek to gain a deeper insight into the tools they are working on.

In sum, I would argue that the work of Justka and Interspecifics underscores what I see as the two most important traits of the Music Hacking and Music Making communities. Firstly, their attitude to music production is based upon an in-depth engagement with constructing and manipulating electronic tools for sonic creations. The tool as an object and its materiality is at the centre of their artistic explorations. This becomes evident not only through their focus upon workshops, but also through their presentations online, where the design principle behind the tools are demonstrated together with sonic documentation. The relation between the sounds and the material creating it, becomes a key feature in their work.

Secondly their praxis is also framed by a focus upon the collective process of creativity. Rather than centring purely on generating a finished musical work, the artistic focus is largely on the creative process where knowledge is shared and the tools are created in a communal setting. Amongst Music Hackers and Music Makers, it is not simply the finished work of the single artist that is in focus, but also the importance of collective music making (Richards 2013, p. 41). This collective approach to creating sonic tools can be understood in direct relation to the focus upon exploring the sonic abilities in different materials. Being part of the process becomes important to appreciating the sound. In relation to this trait, the concept of open software and hardware platforms is of great importance and I will discuss this element in more detail at a later stage.

Obviously, there are other organisations and events who share the same focus upon creating musical tools, such as NIME++ and Music Tech Fest. What makes Music Makers and Music Hackers different to these other events, is that NIME++ and Music Tech Fest operate much more in collaboration with academic organisations and commercial industries. NIME (International Conference for New Interfaces for Musical Expression) takes place mainly as an academic conference co-hosted by Universities and originally started as a workshop at the Conference on Human Factors in Computing Systems (CHI) in 2001 (Retrieved 12 April <http://nime2018.icat.vt.edu/about/>). Music Tech Fest also has a strong link to established institutions. The 2018 edition was hosted by KHT Royal Institute of Technology in Stockholm and the first event was held at Microsoft Research New England (Retrieved 12 April <https://musictechfest.net/musictechifesto/>).

4.2 The legacy from earlier musical experiments

The attitude to artistic praxis and the creation of sonic tools that we find amongst Music Hackers and Music Makers, has in my opinion, many new and unique characteristics. They do, however, also share characteristics with earlier historical tendencies in Western music. Throughout the 20th century, there was an ongoing search for new musical sounds amongst many artists. As part of this pursuit, the construction and development of new sonic tools at the hands of musical practitioners, became a re-emerging praxis. To explain the Music Makers/Music Hackers connection to earlier praxes and through that identify what new developments they represent, I now return to some of the topics that I described in the introductory chapter to this dissertation.

When electronics became available in the early 20th century, it immediately enabled artists to move beyond acoustically produced sounds; mediating technology was used to pave the way for an explosion in artistic possibilities. In this environment, one influence in particular stands out for its huge impact upon Western experimental music; this was the creative circle associated with John Cage. As mentioned earlier, Cage played a central role in developing new ideals for musical aesthetics. In part, his new aesthetic ideals became an inspiration for practitioners who wanted to involve themselves more deeply in the construction of new sonic tools. Thus, in the next section I begin with a detailed examination of the praxis developed in this creative environment, and then move on to look more widely into communities which evolved outside of the field of experimental art.

4.2.1 Cage and his followers

The most important contribution from Cage for musicians wanting to experiment with new sounds, was his emphasis upon all sounds being equally important, a point he promoted in his seminal text *The Future of Music – Credo* (Cage 1991) first published in 1968. Firstly, this approach inspired him along with other practitioners to seek out new sounds for artistic expressions either by introducing unfamiliar but existing sounds into the musical domain, or most importantly, by creating new sounds. Secondly, his career and works centred upon expanding the concepts of musical performance and creation. This included an emphasis upon chance and indeterminacy within musical scores and performances (Kuivila 2004, p. 18) In *Composition as Process*, published in 1958, Cage describes how chance operations can create music as "an object more inhumane than human" (Cage 1961, p. 36-37). His goal was to compose scores that circumscribed a field of musical possibilities out of which an unpredictable stream of unique sounds and actions could emerge. With these reorientations, it became clear that the role of a musical instrument within a musical performance could change, leading to a new and important understanding of what a musical instrument could be (Nyman 1999, p. 20). When chance and indeterminacy became a strategy in the search for new musical sounds, there was no longer any reason for musical instruments to remain as stable entities. Redesigning and reconstructing sonic tools thus became a necessity for realizing such musical ideals, the most famous being probably the prepared piano.

Amongst Cage and his colleagues, we find an environment for new aesthetical developments that both supported and explained the many new creations and appliances of mediating technology within music. Cage himself though, was no technological wiz in the creation of new tools and technology, but his ideas attracted people who were. Working with Cage in the 1950s and 1960s, David Tudor was perhaps the person who was most successful in developing Cage's ideas into new experimental electronic instruments. He started out as a pianist, realizing works of Cage such as the first infamous performance of *4´33*, then moved on to more in-depth technical collaborations with Cage as we see in *Cartridge Music* (1960) and *Variations II* (1961) (Collins 2004, p. 1). Inspired by Cage's alternative approaches to musical sound, Tudor embarked upon a process of acquiring enough knowledge of circuit design to enable him to construct his own electronic instruments.

Tudor's work and experiments can be seen to realise many of Cage's musical ideals concerning new musical sounds and new ways of realising musical works, through the means of mediating technology. Cage's ideas of indeterminacy in performance, which he himself often achieved through event-like scores and process, became a concept woven into the design of sonic tools in the hands of Tudor. These tools could independently produce sounds beyond the control of the performer. By designing complex technological systems often based upon simulating the complexity found in nature, he created situations that quickly spiralled out of control (Gottschalk 2016, p. 12). Through the construction of such electronic circuits, Tudor not only recreated Cage's ideal of indeterminacy, but also worked towards "collapsing the roles of notation and realization, making room for an entirely different kind of music-making and an entirely different kind of musician" (Kuivila 2004, p. 20). He worked especially with creating musical pieces that would "compose themselves" through their constituting material elements. Such an approach to technology was, according to Michael Nyman, a key aspect within the reorientation towards composition as a process that emerges in the experimental musical scene around Cage in the 1960s (Nyman 1999, p. 4). In these circumstances, Tudor relied heavily on bringing together both the circuit design and the material qualities of the sound devices within the space in which the performance took place. But by building a degree of instability and unpredictability into the different custom-made tools, the sonic result would often be beyond the performer's control, or at least outside the performer's knowledge. As he himself explains it: "I don't like to tell the machines what to do. It´s when they do something that I don't know about, and I help it along, then suddenly I know the piece is mine" (Fullemann 1984). In his music, he becomes more of "a collaborator and diplomat within the unstable and unpredictable actions and interactions arising from the confines of his electronic and electro acoustic system" (Kuivila 2004, p. 22).

Many of Tudor's designs centred upon creating different forms of feedback loops - a way of generating sound where the audio output of the electronic circuit is circulated back into the input of the device. The sound is both generated and manipulated within the same circuit (Holmes 2016, p. 235). This process of sound-creation explores how material qualities of the object influences the sound, a topic that became central in in his most famous works: *Rainforest* I-V (1968 to 2009). These works consisted of a variety of objects that were set to vibrate by the use of transducers, in this way functioning like speakers. Different sound sources were fed into the object, either by electronic oscillators or in later versions by tape recordings, and then re-amplified (Driscoll and Rogalsky 2004, p. 18). Depending upon the shape and material of the objects, the original sound would be changed before it was captured again by contact mics connected to the objects.

The very first version of *Rainforest* was created for a performance by the Merce Cunningham Dance Company with the same name. For practical reasons, this first version was a small table top performance using only small objects like wooden boxes, cymbals and other metal objects. The work was then developed throughout the 1970s, especially with *Rainforest IV*. This version was conceived as part of a workshop Tudor held in the summer of 1973. After explaining the basic principles behind the work, Tudor sent out the different participants to collect objects that could be used. However, to Tudor's surprise, rather than returning with small table top objects, they presented objects such as metal bedsprings and wagon wheel rims (Holmes 2016, p. 395-396). This turned the work into a large-scale installation, where the different workshop attendees were controlling the sounds fed into the objects. The audience was free to move around to explore the environment and experience the resonance of sounds of each object in close range.

The different versions of the work *Rainforest* closely illustrate Tudor´s concept of musical composition, designing a sound production system that could be realized in many different forms. Depending upon what sound sources were used and what objects were made to vibrate, the result would vary. Thus, the piece was not confined to a performance in a traditional way but could also take shape as an installation.

Tudor shared many of the same sentiments towards the role of technology in creating music and sound as the Barrons had done some years earlier. They all shared an interest in how technological devices themselves defined the sonic result beyond the control of the composer or performer. It is also evident that the Rainforest works resemble, to a large degree, the present day works of Ewa Justka and Interspecifics in the way they experiment with the sonic properties of materials and electronic devices. An important distinction with Tudor's work, however, is that his praxis is framed by the experimental ideals of the 1960s, linked to John Cage and his focus on indeterminacy. While Interspecifics' explorations into the sonic properties of different objects ends in the creation of a specific tool: the Energy Bending Lab: Tudor´s sonic experiments with different materials resulted in the realizations of several different versions of the musical work: *Rainforest*. Tudor's way of explaining his praxis placed a great deal of emphasis upon the fact that he was aiming at creating musical works that would compose themselves through the technical design of the electronics used.

This difference between Interspecifics' Energy Bending Lab and Tudor´s many realisations of the musical work *Rainforest*, points to a very important aesthetic change between present day and earlier artists. Compared with many later practitioners, the experimental ideologies of the 1960s framed Tudor´s creativity as expanding the established concept of musical works. As I emphasized earlier in this thesis, Cage's ideas of music, even though they were radical, were still framed within the praxis he was apparently trying to change (Goehr 2007, p. 260). Thus, as a result of Cage´s ideals, Tudor´s work, experimental as it was, remained confined within the established Romantic ideals of musical works.

The way Tudor worked to change musical praxis whilst still situated within the same established praxis, becomes even clearer if we look at how he engaged with the three agents of composer, score and performance. Much of the ideological drive in Tudor´s praxis can be defined as striving towards new ways of creating music. However, the way his praxis was understood and explained, was not so much based on defining totally new ideas for musical creation. Instead, his work was explained as fusing the traditional role of the composer, notation and performance, and collapsing these established roles into the circuit design of the sonic tools. In particular, the "score" as a mediator between the creation and the performance/realization, becomes substituted with the circuit/sonic tool. Nicolas Collins uses this approach to explain the works of Tudor: "the circuit – whether built from scratch, a customized commercial device, or store-bought and scrutinized to death – becomes the score (Collins 2004, p. 1). Collins' use of the word "score" to describe how the tools shape the musical result is a very interesting statement. By making these comparisons, Tudor´s way of working becomes framed within a known framework of labour divisions. The question is how much this framing of Tudor´s praxis influences the aesthetical understanding of his work, and if this in turn is significantly different from the artistic praxes that came later. These questions are important since Tudor's approach to the creation of sonic tools continued to influence later practitioners.

Tudor and his contemporaries' focus upon altering the traditional agents for musical creation through designing electronic circuits, was an attitude that was continued in the years to come. Besides being a key collaborator with Cage, an important legacy of Tudor is his influence upon the group "Composers Inside Electronics" in 1973. This group emerged from the workshop creating *Rainforest IV,* describing themselves as "a group of composers/performers dedicated to the composition and live collaborative performance of electronic and electro-acoustic music using both software and circuitry designed and constructed by individual composers" (Composers Inside Electronics web page, Retrieved 12 April 2019 <http://composers-inside-electronics.net/cie/cie/cie_home.html>) The group continued much of the same approach to artistic creativity and music technology as Tudor had in the 1960s, with a very clear focus on his desire to make musical pieces that "compose themselves". With the name and their statement, the practitioners linked to this group aligned their praxis of designing new sonic tools with that of “composition”. Even though it is clear that Tudor’s work transgressed traditional roles in music production, we find both in his statements and amongst his “followers”, a definition that aligns this type of artistic praxis with a traditional concept of music. If creating a sonic tool can be seen as composing, the devices they create would inevitably be labelled as “scores”. [51]

Comparing experimental sonic tools with musical notation can, of course, be criticized for framing this new praxis too closely to traditional musical ideals. However, in my opinion, this comparison can be fruitful in the way that it illustrates and acknowledges the degree of artistic work that goes into the designing and creating of complex sonic tools. A traditional score in the form of notations is obviously very different from a complex electronic or digital sound production device, but what they have in common is that both are material manifestations that act to shape the performance of music. A score tells the performer how to handle the instrument to realize a musical work. Whilst constructing a sonic tool does not directly instruct a performer as to how to handle the instrument in creating a specific work, it creates a set of possibilities through its material design that establishes how the performer can use this device and what sounds can be produced. The designer of such a sonic tool defines what parameters of pitch, volume or timbre the performer can manipulate (not necessarily control), and what actions of striking or pressing buttons must be done to achieve this. In such a way, these electronic devices can

[51] This conceptualization of the musical instrument as the Score was also something Alvin Lucier promoted when forming the Sonic Arts Union in 1966. Amongst the work produced by this group, there were no scores to follow, the score was inherent in the circuitry (Lucier 1998, p. 6). It is also a conceptualization used by practitioners who are active today (Tomás and Kaltenbrunner 2014).

be made to make room for a very specific artistic sonic expression that exists between the limited possibility of interaction and parameters of manipulations.

Michel Waisvisz, who has created many electronic sonic devices, is also amongst those who regard the creation of specific electronic music instruments as equivalent to a compositional process. As Waisvisz puts it: "The way a sound is created and controlled has such an influence on its musical character that one can say that the method of translating the performers' gestures into sound is a part of the compositional method. Composing a piece implies building special instruments to perform it as well" (Krefeld 1990: 28).

4.2.2 Circuit bending and DIY-culture

Even if the comparisons to concepts such as "score" and "composer" can be fruitful in making sense of the in-depth engagement with technology that many practitioners engage in, I also believe these concepts can blind us to the unique characteristics we are faced with. For people working within an already established academic field of contemporary music as Tudor did (Tudor was working at university institutions and was a classically trained pianist), establishing artistic praxis in relation to a recognized concept of music was probably a natural thing. But for practitioners who did not have an affiliation with established cultural institutions and governing musical ideals, framing their praxis of creating sonic tools took on rather different directions.

Parallel to the developments that occurred in the realm of institutionalized contemporary music - now well documented as a part of the history of Western experimental art - there were developments in the artistic design of sonic tools which happened outside the established musical institutions. These developments are mostly associated with the terms "DIY-culture" and "Circuit

Bending". DIY (Do It Yourself) is a very broad term describing a range of different praxes where people build and repair things themselves without relying upon professional expertise (Knobel and Lankshear 2010, p. 5). It can be used to describe anything from tailoring to home carpentry, but it is also used to describe musical practitioners who build tools and gadgets for themselves.

Within the larger umbrella of musical DIY praxes, the more specific term Circuit Bending is most interesting when discussing artists who create their own sonic tools. This term is used to describe the redesign and manipulation of existing music technology and other types of electronic sound production devices. Such an activity would include opening up radios or amplifiers and changing how electricity flows through its circuitry. A favourite amongst Circuit Benders is also tampering with electronic toys that produce sound.

Even if these communities demonstrate much of the same praxes we find amongst Tudor and his colleagues in Composers Inside Electronics, Circuit Bending is a good example of how working outside of established musical institutions influences the way in which their activity is framed. Practitioners of Circuit Bending and DIY-culture put a great deal of emphasis upon their work as a form of amateur expression, a result of reaching into fields of praxis beyond their own expertise. Nicolas Collins, in describing the early DIY-community, places emphasis upon the informal sloppiness of their activity and how they intentionally engaged with technology they did not fully understand (Collins 2009, p. XV). This way of framing their praxis means they do not define their work in line with the established concept of music; that of composers, score and performers. Instead DIY-practitioners often describe themselves as some sort of folk movement. Qubais Reed Ghazala, who is known to be the first person to coin the term "Circuit Bending", compares his praxis to earlier traditions of simple homemade folk instruments. However, where people previously worked with objects they found in nature, like a coconut, we nowadays have the possibility to dig into the vast amounts of electronic devices that our society produces and consumes (Ghazala 2004, p. 100). In the same way as Collins describes the DIY communities, Ghazala upholds Circuit Bending as an activity which can be done by people with little prior education in electronics or music.

Central to Ghazala´s idea of Circuit Bending is once again, the concept of chance. But where Cage and his followers talked about chance in the realization of a musical work, Ghazala places more emphasis on the process of designing sonic tools. Ghazala recalls an incident during his teens in the 1960s: stumbling over a small broken battery-driven amplifier, he notices that it has started to omit a swiping tonal sound on its own. Examining the amplifier, he discovers that short circuiting parts of the electronic flow makes the device omit a range of different sounds (Ghazala 2004, p. 97-98). This puts the praxis of Circuit Bending more in line with the later praxis of Music Makers and Music Hackers as exemplified by Ewa Justka and Interspecifics. Ghazala´s process included opening up sonic devices and then setting new paths with a wire for the electricity to flow. The new connections that result in interesting sounds can be soldered in place. In some cases, it can be enough to touch the circuits with your bare hands and use your own body to change the electric current.

The crucial point, in my opinion, is how Ghazala uses the term "chance" to describe his work process in the creation of sonic tools, rather than in realizing a musical work. A person Circuit Bending a sonic device, is not acting on any predisposed knowledge about what they want to achieve artistically. The whole process is based upon a random method of trial and error where the sonic result of these trials defines how the final modifications will be implemented (Ghazala 2005, p. 4). Circuit Bending, as defined by Ghazala, must therefore not be confused with a deliberate redesign or modification of a sonic tool. It is instead based upon a search for alterations in the circuitry that can produce interesting sound. Ghazala calls the circuit bent devices: “out-of-theory-instruments”: a device that produces music that no longer adheres to human presumptions in theory (Ghazala 2004, p. 99).

Based upon the way in which Ghazala defines the praxis of Circuit Bending, I argue that it represents a different aesthetic motivation to the more intellectual and theoretical explanation we find especially amongst artists inspired by Cage. The unstable and random aspects to be found in a piece like Rainforest by David Tudor, are placed there intentionally by an artist who wants to expand upon the traditional concept of musical works. Ghazala, however, explains his process in the absence of any established musical concept, focusing more upon the shared joy of experiencing the sounds that occur as result of the random process. Thus, Ghazala´s point of departure is “out-of-theory”, where chance is the standard mode of operation; in contrast Cage and Tudor’s originates in a tradition of stabile musical works but adds the elements of chance to develop an alternative aesthetical approach.

The difference between the two approaches I have here described - working to expand upon traditional musical concepts as with the Cage-ian approach and working in an absence of them as in Ghazala’s concept of Circuit Bending - is in my opinion a very important distinction. In the next section of this chapter, I therefore continue a discussion upon these differences but look to how these distinctions manifest themselves in a more contemporary technological and artistic environment.

4.3 Creating sonic tools in the contemporary technological environment

As I stated in the opening of this chapter, my claim is that we are experiencing a re-establishment of earlier praxes in relation to the artistic creation of sonic tools, but in a new context. The broader cultural environment of today, frames this praxis differently. Compared to examples from the past, as illustrated by Tudor and Ghazala, I claim that present day practitioners such as Music Makers and Music Hackers are influenced by a new technological reality that introduces important historic changes to this praxis. This new technological reality becomes apparent if we look once more at my introductory example of the Barrons' work on *Forbidden Planet,* and all that followed both inside and outside academic music. What is evident with these early examples of artists designing sonic tools, is that their work method was largely driven by necessity. Practitioners working in the middle of the 20th century, developed their creative praxis in the absence of an established industry for electronic musical instruments. Of course, at the time the Theremin was available for purchase, but besides that, artists searching for new sounds by means of electronic technology, such as the Barrons and Tudor, had few choices but to build their own sonic tools. Even if institutions gradually built several studios for experimenting with electronic sounds, these were ill-suited for the live performance format that many artists in the 1960s wanted to work with (Nyman 1999, p. 89). Their active engagement in creating sonic tools was at that time not so much a work method chosen amongst other possible trajectories, but rather the only possibility available if artists wanted to explore new electronic sounds.

When Moog and Bouchla started to produce their synths in the mid-1960s (Pinch and Trocco 2002, p. 41) a developing industry for synthesizers gradually started to make its mark on the music scene. But even so, the electronic instruments that were for sale, were so expensive that only the richest rock stars could afford them

(Collins 2009, p. XV)[52]. Thus, making your own sonic tools continued to be the only option for many. Even in the late 1970s, the British band Joy Division, built their first synth themselves, simply because they could not afford to buy one of the shelves (*Synth Britannia* 2009, 27:00 min). Building your own sonic tools and "Circuit Bending" was therefore popular due to the fact that existing music technology was out of reach due to the high cost.

A decisive change happened in the early 1980s when technology gradually got cheaper. With this increasing availability in technology, the relationship between artists and tools also developed. One of my findings from the previous two chapters, was that the increasing access to technology of both drum machines and samplers, encouraged new ways of using technology that was not always foreseen by the manufacturer. Thebergé explains how many new electronic tools for music production were manufactured and sold with the sole purpose of replacing existing and more traditional instruments (1999). However, artists using such novel tools quickly found new uses for such products, and thus established new musical ideals. As a result, manufacturers had to devise new products that incorporated these developing creative ideals, forcing the music tech industry into a commercial race to keep on top of the new musical trends.

Whilst Holmes points out that the biggest problem with synthesizers in the 1960s and 1970s was that they were very expensive and quickly become outdated (2016, p. 396), this dynamic turned out to be a creative blessing in the 1980s. The race to keep ahead of evolving trends created a tail of outdated and cheap second-hand tools that lowered the economic threshold for musical experimentation. As I

[52] Academic institutions could also invest in such equipment, but it just repeated the situation that Kahn describes, that the means for musical production often ended being controlled by a rather conservative established elite (Kahn 1999, p. 104-105).

showed in the two previous chapters, this enabled artists to repurpose these tools to suit new aesthetic ideals.

The current motivation amongst artists today to create their own sonic tools, is in my opinion not driven by the lack of material possibilities as was the case with many earlier practitioners, but rather the opposite. Today, it is the abundance of technology that drives artists to seek out new freedom in the use and repurposing of tools. The in-depth exploration of aesthetic possibilities that I have explained both with sampling technology and drum machines, shows that the artistic results in such instances are often not defined only by *which* tools the artist chooses to use, but primarily by *how* they choose to use them. A logical conclusion of this artistic emphasis upon the freedom of choice in relation to technology, is that practitioners can also choose to design or redesign their sonic tools on a material and functional level. The large backdrop of technical possibilities now presenting itself to artists, creates a new relationship between the musicians and their tools.

Whilst earlier practitioners such as Tudor mostly approached the design and creation of electronic sonic tools out of necessity, I will demonstrate in the next section of this chapter how this same praxis today can be identified by two new aesthetic trajectories. The first and often most striking of these new trajectories is experienced when artists, by redesigning existing tools, deliberately choose to work against the use and established ideals intended by the commercial manufacturer of the sonic tools. The artists here are no longer working in a material and technological vacuum, but responding directly to the ideologies they identify within the present technological reality. The second aesthetic trajectory emerges where artists design new sonic tools not to create a dichotomy against the ideology of commercial music technology, but instead treat the technological backdrop as a fluid basis for all possible artistic creations. In these instances, the aesthetic emphasis is on the material aspects of technology and less on its cultural significance.

4.3.1 Cracked media – a tactical approach

The first aesthetic trajectory that we find in present-day artistic design of sonic tools, that of practitioners working against the established musical ideologies of commercial manufacturers, is the main topic in Caleb Kelly´s book "Cracked Media - the Sound of Malfunction". Here, Kelly digs deep into the field of experimental music and media arts that engage in the redesign and misuse of different technological devices. He focuses upon how much of media art and music actually emerges from what we can identify as "misuse" of sound production tools. He describes artistic praxes that span from just tampering with musical instruments and sound devices, all the way to totally destroying the contraption in question.

> "Cracked media are simply redirected electronics. The producers who exploit these redirected electronics take the tools of playback and redirect them to transform and create sounds for unique and/or indeterminate outcomes. These often commonplace or everyday technologies become performance tools that extend the sound field and modes of sound performance" (Kelly 2009, p. 286).

Many of the examples he draws upon, come from artists who manipulate consumer playback devices, as seen in Yasunao Tone´s and Oval´s use of sounds from skipping CD players. In the mid-1980s, Tone started to experiment by damaging and physically manipulating CDs in order to get the player to "skip" and "stutter", creating random pieces from commercial CD-recordings (Marclay and Tone 2004, p. 342 73; Obrist 2006, p. 73). Oval used the same type of CD-skipping, but arranged and processed the sound using sampling technology. These sounds became the foundation for their album *Wohnton* (Ata Tak/1993).

The example of using CD-players to create new music, places Kelly's concept of Cracked Media in line with my definition as outlined in my introduction: as using sonic tools. I there described the sonic tool as being used by the artist as the primary means to create music, but in contrast to traditional instruments, they were not designed or culturally ascribed with such a purpose. The praxis Kelly focuses upon, also shares many similarities with the praxis of Circuit Bending. The similarity is that they both take the increasing saturation of technology as the backdrop for redesigning and creating sonic tools. The tools that the artists redesign and even destroy, are a part of the material context of society. With the increase of outdated electronic and digital tools from the 1980s onwards, there emerged new possibilities for artists wanting to experiment with Circuit Bending[53]. Ghazala explains that the process of Circuit Bending turns the circuitry of everyday electronic devices into an immediate canvas upon which artists work to create new sounds (Ghazala 2004, p. 100). Kelly explains Cracked Media as redirecting everyday technology into tools for sound performances (Kelly 2009, p. 286). An interesting aspect that makes Ghazala´s concept special in this relation, is, as I have pointed out, that artists do not need previous knowledge of how to create sonic tools from scratch. Using the existing electronic devices as a canvas, practitioners can develop their own sonic tools through chance experiments. In this process, the destruction of the object also plays a central role for Ghazala. He calls the creations: "living instruments". The "bent" device will, due to its manipulation, go into a state of material decay, resulting in changing sonic characteristics until it suddenly stops working all together (Ghazala 2004,

[53] Electronic toys that were available at the turn of the 1980s became a firm favourite amongst Circuit Benders. One particular favourite was the Texas Instruments *Speak and Spell* series (first released in 1978) and is according to Ghazala the most bent device in the world (Ghazala 2005, p. 208).

p. 101). Through this process the “bent” instrument gets a sort of lifespan, from its creation, through its decay, to its final “death”.

There is, however, a critical difference between how Ghazala and Kelly approach technological materials in our society. While Ghazala emphasises our technological environment as an immanent canvas, I would argue that Kelly places a larger conceptual focus upon the transformative process of technology used. Parts of Kelly´s aesthetic understanding of “cracked media” comes out of the dichotomy between the intentional use of the device and the subsequent artistic result. For Kelly, the tools that artists transform, are not to be understood as neutral, but as having an inherent meaning that becomes a part of the artistic result as a whole. For Ghazala, on the other hand, the original intended use of the object seems to play little or no role in how we evaluate the result. Circuit Bending is more focused upon the play with the unforeseen possibilities of sound creation, whilst Kelly´s analysis of Cracked Media includes a partial critique of the technological backdrop it manipulates.

This focus that Kelly places on the transformative aspect of redesigning sound production devices, drives him to define this artistic praxis as a “tactic” existing outside of the “correct” means of creation. “Tactics”, in opposition to “strategies”, rely on actions carried out by opportunity, blow by blow. “Strategies”, on the other hand, derive from a calculation of power relationships, carried out with a centre and autonomy (Kelly 2009, p, 287). These are concepts which Kelly borrows from de Certeau´s book *The Practice of Everyday Life*. Here de Certeau focuses upon tactics as a “way to make do”, an approach to make life a little better, not create revolutions or overthrow the powers of strategies (1984, p. 35-37). If we look at Tone´s manipulation of CDs by scratching the surface and sticking parts of tape on it, we see an illustration of this tactical approach to working with sonic tools. These added manipulations represent a tactical “misuse” of technology, since they do not fundamentally change the tool, but make it produce a result that is rather the opposite of what was originally intended by the manufacturer.

The tactical approach to redesigning and even destroying sonic tools and instruments, embodies a significant part of the historical praxis of artists engaged with redesigning and creating sound technology. Such an approach, of course, includes Circuit Bending as Ghazala defines it, since it is based upon working intuitively through trial and error, dismissing most technical knowledge in the process. However, if we return to the artists I used to exemplify the Music Hacker and Music Maker communities, the work and tools they create are not based on a such a tactical manipulation and repurposing of existing technology. Both Ewa Justka and Interspecifics are creating sonic tools from the ground up. Of course, they are using ready-made circuitry, but these are treated as components in a larger technological system, far removed from how Yasunao Tone and Oval tampered with consumer electronics to make cd skipping-sounds. It is therefore clear that the artistic praxis of Ewa Justka and Interspecifics represents a different trajectory in responding to our technological environment, and frames their creative praxis differently from the tactical approach found in both Kelly´s Cracked Media and Ghazala´s Circuit Bending. In my opinion, Music Makers and Music Hackers represent a new second approach to creating sonic tools, where technology does not come with an inherent purpose, but is a fluent and flexible backdrop for positive artistic creation.

4.3.2 The Post Digital - a strategic approach

To understand the shift that occurred between the two different aesthetical trajectories, firstly the concept of tactics found in Cracked Media and secondly the aesthetic trajectory of Music Hackers and Music Makers, we have to focus upon how the conceptualization of technology has changed in the last 20 years. Due to the growing digitalization of our society from the late 1980s and the 1990s, the power relation between users and producers of technology has undergone significant changes. In my opinion, this reveals itself through new types of tools developed along digital principles, empowering the artists themselves to define the purpose of technology. Artists take more and more control over their technology, establishing their own norms of use. As a result, the "tactics" Kelly identified amongst artists, was substituted with a more "strategic" approach.

A good starting point to explain this development, is the writings of experimental musician Kim Cascone. In his seminal article *The Aesthetics of Failure* (Cascone 2002), he argued that the proliferation of digital technology created a situation where technology could no longer be understood as a passive conveyer of musical works. As an explanation for this artistic reorientation, he used the concept of "post digital", a term originally coined by Negroponte who famously argued that the digital revolution was over (Negroponte 1998). Negroponte´s claim was not supposed to mean that digital technology no longer played a role in our contemporary society, but rather that it had lost its revolutionary allure. Digital technology no longer represented something different or new but had become so omnipresent that it had reduced itself to the mundane backdrop for all cultural expressions.

Cascone´s concept of the post digital is a sentiment shared by others, for example David Berry (2014, p. 2). What however is unique to Cascone, is how he links this concept to a change in the way artists used mediating technology. Due to the post digital condition, Cascone claimed artists were forced to engage with the technology on a new and deeper level. He stated: "that medium is no longer the message; rather, specific tools themselves have become the message" (Cascone 2002, p. 12). What he described was an artistic interest in the sound emerging from the digital tools themselves. The clicks and glitches that came as a "by-product” when digital information was turned into sounds, became the focal point of artistic expressions. Examples of this can be aliasing noises, glitches in sound files or just the noise floor of the computer itself. These types of digital sounds have very distinct characteristics; they are extremely crisp and clear compared to sounds that were created as a by-product of previous analog equipment.

The interest in these sounds generated by digital tools, formed the basis for a musical genre of its own, known as “Glitch Music”. This was a musical genre that extensively explored digital technology, not as a means to convey other sounds as described in the example with the samplers, but rather how the digital technology sounded in itself (I will return to this musical genre in the second part of this chapter).

In making his case about post digital music, Cascone interestingly used many of the same artistic examples as Kelly did when describing Cracked Media. They both use the work of Oval and Yasunao Tone to illustrate artists who utilize technology in new and un-intended ways. There is, of course, a degree of overlap between the different artistic trajectories that the two writers describe, but where Kelly can be seen to place emphasis on the dichotomy between the intended use of technology and the eventual sonic result, Cascone leaves this dichotomy in the background. Instead, Cascone focuses more on working “beyond” any established ideals of how digital sonic tools are to be used. When he claims that the “tools are the message” (Cascone 2002, p. 12), he emphasises that experimenting with the material aspects of the mediating technology is the most interesting artistic approach. This approach does away with any ideals of using mediating technology as merely a conveyor of artistic content. Subsequently, any such ideals imposed on the tools by manufacturers and designers, are of little concern for artists. Rather, artists approach the technology with an open and explorative mindset, unaffected by any ideals of a right or wrong way to use it. In my opinion, this change played a crucial role for many of the practitioners who today make their own sonic tools.

The post digital aesthetics that Cascone defines, are very close to the artistic praxes of Justka and Interspecifics, such as I explained earlier. Their works are, as mentioned, largely based upon exploring the different materiality of sonic tools. Justka´s Motherfucker II is based upon exploring the possibilities in the delay units sending sound between each other; Interspecifics explore the sonic possibilities in electrical pulses from plants and other living organisms. As Cascone argues, the mediating technology is not used to convey an artistic piece, it is the sound of the digital and electronic tools that becomes the aesthetic focus. In the case of Justka and Interspecifics, it is the actual design of the tools themselves and in turn the materiality that is explored in sonic terms.

4.3.3. The new flexible and digital tools

A central part of Cascone´s claim about post digital aesthetics, was as I explained, rooted in a new artistic interest in the tools themselves. This was a development that he connected to the emergence of a new type of digital tool for musical creativity. These tools brought with them a new complexity and flexibility that transgressed many of the static ideals previously established by commercial producers of music technology. With this change, a new centre of autonomy emerged giving rise to more strategic approaches in the artistic creation of sonic tools. Returning to de Certeau, he explains that “strategies” differ from “tactics” in the way they are based upon the production of knowledge, hence constituting their own independent fields (1984, p. 36). Strategies establish a central control over the development, whilst tactics are about merely altering and manipulating the existing tool. A crucial aspect with these new tools, is that artists are empowered through knowledge, taking greater control in shaping the functions of the tools. What both I and Cascone see as exemplifying this new approach (Cascone 2002, p. 12), are computer programs such as Max/MSP, and SuperCollider.

Compared to many earlier tools for musical production, Max/MSP and SuperCollider represent a radically new approach, since they are designed solely to enable the users themselves to design new functionalities which they find interesting. With these computer programs, the "tactic" approach we find within both Ghazala's idea of Circuit Bending and Kelly´s account of Cracked Media, have in my opinion been substituted with a new strategic ideal. The principle behind these new programs is based upon the fact that you do not have to bypass any defined purpose of the tool to get them to produce new and interesting results. These programs are neither designed to function with an inherent "correct" way of use, nor to work in line with a specific musical ideal; rather, they are designed as an empty canvas for artistic praxis (Fell 2013). Thus, instead of artists repurposing technology to experiment with new electronic sounds, this group of digital tools are designed to let the artist take control over the design process and construct their own tools from scratch.

The way Max/MSP and SuperCollider are designed as open and flexible tools, underscores a unique aspect of such post digital tools. Whilst I have argued that Circuit Bending also treats technology as an open canvas for artistic exploration (Ghazala 2004:100), post digital tools approach this "openness" from a different angle. Ghazala calls for a tactical approach to artists' experiments through trial and error; the use of Max/MSP and SuperCollider calls for a more strategic approach, applying and developing knowledge to take control over the software.

In the year 2000, Cascone claimed that academics had been slow to realise the changes that occurred with programs like Max/MSP (Cascone 2002, p. 12). Some time explaining how these programs work is therefore justified. In this way, I can illustrate how such a program differs from more traditional tools for musical creation, whilst also providing practical examples of the difference between tactics and strategy. In addition, I have personal experience of using Max/MSP and SuperCollider, hence a firm reason to focus upon these programs, rather than other examples of similar software available.

In my chapter about sampling technology, I touched upon a group of digital software programs designed for music production called DAWs (Digital Audio Workstations). As I then discussed, these programs are based upon a "tool metaphor", an overall concept of re-representing known processes of music production into the program's digital workflow (Tresch and Doland 2013, p. 279-280; Puckette 2002, p. 31). We often find that these DAWs are designed around traditional technological work-methods found in multitrack recording studios, or established synthesizer sound architecture, but programs such as Max/MSP and SuperCollider are very different (Toop 2004, p. 246). First and foremost, they are developing-environments that have more in common with computer programming than traditional studio work. When opening the program, you are met by a more or less empty screen. Max/MSP is designed in part as an object-oriented programming environment that presents you with a variety of objects that can be added to your workspace[54]. These objects can execute different actions: manipulate digital information, output sound and other media, or just do mathematical calculations (see Fig. 8). These objects can both receive signals and output results (Blum 2007, p. 21 and p. 24). The easiest way to explain this program is the way it enables users to build systems by connecting objects by

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[54]An object-oriented programming language is based on manipulating encapsulated objects whose internal codes are hidden from the user (Pierce, 2002, p. 226). Though I would claim that this gets close to describing Max/MSP, there are disagreements concerning the program's lack of many of the features common to other object-oriented programing languages (Puckette 2002, p. 35).

wires on the screen: some wires will direct the sound paths, whilst others will transmit signals like numbers and written messages to control the different objects[55].

SuperCollider differs from Max/MSP by being a more traditional programming language; the user builds systems through typing commands, creating a computer program in a more traditional sense. It is made up very similarly to C++, but with specific objects for creating sound (Zanos 2011, p. 127-128). Both programs demand a greater technical skill from users, but the reward is that you can ensure the sound producing devices function in the way you want them to. You do not have to modify existing devices by going beyond the defined purpose of a tool; you are instead presented with an open digital platform that empowers the artist to create sonic tools and define their specific function themselves.

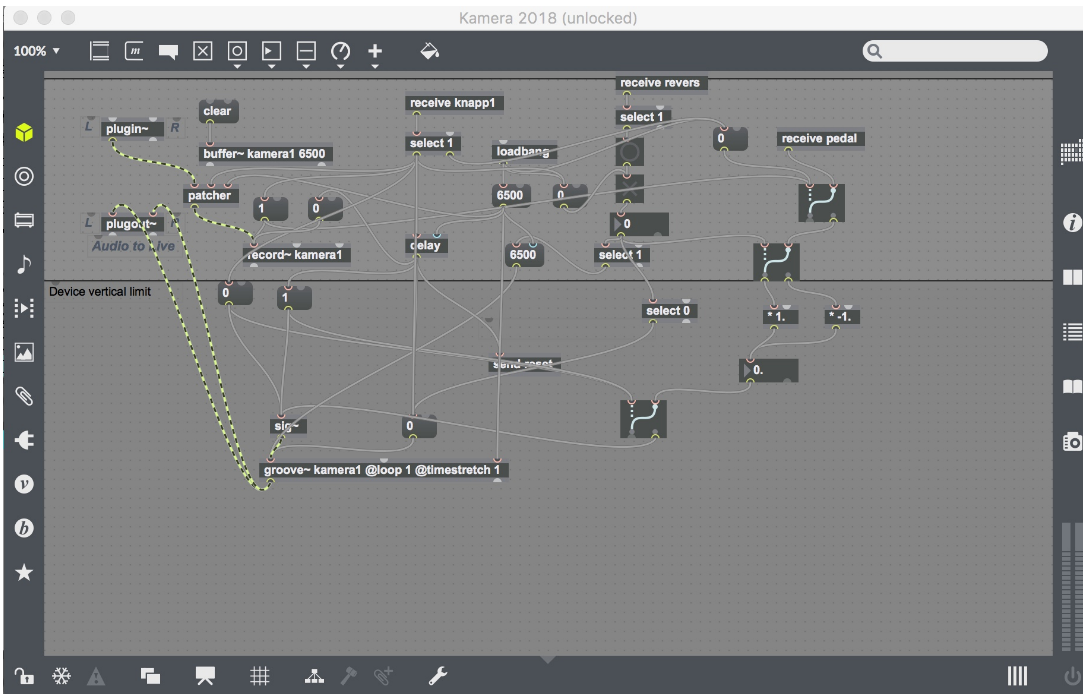

Fig. (8) This is the editing window from Max/MSP, showing a rather simple loop sampler. The grey lines are the paths of messages between the object (the dark grey boxes) while the dotted green lines shows the paths of the sound.

[55] For a more in-depth explanation of Max/MSP see d´Escrivan 2011, p. 156-159.

An interesting aspect associated with the sonic expression coming out of these open-ended software platforms, is that you can produce many of the same sonic effects that are achieved by tampering with mundane consumer playback devices. As a result, the sound produced from such software is also crucial for the musical genre known as Glitch (Vanhanen 2003, p. 47). By utilizing Max/MSP or SuperCollider, you can easily make a playback device that generates skips and glitches equivalent to those achieved through manipulating cd players. With similar ease, you can also make different feed-back loops that totally transform the original recording. But even if tools created by Max/MSP and SuperCollider enable similar sonic results as other approaches to sonic tools, the use of such software represents a unique aesthetic approach for the artist to engage in the design of their own sonic tools. Describing the new creative approaches that emerge with programs like Max/MSP and SuperCollider, musician Mark Fell states: “we can redefine technology, not as a tool subservient to creativity or an obstacle to it, but as part of a wider context within which creative activity happens” (Fell 2013). The use of knowledge to gain control over the tools, represents a deliberate strategy. Such an approach does away with earlier tactical approaches, subsequently making the artist depart from the aesthetics of misuse that appears within the dichotomy of working in line with or against the tools’ intended functionalities. The artists are no longer destroying or manipulating consumer technology as Yasunao Tone did, by scratching and manipulating the surface of compact discs. The artists are rather themselves the centre of autonomy in creating the sonic tool.

The view on technology that is presented in Mark Fell´s understanding of Max/MSP, echoes in part the attitudes found amongst many of the earlier experimental musicians. Nicolas Collins, in an introduction to David Tudor´s work, advocates for a more open view towards technology that can be understood as a definite “strategy”. He points to the fact that we often have a very dualistic vision of our technological future. Either we view technology as a utopian seamless device that makes our life easier (like the iPod future), or a dystopian entity, decaying and leaving us at its mercy. But in Collins´ view there is a third vision: “one in which we accept the machine as a collaborator, rejoicing in its inexplicable intransigence and, like Michelangelo finding the figure in the marble, pause to listen to the composer inside the electronics” (Collins 2004, p. 1). This third way of approaching tools erases some of the “tactics” of misuse, instead framing the relationship between the artist and the technology as an equal partnership. Such an approach thus supports a trajectory where artists are empowered in their use of technology, engaging in a more equal relationship, rather than embattled in a struggle with the tools.

This comparison between the artistic possibilities with Max/MSP and Collins´ description of Tudor´s work, might point to similarities between post digital aesthetics and musical ideals put forward by earlier practitioners. A program like Max/MSP does of course enable much of the same musical practice as found in earlier experimental music. As with Waisvisz and Tudor´s praxis of creating a sonic tool that functioned as a replacement for the musical score, similar creative approaches are also possible with Max/MSP (Krefeld 1990: 28 and Collins 2004:1). This is, for example, advocated by the Japanese artist Atau Tanaka: “the max patch is at once the score of the piece as it is part of the instrument definition” (Tanaka 2000:298). In a similar vein to earlier practitioners, this points to the re-configuration of the musical paradigm: the traditional roles of score, instruments, performer and audience. However, there are aspects that make the post digital approach different to previous strategic experiments in the artistic design of sonic tools. Whilst the historical approach to the artistic design of sonic tools developed out of a friction within established musical ideals, the open approach to sonic tools that we experience today with software like Max/MSP, is developing through impulses from outside of the musical domain. These differences form a central argument of this chapter.

Returning once more to the examples of Ewa Justka and Interspecifics provides an illustrative example of the differences between earlier and present-day practitioners. The attention many present-day artists pay towards experimenting with objects of technology and focusing upon the actual tools that create sound, is, as I pointed out earlier, a departure from the traditions that Tudor represented. He focused on creating tools that would create indeterminate musical works. Ewa Justka and Interspecifics have a rather different goal. To understand this slight, but artistically very important difference between earlier praxes and present-day Music Makers and Music Hackers, I will now look into the technological communities that have inspired present day practitioners.

4.4 The strategies of Music Makers and Music Hackers

Within the communities of Music Makers and Music Hackers, we can identify many shared praxes with earlier artists who engaged in constructing their own sonic tools. However, it is also evident that these new communities are infused with very different ideals of creativity. The way in which these communities brand themselves as "hackers" and "makers" are obvious clues to these connections. Before the first music-hacker gatherings emerged, computer hackers had for years met up to collaborate on new software and games. In addition, the concept of "makers" has been emerging within many fields of praxis for the last 20 years. Thus, looking into the cultural and ideological attitudes that have been a part of the hacker and maker communities, provides important guidance in further analysis of the praxis of Music Makers and Music Hackers.

4.4.1 Hacking

To understand the significance of how Music Makers and Music Hackers approach technology in their creative praxis, it is important to realise the real implications of the term “hacking”. Hacking not only describes a practical format of working but also implies a specific ethos when it comes to the distribution of power and knowledge. Hacking is commonly used to describe the manipulation and changing of computer codes and programs, but underpinning this praxis is a specific ideological approach to technology. This ideology builds upon the notion that computer programs and technology are something that undergo constant development. A digital system that does not work is not in need of fixing; it has to be improved. Unlike when a car breaks down and you replace the relevant parts, Hackers go into a system to write new and improved codes rather than “repair” them. This is the only way to get the system to function again. Additionally, this praxis underscores the importance in developing technology further, rather than just “making it work”. Hackers are people driven by an urge to open up these systems, explore them, understand the notion of how the system operates, then use the knowledge to generate further improvements (Levy 1994, p. 32). Crucial to this approach is the idea of sharing knowledge and focusing on the task of improving technology as a communal endeavour. When working on a program, you should share the codes so others can read it and suggest better ways to resolve that task. Continuing this process, the program ends up as a collaboration between several individuals. The social gatherings and workshops then function as a vital part in keeping such a process alive.

In the popular press, the term “hacking” is today associated with criminal activity. Of course, many commercial companies would claim that tampering with their software codes is considered a breach of copyright, but hacking ideology predates all these concepts[56]. According to Levy, innovators in the field in the infancy of computer technology, were inspired by the hacker ideologies.

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[56] The license you agree to when buying most software today defines the codes in the program as copyrighted material, you are not allowed to look at the codes and most certainly not to change any of it.

The hacker mentality is clearly linked to the very nature of digital technology and its dependence on software to get the work done. Digital software bought off the shelf is rather like a traditional tool, fulfilling its purpose for you as a user. But behind the surface of every digital tool is the programming language, a set of codes used to make the computer do whatever you want it to. By nature, digital technology has this deeper level of interaction that can be accessed by its user; a level that always lets you define its purpose. In the infancy of computer technology, users had to write their own programs to make the computer do the calculations and operations they wanted. This level of control, fundamental in the code, is the prize most hackers seek out. The shared immateriality of these codes makes them easy to manipulate by anyone with the knowledge of how to do it. Eli Pariser claims it is no coincidence that the most common introductory example of any programming language, is teaching you to make the phrase "Hello, World" appear on the screen (Pariser 2011, p. 166). Having the knowledge of programming, enables you to create and manipulate anything at your will (as long as it is digital). Through programming, the user can to some extent shape their own environment, setting the rules for how a system is to work. For those with knowledge in programming, this is empowering.

Different writers (Pariser 2011, p. 166; Anderson 2012, p. 22-23) have pointed out that hacker ideologies were heavily inspired by other cultural and social developments in the 1960s. In this period, one event in particular played a crucial role: Stuart Brand and The Whole Earth Catalog. The idea here was to liberate people's minds and talents, not as others at the time were promoting with experimental drugs, but with knowledge and material resources. As an extension of the psychedelic culture of the time and the overall urge to open peoples´ minds and pave a way for a new type of society, Stuart Brand started selling tools and educational material out of his truck. In 1968, he extended his business and launched a mail order catalog: The Whole Earth Catalog. For hackers and other people active in the early days of computer technology, Brand's ideas of sharing knowledge and tools became an important inspiration.

Some might argue that the dominant contemporary tech companies of today like Apple and Microsoft have abandoned much of their hacker roots. However, central parts of the hacker ethos have lived on in the so called "free software communities"; communities that developed out of the GNU project[57]. Their main ideology is that the user should be given the opportunity to change, redesign or improve the software they are using by accessing its source code (Stallman 2006, p. 29). Behind this ideal, lurks the same overall notion as emerged within the early hacker communities; the notion that the power of digital technology resides in the coding. Knowing how to code – program the computer – gives access to the potential of the technology, and most importantly sharing this knowledge is the best way to develop the technology.

It is worth pointing out that at this point, we are closing in on a topic that was debated in my discussion on Sampling: how the ideological understanding of technology plays a role in analysing the music deriving from that technology. The framework of copying-as-resistance, frequently used to analyse Mash-Ups, has some of the same origin as the Hacker ideologies. However, while I used Morozov's critique to question the legitimacy of the copying-as-resistance analyses, the strategic approach we find within the post digital practitioners has a very different connection to the ideological understanding of technology. The copyright discussions that appear in the wake of digital sampling praxis, took

[57] The GNU project was initiated by Richard Stallman for the purpose of creating a free operating system (Stallman 2006, p. 27). Within the general computer society, the free software movement is strongly linked to the user community of Linux – a free operating system developed and maintained by its community of users. If there is something you want to fix in the program, you are free to do so, as long as you share the changes with others.

ideological cues from the software communities; the discussions on sampling applied this ideological understanding to topics outside that of technological tools and used them instead in the realm of music copyright legislation. Music Makers and Music Hackers who work with the designing of sonic tools, also work within the actual technological field where the ideas have been developed. In this case, we are not focusing on these ideals as immanent in the actual technology, but as ideals linked to established work praxis within the field in question.

In my opinion, there is evidence that the use and development of software like Max/MSP and SuperCollider is influenced by ideals apparent in the Hacker and Free Software Communities. These communities have historically nurtured ideas of shared knowledge and creative freedom within technology, and Music Hackers and Music Makers have to a great extent continued this ideal.

SuperCollider is a free and open software. James McCartney, the designer, attributes much of its success to this fact. Developing and maintaining the program has become a collective task for all its users, ensuring a functional and bug free program. In addition, it has encouraged a range of documentation and tutorials, where individuals share their programs and knowledge of making interesting sonic programs (McCartney 2011, p. IX).

In contrast, Max/MSP is not an open free software; but as it is a programming language, the knowledge of how to program it is shared on many online forums. Here, users post problems they encounter in creating specific programs, receiving answers from other users with suggestions on how to improve its performance. Some forums are connected to the actual developer of the software, whilst others can be connected to educational institutions or artist communities.

4.4.2 Makers

The rise and proliferation of “hacking” ideologies are closely linked to digital technologies, coding and software, but artists designing their own sonic tools work with more physical objects of technology. It is therefore important to point out that the approach that developed within the early hacker communities also spawned new ideas outside the domain of software programming. The “real life” equivalent to hackers has over the last 20 years become known as the “Maker Movement”. This is a term that encompasses a larger group of people, not just computer programmers but also people soldering hardware and those who engage in more craft-like praxes such as knitting and furniture design.

The author Chris Anderson explains the current Maker Movement as taking everything we learned from free software developmentsand applying it to real life (Anderson 2012, p. 17 see also Lindter, Hertz and Dourish 2014, p. 44; Kostakis, Niaros and Giotitsas 2015, p. 556)[58]. Central to establishing the Maker Movement has been an emergence of “makerspaces”. These are shared production facilities where people can come and work on their ideas and inventions, sharing knowledge, technical tools and expertise. This fuses the lessons learned from the hacker community about open access to knowledge and tools, with the premise of creating real life physical objects. Amongst the most famous of these was the membership-based workshop facility TechShop, with ten different locations in the US [59] (Anderson 2012, p. 17). Several smaller and more community based “makerspaces” have since emerged over the years. The first ones to appear, C-Based in Berlin and C4 in Cologne, were both established in the mid-1990s (Kostakis, Niaros and Giotitsas 2015, p. 557). Central to the

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[58] These authors’ original use of the term “Open Source” is identical to “free software” in describing the creative process of sharing programming codes and knowledge, but there are some ideological differences between the two concepts when it comes to the commercial rights to software.

[59] The company did however file for bankruptcy February 2018. <http://www.techshop.ws>

establishment of these workspaces was the emergence of open hardware platforms like Arduino together with later publications such as Make Magazine and crowdfunding webpages (Lindter, Hertz and Dourish 2014, p. 440). The open hardware platforms underscore the link between makers and hackers. The Arduino is a small microcomputer that can be easily programmed, enabling easy prototyping of electronic devices without having to build everything from scratch (Banzi 2009, p.6). The further connection with Music Makers is apparent considering that Make Magazine was involved in organizing the first MusicMakers Hacklab in 2007.

Even though there are clear links between the emergence of Hacker ideologies in the digital communities and the emergence of the Maker Movement in the very late 20th century, the Maker Movement can also be understood as tapping into more fundamental aspects of human creativity. A decisive force in the emerging Maker Movement was, according to David Gauntlett, a human urge to get back to a more pre-industrial age where people themselves could make the tools and material goods they needed. This is not only part of a struggle against consumerism, but also about the joy of making stuff (Gauntlett 2011, p. 60). The Maker Movement can therefore be seen as part of a larger development in breaking down the industrial barriers between consumers and producers.

4.4.3 A fluid approach to sonic tools

If we compare the creative praxis found amongst Hackers and the Maker communities with practitioners who earlier engaged in designing and redesigning sonic tools, it is clear that we are faced with an approach to tools and technology that is much more fluid. If we consider Ghazala´s “out-of-theory” approach (Ghazala 2004, p. 99), Hacking differs since it centres upon a deeper knowledge of how technology works, rather than just working around it. The focus on workshops - developing sonic tools and sharing in the knowledge as emphasised by both Ewa Justka and Interspecifics - is clearly an inspiration from these bordering technological communities. Interspecifics also has clear ties to the free software communities in the way they share their codes and instructions to make their Energy Bending Lab. The lab is designed using open hardware platforms like the Arduino (whose codes can be downloaded online https://github.com/interspecifics/EnergyBendingLab). In addition, they use the open software Pure Data that is very similar to Max/MSP[60].

This open and flexible understanding of creative tools that I have argued exists within the Hacking communities and the Maker Movement, can be understood as replacing the dichotomies that are important within the tactics of Cracked Media. Hackers might be trying to realize some wild and often not so constructive goals, but it is always about a positive creative process in making the tools work better (Levy 1994:33). Making a cd-player skip, as Tone did, would for a hacker be understood as an improvement of the tool, enabling it to create a new array of sound. In this way, we can argue that much of the transformative aspects that we find in the concept of Cracked Media – the dichotomy between right and wrong use - is de-emphasized. Instead we are left with a primary focus upon the creation and development of sonic tools as a positive artistic process, exploring the relationship between tools and sound.

Returning to the concept of the post digital, we find that it embodies much of the same sentiments about artist´s creative use of technology. Stefan Sonvilla-Weiss sees the post digital artist as an intermediary, a catalyst between diverse fields of knowledge, ways of thinking, social models, and solution strategies based upon cooperation, communication and interaction (Sonvilla-Weiss 2008, p. 15). This not only changes the modes of media production and distribution, but it

[60] Pure Data was designed by Miller Puckette, who also started the development of Max/MSP, and shares many of the same functionality and design features (Puckette 2002:31).

transforms art from object making to art as a process of creating immaterial, rhizome-like structures of remotely connected individuals in online communities: “Print and radio tell; stage and film show; cyberspace embodies” (Sonvilla-Weiss 2008, p. 15). The technological environment that nurtures Music Makers and Music Hackers therefore represents a unique and novel approach to the creation of art. This definition of the post digital therefore explains the difference between present day Music Hackers and Music Makers, and earlier experimental musicians like David Tudor. The focus on the process of creation is a clear illustration of why Justka and Interspecifics place such an emphasis upon workshops and sharing knowledge. The workshop and creative process is not a means to create an indeterminate work of art as Tudor emphasised, but is more the primary focus of the artistic praxis.

4.5 Making noise and Mediating music

In previous sections of this chapter, I have demonstrated how present-day practitioners who engage in the design and creation of sonic tools as a part of their artistic endeavour, often draw inspiration from creative ideals established within the current technological culture. Their praxis of designing sonic tools and their approach to using technology is, as I demonstrated with my description of Music Hackers and Music Makers, often influenced by a strategic approach to tools that in part displays different artistic trajectories than praxes we have earlier found in the musical domain. Music Makers and Music Hackers are influenced by more “post digital” tendencies and approach technological tools as an open and flexible entity which empowers artists to explore the sonic possibility in mediating technology. This is in sharp contrast to the more common approach to the artistic design of sonic tools that Caleb Kelly described as Cracked Media, where artists relied on the tactics of misuse as an aesthetic approach. In the final part of this chapter, I want to discuss how this new tendency in musical praxis can affect the theoretical framework concerning our aesthetical understanding of music and sound. My goal in this section is to discuss how strategic ideals found in the contemporary technological culture can inform us as audience and academics when we analyse the resulting sonic expressions. With this discussion, I will return to the dichotomy between "noise" and "music" that I introduced in the initial part of my dissertation, and discuss how the conceptualization of "noise" has changed with the development of new mediating technology and new artistic approaches to sonic tools.

Little has been written specifically about the aesthetic tendencies amongst Music Makers and Music Hackers. However, several writers have tried to make sense of the broader aesthetic changes that have appeared in electronic music over the last 30 years. To understand how ideals found amongst Music Hackers and Music Makers have influenced the aesthetics of present-day music, I will therefore focus mostly on discussing the post digital musical genre of "Glitch" music, especially how this genre has changed our conceptualisation of "noise". This genre overlaps to a great extent with the artistic creativity that we find amongst Music Makers and Music Hackers. It is therefore very relevant to our understanding of the aesthetic changes that are introduced by the current praxis of artistic design of sonic tools. After discussing the new ways of defining "noise", I will discuss what these new conceptualizations of sound mean for our aesthetic analysis of the praxis of Music Makers and Music Hackers.

4.5.1 A new conception of noise

As I stated in the introduction to this dissertation, a traditional way of analysing new sonic expression deriving from mediating technology is to focus on the dichotomy of "music" vs "noise". For most of the 20th century, this division has been drawn up along the lines of what musical ideologies have framed to be a part of musical aesthetics and what is considered to fall outside this domain (Kahn 1999, p. 68 and Attali 1985, p. 35). But the technological culture emerging at the end of the 20th century not only inspired new praxes in artistic creation, it also gave rise to new ways of conceptualizing and evaluating sound. Inspired by new media science, academics and writers analysing contemporary electronic music have been motivated to modify their conceptual dichotomy between "noise" and "music". What happened was that a new understanding of "noise" appeared, this time inspired by concepts from communication theories where "noise" emerged as a technical term to describe unwanted interference that disrupted the intended messages transmitted from sender to receiver. Much of this understanding can be traced back to Claude Shannon's theory of communication, where the introduction of noise into a system degrades and interrupts the message sent (Shannon 1948, p. 19). This subsequently means that noise has the possibility to disrupt communication and information flows[61].

What makes this new definition of "noise" important in relation to the topic of this chapter, is that it introduces a conceptualization of sonic "noise" not as an opposition to traditional musical praxis but as a technological condition (Van Nort 2006, p. 174). Both definitions of "noise" are based on it being the negative of an established ideal of sound, but "noise" in the realm of the new digital technology and communication theory, becomes defined as the sound that breaks with the correct functioning of media technology. "Noise", in line with this new definition, arises as a result of the incapability of the medium to convey the intended sonic message. When defining "noise" as that which falls outside of musical aesthetics, "noise" can also, as I explained in the introduction, become a direct force in challenging the aesthetic norm (Hegarty 2007, p. 5 and Attali 1985, p. 33). If, on the other hand, you use communication theories to define "noise", sonic aesthetics become embedded into the discussions on the use and functionality of technology. This second definition of "noise" therefore represents

[61] It is important to note that Shannon's theory focuses on mathematical models; it was Warren Weaver who later speculated that it could perhaps be used to describe communication between humans (Case and Given 2016:61). This use of the theory though was never intended by Shannon.

a different approach to sonic aesthetics and is a very important reorientation in the role we assign to mediating technology in defining musical aesthetics.

Within the context of music and new media, this new conceptualization of "noise" has gained considerable momentum since it also shares much of the same sentiment to sound reproduction as was defined in the earlier High-Fidelity traditions. The way communicating theories define media technology, has much in common with how the High-Fidelity ideologies understood the workings of sound recording. Both define the purpose of the medium to transparently mediate musical performances. This ideology was a topic I covered extensively in my introduction and also in my analyses of sampling technology. I explained how the High-Fidelity ideals came about through defining the purpose of sound recording as faithfully copying an external sonic event, a definition that was strengthened by conveying established musical ideals like the acoustic rendering of a live performance of a musical work. The sound recorded becomes equivalent to the message transmitted by media in communication theory. The more accurate a sound recording is in reproducing the initial musical performance, the more precise the message is as conveyed through the medium. But even if communication theories in combination with High-Fidelity ideologies arguably galvanized already established ideals within musical and technological understanding, the combined effect of this eventually led to an important change in artists' understanding of sonic expressions. According to Greg Hainge, due to the negative focus that High-Fidelity ideologies and communication theories place on the undesired sonic mediations, it paradoxically defined a new artistic interest towards music technology (Hainge 2007, p. 23). Most people can easily identify with the understanding of different mediating technologies as a "conveyor" of a desired pure musical content. At the same time, however, we have all experienced how technology exposes itself through different types of errors, from small undesirable sounds all the way to complete breakdown. All technology developed for the recording and playback of sounds, displays inherent qualities that throughout history have been interpreted as “errors” in reproducing an accurate mediation of sound. Vinyl records are prone to crackles and skips, magnetic tape produces hiss and distortions and even digital formats are known to skip and produce digital drop-outs. These “negative” sounds have through time been a point of interest for many artists, eventually leading to the musical genre of Glitch.

I have explained how Glitch is a genre based upon the way artists harnessed the sound coming from mediating technology when it skipped and clicked in its playback of sounds; a key feature within what Cascone named “post digital” music (Cascone 2002, Hainge 2007:23). I touched upon this by using musical examples of artists such as Oval and Yasunao Tone, who are prime examples of practitioners who worked with harnessing the sound coming from dropouts and skipping sounds in CD players. The conceptualization of Glitch and the sound used in this musical genre, have clear ties to how communication theories define “noise” and how that again merged with High-Fidelity ideologies. We can trace this through the way several writers and also artists have turned to this concept of “noise” as a term to explain and make sense of the sounds of clicks and crackles that are produced by the sonic device itself.

Greg Hainge claims that Glitch actually reverses the concept of High-Fidelity, seeking out the sounds that actively work to betray the idea of a faithful mediation of reality. Eliot Bates is probably one of the writers who is most explicit in framing the genre of Glitch in line with the idea of High-Fidelity. Bates’ ideas of Glitch are based on an understanding that the recording process itself represents an enemy of the musical work, where practitioners have to strive to remove all the noises and errors that can challenge the simulacra of the musical work. When the glitches and errors become the prominent element in the recording, the sonic expression moves into a category of “non music” (Bates

2013, p. 289). This frames Glitch music as a critique of established assumptions of the relationship between music and mediating technology, subsequently leading us to analyse the artistic use of these sounds as opposing traditional ideals of musical aesthetics.

Much of the same sentiment towards the genre of Glitch is voiced by Peter Krapp, but he places more emphasis upon how Glitch breaks with what he understands to be a broader condition in a digital culture predicated on communication efficiency (Krapp 2011, p. 53). Glitch becomes a genre that focuses on that which is routinely filtered out as distortion and errors on a larger scale of communication, thus becoming a criticism of the dominant understanding of digital technology's purpose and functionality.

This conceptualization of Glitch is also described in the linear notes on a compilation of Glitch music. Focusing on the "click" sound, Philip Sherburne claims it is a reminder of the limits of digital technology: "the indigestible leftover that code won´t touch. Cousin to the glitch, the click sounds the alarm. It alerts the listener to error. The motor fails, the disk spins down, and against pained silence there sounds only the machinic hack of the click" (Sherburne 2001).

As a result of how Glitch music is often defined in line with both communication theory and Hi-Fi ideologies, the genre emerges as a form of meta-music that comments on the medium that we use to convey music. Glitch music is, according to Bates, a new type of meta-discursive praxis: "rather than writing new music inspired by old recordings, it constructs new music inspired by the technological conditions and limitations in which those recordings emerged" (Bates 2013, p. 289). It becomes music about music, sound about sound and process about process (Sherburne 2003, p. 79). The new digital sound that Glitch artists explore, is labelled as a signifier for digital technologies' inadequacy to transmit music. It becomes an art that critiques the contemporary media landscape and its false promises of an authentic aesthetic experience, coming into existence as an opposition to the dominant use and understanding of music and mediating technology.

The understanding of Glitch as a disruption to the High-Fidelity ideal of the medium's ability to present the listeners with a coherent musical performance, is also advocated by Ragnhild Brøvig-Hansen and Anne Danielsen. They exemplify this through an analysis of the album *Descargas* (2000) by Los Sampler's (actually one of the German producer Uwe Schmidt´s many monikers, but the linear notes claim it to be a band consisting of five Latin American men). This album appears to be a recording of tradition Cuban/Latin music but through warping, stuttering and skipping, the apparent glitches in digital technology become apparent. As a result, it clearly establishes a contrast between the medium's conveyance of live musical instruments and the noisy effects the medium itself creates through its manipulation of sound (Brøvig-Hansen and Danielsen 2016, p. 88-89).

4.5.2 The limits of Noise as errors

The approach to "noise" and subsequently Glitch music, as it emerges through its alignment with communication theory, to a great extent overlaps with the aesthetic conceptualization that Caleb Kelly described as Cracked Media, where artists deliberately go beyond the intended use of the technological tool (Kelly 2009). We are, in both cases, faced with a sonic aesthetic that is defined by analysing the appliance of sonic tools along an axis of correct and incorrect usage. Cracked Media shares the same understanding of sonic tools as defined through communication theory's definition of "noise", both defining the technology with an inherent purpose and a defined correct way of use. Realizing this fact, directs us back towards a crucial point in my analysis. In the previous sections of this chapter, I used a great deal of effort to demonstrate that present day practitioners are actually informed by a much more flexible and strategic approach to sonic tools, breaking away from this dichotomy of correct and incorrect usage. The important question we therefore need to ask ourselves, is what this finding means for our conceptualization of "noise"? When we can no longer claim that the sounds we are analysing are "noises" resulting from malfunction or incorrect use of technology, but rather have to acknowledge that the sounds are the results of the deliberate artistic design of a sonic tool, it is difficult to uphold the aesthetic analysis of these sounds as an unwanted and negative product. When we realize that there now exists a much more flexible approach to using and designing sonic tools, it would mean that it is difficult to uphold the concepts from communication theory and continue to interpret "noise" only as a failure to communicate. Such an approach to sound has, in my opinion, a limited relevance for analysing aesthetics as it emerges in the technological environment of today.

Many writers who approach the genre of Glitch from the ideas of communication theory, must, not surprisingly, admit that the resulting conceptualization of "noise" that often informs the analysis of such music, represents some inconsistency within the actual artistic domain. The focus upon the sounds of Glitch as errors coming from the incorrect use of technology, has had, as I demonstrate, the effect of defining music that uses such sound as a form of "non-music" or "music about music" (Sherburne 2003, p. 79 and Bates 2004, p. 222). The apparent problem with this stance is that the "noise"-sounds and artistic expression that explores them is consequently denied an aesthetic evaluation on its own terms. These artistic expressions are reduced to being defined as the "other" in relation to something else (Haggerty 2008, p. 5). Within the musical genre of Glitch then, it was evident that the sonic expressions that formed a key ingredient in their musical praxis, gradually became part of a norm which influenced other areas in more commercial popular music (Thomson 2005, p. 214). We could here mention the music of Björk and Radiohead (and even Madonna´s *Don't Tell Me* (2000)) – all of which experienced great commercial success while still using electronic sounds that originally emerged as part of the Glitch genre (Prior 2008, p. 310). This means that the artistic exploration of these sounds gradually establishes itself as an independent aesthetic expression.

The consequence of the definition of "noise" and subsequently Glitch in its reliance upon communication theories, is that it becomes difficult to analyse Glitch as anything other than a negative of the established ideal. Glitch is therefore denied any existence as a musical genre on its own terms. Analysing Glitch music as an independent aesthetic expression can thus end up as academically uninteresting faced with the conceptualisation of "noise" that communication theory establishes. Bates concludes: "When glitch becomes pop, it loses its theoretical savvy" (Bates 2004, p. 222 see also Vanhanen 2003, p. 47). We can therefore argue that basing our analysis upon this approach to "noise" only enables us to conceptualise the sonic expression in a limited historical context before it develops into a more established musical genre.

The apparent shortcomings in analysing Glitch and "noise" as "errors" - primarily the failures in sonic tools and unwanted sound - points in my opinion to the obvious realization that concepts derived from communication theory are not necessarily fruitful in analysing aesthetic expression. Analysing aesthetics is essentially not the same as analysing information. So, whilst communication theory might be useful in explaining the spread of linguistic information, Peter Krapp points to the fact that music is much more flexible than language. You can manipulate music with great ease whilst still retaining its aesthetic potential, but the manipulation of language can, on the other hand, easily destroy its informational potential: "Syntactic or syllabic inversion destroys the meaning of speech but affects a melody or series of sounds far less directly; the resulting music may seem unfamiliar, but it remains intelligible as an articulation of sonic objects" (Krapp 2011, p. 71). The norm in musical aesthetics is much more open towards the listener's surprising experiences of an unheard combination of sounds. In my chapter about sampling, I touched upon the same topic. I there explained how Genette defined the differences between quoting text and quoting music (Genette 1997, p. 386). Whilst text is information understood as having a fixed semantic structure, music has a much more flexible structure enabling it to be transformed and altered; it is still recognizable but with an added aesthetical dimension.

At this point, there are clear similarities between the analytical problems I discussed in relation to sampling praxis and the problems that appear when using communication theory in analysing musical aesthetics. In both cases, we stumble upon the shortcomings in analysing music as text. In relation to sampling technology, I argued that some academics were analysing sampling praxes in line with reusing and combining text, whilst not acknowledging that we were in fact talking about music. What is also apparent, is that in both cases the underlying reason for these problems can be linked to High-Fidelity ideologies. High-Fidelity ideals were defining sound recordings as reproducing a defined sonic reality or a musical work as a mimetic media, establishing the purpose of this tool within a very rigid framework of interpretation.

As I have pointed out, the definition of "noise" as it emerges through the application of communication theory, has clear parallels to how High-Fidelity defined the purpose of recording technology. But, as I stated in the first part of my dissertation, the concept of High-Fidelity has in itself always been problematic in relation to musical aesthetics. As Jonathon Sterne stated, High-Fidelity started out more as a sales pitch than an actual artistic ideal (Sterne 2003, p. 216). In effect, it is not the theory of communication as such which is the problem, but the way in which its relevance is based upon a relation to music on a singular and often questionable assumption about mediating technology. My earlier examples with Glen Gould, John Culshaw and Jamaican Dub illustrate that recording technology could be utilized artistically outside the confines of High-Fidelity. With these examples, I demonstrated that it was possible to establish aesthetical ideals and conceptualizations of musical works that bypassed the purely mimetic definition of sound recording that simply focused upon copying a live musical event. Within musical praxis, it is clear that mediating technology has proven to be a flexible entity rather than merely functioning as a passive signifier for artistic expressions. As I illustrated with examples of sampling used in ambient and club music, changes and unpredictability are very much the prevailing norm. Recreating the exact sonic structure that a listener would anticipate, does not necessarily produce an interesting artistic expression.

My argument for departing from High-Fidelity ideals when analysing Glitch music, is also something that Cascone saw as an important part of post digital tendencies. As I previously pointed out, he argued that Glitch was a musical genre where the medium was no longer interesting as a conveyor of an artistic content but as a technology which primarily functioned as a tool for sonic creation, Hainge closes in on the same conclusion when he critiques our notion of "noise" as just a failure to communicate (Hainge 2007, p. 32). What Hainge focuses upon, is how the sound we hear as a malfunction from a digital cd player does not result from the actual CD being broken – an inadequacy in the data being transmitted - but from the player trying to make sense of the abrupt information it is receiving[62]. This implies that we are not hearing the noise in the digital communication system but rather as a by-product of the digital system´s ability to make "noise" heard by rendering it sonically.

> "In regards to glitch itself, which is often thought of as a genre in which failure is turned to positivistic ends or made to ''succeed'' through

[62] See Stuart (2003) for a detailed description of this process.

> integration into an aesthetic construct as primary content, it is perhaps rather the case that through the failure that it foregrounds, "Glitch" in fact shows us the extent to which digital technology always relies on a successful integration of failure into its systems" (Hainge 2007, p. 35).

With this claim, Hainge, in a similar way to Cascone, takes a step away from defining digital recording technology as a means to mediate external musical events and places more emphasis upon the internal technological system itself as a sonic tool.

This focus upon the internal technological system can be argued to have a very specific function in establishing new musical aesthetics beyond that which is covered by High-Fidelity ideals. Salome Voegelin is someone who uses this realization as a starting point for redefining the concept of sonic "noise" and subsequently establishing a new sonic aesthetics. Defining "noise" as just a failure to communicate is, according to Voegelin, also a consequence of how we reproduce earlier limitations into our sonic understanding, limitations that were initially caused by the musical ideal of its time. She claims that this dates back to a modernist conception of aesthetics, where "noise" "is counter to that which fulfils the demands of the medium to reach its own autonomous ideality" (Voegelin 2010, p. 59). The idea of "noise" as failure to communicate clearly repeats older aesthetical traditions where sound is evaluated against an established syntax of signs that we as listeners are trained to apply when we make sense of what we are hearing. A consequence of any such syntax of sound would be that we cannot appreciate any sound that we are not trained to hear. The most striking example of such a system is the tonal definitions in Western music. Here, our understanding of sound is not inherent in the sound itself but in its reference to an external transcendental system.

> "When training as a classical musician you are asked to identify minor thirds, perfect fifths, major sevenths and so on; sounds are given names and are organized in relation to each other, and it becomes a matter of recognizing what's being played and attributing the right term to the corresponding tonal relationship. You cannot possibly give the right answer unless you know what you are listening for, and the "listening for" is never its sound but its visual point of reference. On the basis of this knowledge you begin to recognize the structures of a musical piece and start listening to it with new attention. From this moment, you are listening to the language of music. You appreciate its sonic material in relation to the systematic understanding of its composition." (Voegelin 2010, p. 52-53)

The notational score is, for Voegelin, an example of an external system that distracts us from the contingent and fleeting nature of sound, instead setting up a system of dialectic opposition. The ideals of Hi-Fi and communication theories are also such systems of setting up a definition of what sounds we should "listen for". Many practitioners designing and redesigning sonic tools have worked to exploit the dichotomy that these systems impose, working in line with what Kelly defined as Cracked Media. The artists who share in the ideal of Music Makers and Music Hackers can however be understood as focusing more upon experimenting with sound in its fleeting nature, working with mediating sound beyond the established signifying structure. As I have argued, they approach their sonic tools not along a dichotomy of correct or incorrect usage. Instead, they place a greater focus upon the flexibility of technology, that by default enables the artist to shape their own tools in order to fulfil the desired purpose in pursuing new artistic expression. The next section thus focuses upon the aesthetical ramifications of this specific reorientation towards technology. How does our analysis of sound and music change when we can no longer define "noise" as a failure to communicate or the sound of malfunctioning technology?

4.5.3 Sound as object, not as sign

My discussion upon the strategic use of sonic tools and the limitations emerging when defining “noise” solely as a failure to communicate, indicates a need to reapproach musical aesthetics. The praxis of Music Hackers and Music Makers demands a departure from analysing the workings of mediating technology in line with communication theories and a departure from an aesthetic where music is confined to a given external symbolic structure. The big question is, though, what are we to replace the traditional understanding of sound with? In seeking out such a new approach to sound, Voegelin states it is important to reconsider both the modernistic and post-modernistic emphasis upon sound and music as some kind of communicational language: “This is to make room in the critical discipline for the signifying praxis of sound and its contingent non-sense, in order to address non-communicative isolation of sound, and bring its fantastic reality to bear on aesthetic discourse” (Voegelin 2010, p. 52). Voegelin here touches upon a topic that Bruce Andrews also discusses. He claims that sound has been domesticated into melodies and semantics, forcing it to serve representational ideals (Andrews 1998, p. 73). In search of this non-communicative aspect of sound - liberated from the established external symbolic structures - the use of mediating technology can be a crucial tool.

Even if recording technology through the tradition of High-Fidelity has been taken as a means to galvanize many of the symbolic structures for understanding music, I have also pointed out that it can be used to liberate sound from any external syntax of signification. Compared to the notation system that marks out the basis of how Western music traditionally has been written down and preserved, the recording apparatus is totally neutral, hence independent of any symbolic order (Vanhanen 2003, p. 48; Kahn 1999, p. 5 and Adorno 2002c, p. 279-280). Recording technology does not store sound in terms of “perfect fifths or major seventh”; the technology as such does not discriminate between sound that is confined to an established musical system and sound that falls outside of this. The recording technology takes equal care of all sounds even when musical language would reject them as “noise”. Giving sound recording a prominent place in shaping our musical understanding would frame our understanding of sound very differently if we were to give notation the same role (Cutler 2004, p. 140).

With this realisation of how recording technology and the further possibilities to mediate sound can be used to break with established aesthetics for evaluating sound, an aspect that I consider to be highly important is that of: sound as objects. To explain this concept, I will use Joanna Demers’ writings and her focus upon sounds as objects emptied of any pre-existing meaning (Demers 2010, p. 14). In this discussion, she also underscores my point as to how many contemporary artists explore sound along artistic trajectories that differ from earlier practitioners who were more rooted in established musical ideals.

> “A chief distinction between the discourse surrounding institutional electro-acoustic music and that surrounding electronica is that the latter discourse concentrates on sound material rather than the acts of composing or listening. What I mean by material here amounts to the objectified, audible phenomena in electronic music, from notes and rhythms to sound grains, clicks, timbres and even silence; it is, as Adorno puts it, “what artists work with” (Demers 2010, p. 43)

The Material is a concept encapsulating the dual concerns of sound itself and sound generation, concerns that as Demers demonstrates, are traits held in common amongst many electronica genres. This focus upon the material aspects of sound is, in my opinion, very much in line with how practitioners like Ewa Justka and Interspecifics work. In both cases, the artists are exploring the materiality of sound coming from technological or organic material. The artistic praxis aims not at exploring sound in relation to the syntax of a musical language, but the sound itself through different forms of mediation.

According to Demers, there are several genres of electronic music that explore the object-hood of sound, aiming at placing emphasis on the sound itself and stripping away any semantic content (Demers 2010, p. 14). This can happen in two distinct and opposing directions. On the one hand, you have the genre of "Microsound", a sub-genre of Glitch that treats sounds as collections of infinite small particles. Small elementary particles of sound construct compositions: "Microsound aspires to a reductive absence of meaning, as if atomized sound can empty it of its residual significance, after their meanings have been removed, grains in microsound exist as mute objects" (Demers 2010:91). Microsound's approach to sound has much in common with Schaeffer's concept of "reduced listening" as I described in my introduction, but it is perhaps more influenced by materialistic art-movements of the 19th century. How Microsound artists approach sound is similar to the focus on objecthood that emerged in visual arts of the 20th century. In his text *Art and Objecthood,* first published 1967, Michael Fried explains how the objecthood in visual arts depended on how the work in question established its objecthood as part of a situation in meeting the viewing subject (Fried 1998 p. 155). It is not the relation between the forms in the artwork that is of interest, but how it becomes an object as the centre of attention in a situation with the audience. Objecthood in sound, can therefore be understood as diverging from Schaeffer´s ideas, since the sound object comes into life in the situation of listening.

Whilst Western art has for centuries strived to suggest, that the world depicted in the artwork is in a separate but realistic plane of existence by the use of perspective as an illusion of depth, artists in the 20th century departed from this tradition. From the 1950s, abstract art moved the artistic focus towards the medium of expression: the paint on the canvas or the stone in the sculpture.

Taking cues from art critics such as Clement Greenberg[63], modernist artists renounced any attempt to be illusionistic, instead focusing their attention inwards upon the material they worked with (Demers 2010, p. 81). But as both reduced listening and abstract modernist art can be accused of being separated from reality, even when artists aim at reducing the symbolic content, their success is always dependent upon audience interpretation. Demers counters this critique against the “mute object” of Microsound by pointing to the rhythmic structure used to organise sounds. Rhythms, primarily derived from genres of dance music like House, Hip Hop, and Techno, frame the sound, enabling the sound objects to be interpreted as music (Demers 2010, p. 85). The familiar rhythms make the listener less prone to be curious about the provenance and origin of each sound, hence leading their attention towards the sounds themselves. The repetitive dance rhythms establish a framework that identifies the sounds as music and distinguishes the sounds from the outside world. One could, of course, claim that rhythm is a symbolic structure, but in this case it is not the sound in itself that establishes the musical connotations but the relation between them; it is the empty temporal gaps that divide the sounds from each other. Demers is, in other words, pointing to some special characteristics in music that make the idea of an “empty object” more reasonable in sound than in visual art.

The second way that Demers claims that sounds can escape sematic interpretation, is by moving in the opposite direction to Microsound towards what she names “maximal” objects (Demers 2010, p. 91). In this case, we do not

[63] As an influential writer on modernistic and abstract art, Clement Greenberg advocated for a development of visual art that called for the abandonment of its mimetic characteristics. In his article *Towards a Newer Laocoon* (first published in 1940), he describes a tendency in painting where the picture plane grows shallow and the artist focuses directly on the real surface of the picture plane, which is the canvas (Greenberg 1986 p. 34-35).

necessarily encounter sounds that are cleared of any signifiers, but rather the sounds do not communicate in any sense of a tangible unit of musical language. What she is focusing upon, are sounds that last so long or are so loud that they call attention to the physical aspects of the sound rather than any syntax of musical language. Demers calls, in this instance, for a conceptualization of "noise" that is radically different to what I have earlier described. Previously, I have referred to definitions of "noise" as defined as "the other", both in the sense of non-musical and as non-informational. Moving away from these previous definitions of "noise" is central to Salome Voegelin´s explanation of the unique phenomenology of sound. She claims that "noise" should be understood as a sonic manifestation that cannot be comprehended in terms of language. This means that rather than being derived from a specific meaning, it forces the subject into a critical ring of self-reflexiveness and turns the work into a moment of subjective experience. It is not that "noise" is different from other sounds, but that it simply amplifies its demand to be considered in its immersive contingency rather than in relation to a system (Voegelin 2010, p. 65). In this definition, "noise" breaks away from the basis of language by insisting upon being a bodily experience.

This new definition of "noise", for Voegelin, points towards a new conceptualization of sound, where she attempts to free our experience and evaluation of sound from traditional concepts of musical understanding. For Voegelin, sound represents a unique form of sensory expression. Sound does not exist as an objective entity, it is only realized as a subjective bodily experience without any reference to a priori transcendental truth. It differs from our visual sensors by being a method of exploration, rather than a mode of reception. Sound does not describe but produces the object/phenomena under consideration (Voegelin 2010, p. 10). This approach to sound also helps to explain some of my earlier examples in this dissertation. A focus upon the bodily experience of sound helps explain why the specific sine wave-based kick drums of the old Roland drum machines became so popular. The way of synthesizing sound made it possible to create loud base sounds with a clear physical presence on the dancefloor. For the popularity of these sounds to spread, listeners and musicians had to abandon the established language as to how a musical instrument should sound, enabling them to appreciate sounds that did not sound like the acoustic drum kit.

One of Salome Voegelin´s main concerns, is to establish a thorough definition of the unique characteristics of sound. To do this, she starts by claiming that sound is not a sensory drive towards total knowledge, but a drive towards knowing as a past principle: "always now, unfolding in present, bridging with the uncertainty of a fleeting understanding. Such a listening does not pursue the question of meaning, as a collective, total comprehension, but that of interpretation in the sense of a phantasmagoric, individual and contingent place" (Voegelin 2010, p. 5). Her account of sound and listening is defined by a subjective interaction with the auditory world. The act of listening is always entwined with the person listening. The understanding gained in such a praxis, is a knowledge of the moment as a sensory event that involves the listener and the sound in a reciprocal inventive production: "This concept challenges both notions of objectivity and of subjectivity, and reconsiders the possibility and place of meaning, which situates the re-evaluation of all three at the centre of a philosophy of sound art" (Voegelin 201, p. 5). Even though her writings have a specific focus upon the praxis of sound-art, this approach has far reaching consequences for our analyses of music. Her approach to understanding sound can present us with an alternative to different conceptualizations that always draw us back to the concept of High-Fidelity and the race towards an objective truth in sound. Her focus on the subjective experience of sound does away with the social contract that defines both High-Fidelity and the predefined cultural language that is not an attribute of sound itself, but rather an element defined externally.

4.6 Summary of findings and prospects for future research

In this chapter I set out to investigate the aesthetic repercussions of the artistic design of sonic tools. My main claim was that practitioners in this field today, were reintroducing an already established artistic praxis into a new and larger cultural environment, a development that in turn results in a different aesthetic evaluation of music and sound. What is evident, is that the proliferation and development of technology to mediate sound has established a cultural backdrop that has influenced how practitioners today approach the design and redesign of sonic tools. Artists working in the mid-20th century mainly designed and made their own sonic tools out of necessity, in an attempt to alter or develop established musical ideals. Present day practitioners are, however, working in a society that is saturated with technology, and they are often more influenced by ideologies from the technology developer and technology communities than from earlier musical ideals.

Within this new artistic realm, I have found that since the 1980s, practitioners have approached working with the creation of sonic tools along two different aesthetical trajectories. The first has been working against the established ideologies of use that has often defined the different sonic tools. This praxis often emphasizes the dichotomy of correct and incorrect usage of mediating technology through manipulations of mundane consumer electronics. The second trajectory focuses upon technology as working without any inherent purpose of use, instead approaching it as a flexible entity that can be used in the creation of sonic tools. This is an approach to mediating technology that, to a great extent, is inspired by creative Hacker ideals and has proven important to what I have defined as Music Hackers and Music Makers. The two different aesthetic trajectories do to some extent produce rather similar sonic results. The difference, however, is found in how the different praxis frames and evaluates these sounds aesthetically.

Working against the established ideologies of how technology is supposed to work, exploits a cultural dichotomy between correct and incorrect usage of technology. This subsequently results in framing “noise” as unwanted sounds and in opposition to established ideals of music production. As a result, much of this praxis could be framed as engaging in some sort of meta-music. The artistic result was always analysed as the opposite of something else, not something that could exist on its own terms. The problem is that the more flexible approach to the creation of sonic tools associated with the concept of the post digital and communities of Hackers and Makers, represents an artistic trajectory that calls for an alternative aesthetic interpretation. The reason for this is that these artistic praxes base themselves upon a different conceptualisation of technology, where there are no correct or incorrect ways of using the tools. Analysing the artistic result as “noise” in the sense of a failure in creating the expected sounds or communicating a message, has little relevance when the creative praxis is framed in this manner.

In relation to my overall research question about how mediating technology changes the aesthetics of music, the Music Hackers and Music Makers affect the relationship between music and mediating technology at a very fundamental level. Through their approach to technology and tools, these practitioners not only promote a new aesthetic approach to sound, but also in turn break with earlier ideals in musical creation. They are therefore a good illustration of how strong the relationship between mediating technology and developments in musical aesthetics can be.

What makes Music Hackers and Music Makers such an important example, is the way in which they transgress the established concept of musical instruments. A musical instrument is traditionally designed to work within the framework of a musical language, either in a strict sense or through the active challenging of existing norms. Consequently, the signified meaning and aesthetic appreciation of the sounds are intertwined with the cultural understanding of the musical instruments. Within the realm of mediating technology used in musical creation, this is also the case, since the sounds created are often defined and evaluated according to the logics and functions of computer programs (Krapp 2011, p. 72). Editing, synthesizing and generating sound with such tools will happen under the auspices of musicality. Consequently, many existing tools will establish a musical aesthetic that appears along lines of a musical genre and strengthen an idea of a musical language which frames our understanding of the resulting sounds. Earlier examples discussed in this thesis, such as samplers, DAWs and drum machines, are all technologies that are clearly designed to function under these assumptions. However, what I have pointed out, is that Music Makers and Music Hackers do not use such tools.

The work of Music Hackers and Music Makers is based upon using tools that are defined in a very different manner to how traditional instruments and music software are designed and culturally defined. Much of their praxis is based upon using programming language, open software and open hardware, to create something very new. For them, technology is something that represents more of a blank canvas or a flexible material that can be used in artistic experiments, rather than cultural artefacts confined to a defined musical language.

With the work of Justka and Interspecifics, I demonstrated how their musical expressions were achieved through exploring the sonic qualities of different materials. They do not use musical instruments in the traditional sense, but use tools that were either created by themselves or designed through the use of open hardware or open-ended programming environments. In these artistic settings, the technology does not have any inherent correct way of use but provides tools that can empower the artist to engage in something like a creative partnership. What this praxis of Music Makers and Music Hackers urges us to do, is to seek out a new approach to sound. Through abolishing the cultural definition of musical instruments, they urge us to approach sound not as a symbolic system of communication to be evaluated against an external structure of meaning, but as objects with a more fleeting nature.

This claim to the open and flexible approach to sonic tools that we find amongst contemporary artists are, of course, not acknowledged by all. In his text on Glitch, Janne Vanhanen defines "glitch aesthetics" as existing in the paradox between the creative subjective and the a-subjective machine (2003, p. 51). Such a statement obviously emerges from an understanding of technology as an obstacle for artists to overcome, rather than something that can be an equal part of the artists' creative process. Vanhanen is, in my opinion, stuck with defining mediating technology purely as a conveyor of artistic expression. However, the opposite position can be found in Achim Szepanski´s manifesto for the record label "Mille Plateaux". This label was one of the most important exponents of Glitch music; such a statement should therefore be given extra weight. He defines digital music as a praxis where the musicians' function is that of a designer who opens up the different program structures (Szepanski 2001, p. 225). Szepanski´s claim is therefore, in my opinion, more in line with how some of the contemporary and more complex tools for music production actually work, considering the possibilities and creative ideologies that exist within these programs.

With the flexible approach to artistic creations that we find in open hardware platforms and programs like Max/MSP and SuperCollider, sound is treated more as an object for artistic exploration than a symbol in a musical language. This is a move that points us towards Demers and Voegelin´s aesthetics of sound with a focus upon objects as they relate more to the subjective experience than a traditional musical language. This position is also advocated by Adrian Moore in his book *Sonic Art: An Introduction to Electroacoustic Music Composition.* He states: "So let us throw "music" out of the window but bear in mind "musical" something with phrases, starts, ends, middles, highs, lows, louds, softs, breaths, space, shape, form, emotion and energy. Think about working with sound as a potter works with clay" (Moore 2016, p. 2).

In altering how artists approach mediating technology, artists who design sonic tools also change the conditions for music as a creative praxis. One reoccurring topic for this thesis is discussing how the three traditional agents in music, the composer, the score and performance are altered through the introduction of new technological means for musical creation. I have already mentioned how Tudor, in the 1960s, compared the new sonic tools he created, to the way in which notation traditionally had worked as mediator between composer and performer. This attitude has, of course, continued to influence contemporary practitioners to apply new digital tools in creating what has been called a Composed Instrument (Schnell and Battier 2002; Tanaka 2000, p. 298). The work of artists Enrique Tomás and Martin Kaltenbrunner have been informed by this concept. Taking their cues directly from the developments in 1960s experimental music, they have worked on creating a tangible interface for new electronic instruments that will act as a mediation of the musical work, substituting the traditional score in musical performance (Tomás and Kaltenbrunner 2014, p. 609). Furthermore, they have been inspired by contemporary computer design where the term "interface" describes the membrane between the system and the person operating it. Such a membrane is, however, never fully transparent. When designing an interface, you also limit and shape the interaction between user and tool (Norman 1990). In this way the ideas from computer interface can be used to establish a set of sonic possibilities mapped physically upon human interactions, that in effect can be understood as the constitution of a musical work.

If we however look at the praxis of Music Makers and Music Hackers, their approach to the agents of composer, score and performance is rather different. They do not use technology to redefine and change musical ideologies through substituting one function as notation with a specially designed sonic tool. Instead of working from within the established system to change it, I argue that they more or less bypass it all together. The aim is not so much to work as a traditional composer of musical works, but to focus upon engaging in an explorative process of creating new sounds. An end result does of course exist, as we see with Interspecifics' Energy Lab, but as the name suggests, it is mostly to be taken as a starting point for a new experimental process in search of new interesting sounds. The creative process and sharing of knowledge through workshops and collaboration are not substitutions for earlier ideals like composer and performer, but can be seen as emphasising a very different aspect of musical praxis.

The focus upon the creative process in workshops, a crucial point for Music Hackers and Music Makers, has made some writers conclude that we are seeing a return to Small's concept of "Musicking"[64] (Jo, Parkinson and Tanaka 2013). The digital technology and the hacker/maker mentality can be understood as a return to the musical praxis that existed before the introduction of the Romantic works concept.

Within the communities of hackers and makers and many of the bordering praxes within post digital music, the creative drive focuses very much upon the process rather than aiming at music as a stabile object in the form of a musical work. This change can be illustrated if we compare Tudor's work to that of Interspecifics. Both of them are in one way working with concepts of nature. Tudor's use of

[64] According to Small, music should be understood as social activity. Instead of analysing "music" he introduces the term "musicking" to emphasis such a reorientation (Small 1998).

electronics was, as I explained, inspired by feedback loops found in nature with the goal of creating an indeterminate work of music (Gottschalk 2016, p. 12). Interspecifics, on the other hand, is a much more direct approach to nature, integrating the actual materiality into the sonic tool. In effect, they are creating a system that makes audible the sounds of changing electronic impulses between living organisms (CDM 2013). In the same way, Ewa Justka explores the material of light in her sonic tools (Ilius 2018). She does not copy its principle of nature, as Tudor did, into the concept of musical works. It is therefore clear that the ideas that both Justka and Interspecifics have adopted from fields of technology and science outside of the domain of music, have given them another approach to that of sonic tools. Taking the cue from creative praxes outside of the musical domain, has in these instances, liberated them from striving towards this ideal of a complete musical work.

5. Conclusion

Throughout this dissertation I have attempted to answer the following question: **how has mediating technology from the 1980s onwards, changed our expectations of how music should sound?** This is a broad topic that I chose to break into three specific sections, focusing on a distinct example of technology in each chapter, which was used within the time frame specified. The central part of the discussion has been to examine how the artistic possibilities these technologies afforded, influenced both the development and renegotiation of existing aesthetical ideals. As I illustrated, the impact mediating technology had on musical aesthetics was not only a result of the new sounds it enabled. What I showed to be of greater importance, were how different possibilities to mediate sound, become part of a critique, an expansion upon or a complete forsaking of governing aesthetic ideals. The three examples analysed in this dissertation, represent dissimilar technologies and touch upon very different artistic expressions. However, I argue that we can summarise these different discussions into two important findings that reveal something significant about the underlying structures in aesthetic changes in music. The first relates to how the aesthetics of music develop through the redefining and combining of different existing elements within musical praxis. The second relates to how these aesthetic developments coincide with a redefinition of the purpose of the technology that mediates sound.

Developing the aesthetics of music

All three examples discussed in this dissertation, have concluded with identifying specific changes in the musical aesthetics. What they all have in common, is that the developments that occurred would have been difficult to predict at the time when the technology entered the realm of musical praxis. The examples reveal a clear pattern of how the existing ideals did not foretell the changes that were to come. The first predictions of the early Roland drum machines deemed them as artistic failures. Since they could neither be played like a traditional instrument nor sounded much like the drum-kits used in music at that time, the TR-808 and TR-909 saw little use in music production in their early years. In the years that followed, however, more marginalized musical genres with alternative aesthetic ideals devised new ways to use these machines, eventually establishing new norms for how popular music was to sound. It was not the established musical aesthetics that evolved; rather earlier musical ideals were substituted with a different musical aesthetic.

Similar patterns also emerged in the history of the sampler. When the very first sampler became commercially available, it was marketed as a substitution for more traditional acoustic instruments with the added potential of creating new complex sounds. This possibility, of course, was widely exploited. Yet, the most important changes introduced by sampling technology were the artistic use of sound recordings as a source for new aesthetic expressions. As I demonstrated with the early Roland drum machines in Chapter Two, sampling was also taken up by alternative musical genres, which in turn changed the ways in which more mainstream communities understood the tool. I will therefore argue that the changes these tools stirred up in musical praxis and aesthetics was not something that could be anticipated if one only focused on the dominant aesthetic ideals existing at the time the technology entered the musical field.

The examples discussed in this dissertation uncover similar underlying structures for how mediating technologies becomes a force in changing musical aesthetics. As I state in my research question, I wanted to examine the role these tools played in renegotiating the borders as to what sounds are considered musical, and how these sounds are analysed and valued within an aesthetic framework. What all my examples showed, was that this renegotiation happened through empowering practitioners who were often marginalized in relation to the dominant musical framework. The tools shaped musical ideals in the ways they were taken up in new and unforeseen directions by practitioners who often worked independently of the dominant musical norms at the time. The new tools resonated with the ideals existing in a smaller community of musical practitioners, who subsequently used the technology to gradually develop their praxis, popularizing it so to establish it as the new dominant aesthetic. The discussions throughout the dissertation highlight that changes in music emerge when artists who live on the fringe of the dominant norms piece together elements of existing praxis. Through such elaborations, alternative aesthetic ideals are permitted to develop.

If we return to the example of sampling technology, the way alternative musical praxis shaped the conceptualisation of this technology becomes apparent. I there showed how DJ culture and emerging thoughts about ambient music inspired artists to go beyond the initial "purpose" of the sampler, which was to imitate earlier musical instruments, instead using the technology to recombine and manipulate musical recordings. Initially, this new artistic use of samplers was analysed along dominant musical ideals of musical quotation or protest against copyright control in the digital domain. If we, however, study this use of sampling more in line with the musical aesthetics of DJing and ambient music, we can argue that we are faced with a musical aesthetic that is radically different from the established norm. The concept of musical works that has been an underlying force in musical aesthetics of the 20th century, was in these instances substituted with a focus on the immanent social experience of the situation in which the music was realised. As David Toop argued, the DJ denied the conclusion of any musical work (Toop 1995:44). The sampling praxis of combining and manipulating recorded sound happened along a line of musical praxis where sound recordings were materials for a fluid realisation of musical experiences, not only a given and stabile representation of a musical work. Thus, we are not faced with what Goehr calls a derivative of the work concept (Goehr 2007:255), but rather an understanding of music existing outside of these confines.

The examples of the drum machines in Chapter Two also highlight how the use of technology in more marginalized musical genres is crucial to the reconfiguring of musical ideals. Once again, club music and DJing played a pivotal role. Since mediated sound was the norm when experiencing music on the dance floor, many of the ideological constraints associated with how music should sound and be performed were less important for the audience. What was important, was the sonic experience in the club and on the dance floor. It was therefore widely accepted that practitioners in this field would depart from acoustic instrumentation and pursue aesthetic experiments with synthesized sounds.

A reoccurring topic in this dissertation has been how the three agents of composer, notation and performer were influenced by the use of mediating technology. In both cases of the sampler and the old Roland drum machines, we see that musical praxes that were less constrained by these three agents were more prone to develop aesthetically with mediating technology. In both cases, however, the technology could also be used to reconfigure or strengthen one of these agents. The way the drum machines could be programmed, might be interpreted as a means for the composers to gain stronger control over their work by bypassing any imperfection of the performers. What became important to the subsequent use of these machines, was not a reorientation in the role of the composer but how the kick drum actually sounded. This inspired a reconfiguration of sonic aesthetics that broke with ideals of acoustic instruments, instead taking advantage of the physical experience of base sound and rhythms. In the case of the sampler, it could also be argued that it provided a means to expand the sonic capabilities of the performers; only one “instrument” was needed to recreate the sounds of any instrument they could imagine. However, as

I mentioned, it was the ability to combine and manipulate larger sections of recorded sound that for the most part became the important entry point into understanding the artistic repercussions of this “invention”.

My findings about how marginal artistic groups often played the most important role when using new tools to develop musical aesthetics, also explains the often contradictory relationship between practitioners and manufacturers of music technology. With both the old Roland drum machines and the sampler, it is clear that the initial design, construction and marketing of these machines did not centre on the artistic use that they eventually became a part of. This must not be taken as proof that the music technology industry operates in isolation from the artistic communities. What it implies, is that such tools were designed and marketed based on the potential needs identified amongst the established majority of musical practitioners. The musicians who ended up using the old Roland drum machines to establish new musical aesthetics were not recognizable to the producers at the time the products were designed. The most significant development in shaping a new sonic aesthetic in music, therefore happened when manufacturers took notice of the ways in which practitioners had ended up using these sounds, and developed the concepts presented in the TR-808 and TR-909 further. Sampling technology was subject to much of the same cultural development. The first hardware samplers were expensive and therefore designed to accommodate the needs of established practitioners who could afford such tools. Promoting the tools as a substitute for other musical instruments was therefore a logical approach. With the release of cheaper machines, the tools reached different communities of practitioners who used the sampler in line with totally different creative ideals. In the end, the way these communities used the sampler was taken up in later hardware samplers and finally the release of software like *ACID* and *Ableton*.

This complex relationship between the music technology industry and the artistic community, points us finally towards the third example I discussed in this dissertation in Chapter Four. This was not so much an examination of a concrete example of technology, but rather an example of an attitude to technology. Here I analysed how the artistic praxis of designing sonic tools changed our aesthetic perception of music. The commercial industry for music technology became an important factor in this discussion, since many artists actively redesigned existing mediating technologies so that they worked counter to their intended use. However, as with the two previous examples, the development of this praxis was again greatly inspired by ideas outside of the established musical norms. By looking into the praxis of Music Hackers and Music Makers, I argued that technological communities outside of the field of music inspired them to approach the role of tools differently.

Musical instruments traditionally have been understood as stabile entities producing sounds that are familiar and culturally accepted into the realm of music. Artists creating their own sonic tools typically do so to create sounds that fall outside of what is aesthetically accepted as mainstream music. At the same time they challenge the praxis of how music is to be created. On one level, the praxis of artistic creation of sonic tools can be understood as a direct critique of established musical praxis, engaging in the creation of noise music. This dichotomy of "noise" and "music" does however lose its relevance if we consider how the post-digital tendencies and hacker ideologies approach the relationship between users and their tools. In this environment, digital tools are understood as flexible entities; users always have the ability to change and develop them to suit their artistic needs. The dichotomy between a correct and incorrect use of mediating technology no longer holds any relevance in such a creative environment. This consequently leaves the analysis of music based on such concepts, as less meaningful in relation to musical aesthetics. What we are faced with within the realm of Music Hackers and Music Makers, is instead a focus upon music and sound in a fleeting form. This breaks with the established norm of evaluating sound based on a connection to an external system of signifiers.

Mediating Technology

The second important finding in my dissertation is not so much centred on the actual aesthetical changes in music, but on how these changes largely correspond to a changing attitude towards mediating technology. As I stated at the very beginning of this dissertation, I based my research question on a very specific definition of mediating technology: as a technology that enabled the storage, manipulation and creation of sound through signals that were not sounds in themselves. What I wanted to achieve with this definition, was to establish a broader focus on the possibilities in technology to alter our concepts of sound. Focusing on mediating technology in this way, meant I could approach the larger scope of technological possibilities, thus spanning both the storing and reproduction of sounds, all the way to the creation of new sounds. Often, writings on sound and music have taken the reproductive and mimetic characteristics of mediating technology as a starting point. Applying a broader perspective to sonic mediation, I therefore hoped to gain a new insight into the topic of music and technology. Many of the same technological principles can be used to both re-create and create sound. Mediating technology in music therefore exists in a fleeting state between these two corners of creating and re-creating sound.

One finding that consistently appears in all discussions from Chapter Two trough Chapter Four, is that mediating technology historically has evolved culturally from the initial purpose of re-creating towards primarily that of creating sound. In all three examples, the conceptualisation of mediating technology starts out with clear links to reproducing sound from the known acoustic realm, but gradually becomes more and more understood as a sound-source on its own terms. There is, therefore, a clear link between new musical aesthetics and an acknowledgement of new creative potential within the mediations of sound.

The important changes that the TR-808 and TR-909 instigated in music, appeared when artists began to focus on the unique characteristics of synthesised sound, not just treating them as replacements for acoustics instruments. Much of the same reorientation was also important for developing sampling praxis. The sampler clearly started out by exploiting the mimetic potential in mediating technology by reproducing the sound from existing instruments. What happened however, was that artists used the sampler more and more to explore the medium of sound recording, using the sampler to create new sonic soundscapes and musical expressions. At first, such a move could be seen as merely a form of musical autosonic quotation; but as I argued, it could also be analysed in many cases as a radical departure from the idea of recording technology as a reproduction of musical works. The cultural praxis of DJing framed the praxis of sampling towards an aesthetic focus on the subjective experience of sound amongst a dancing audience. In such a cultural environment, sound recordings are framed as a material for further artistic creations, not just as an artistic end result in themselves. This represents a significant reconfiguration of the purpose of sound recording from being a technology used to re-create sound and musical works, to a mediating technology that has a creative artistic potential in itself.

In relation to how mediating technology is used, my discussion about the artistic creation of sonic tools probably presents us with the most radical redefinition of sonic mediation. In some of the examples I discussed, artists deliberately redesigned recording technology to break down its mimetic possibilities. This praxis was described by Caleb Kelly as Cracked Media, redirecting electronics to create new sounds (Kelly 2009:286). My focus, however, was on practitioners I defined as Music Makers and Music Hackers, who had much in common with this praxis of Cracked Media, but in my opinion demonstrated a more radical approach to mediating technology. Instead of working to redirect the function of known tools, they approached tools as an open-ended material that lacked an inherent purpose. Taking inspiration form Hacker Ideologies, they defined the tools as a flexible entity that could be shaped by the artist to work in many ways. Mediating technology thus becomes the material basis amongst these artists for an exploration of sound, where the fleeting nature of sound in itself is important. The tools are no longer evaluated against a norm of reproducing known sounds; either in a positive or a negative sense.

Further Research

The conclusions I arrive at in this dissertation, are based upon a limited number of examples. It would therefore be interesting to explore how my findings relate to other examples of mediating technology used in musical creativity. For me, the most important finding is to acknowledge that musical praxes are heterogenic and in constant flux, and that this fact must be taken as starting point in any studies on music and technology. What is therefore important, is to contextualise the discussions by also questioning established assumptions that might have shaped the starting point for our research. In relation to many of the contemporary artistic expressions, it is clear that traditional assumptions about what music is and how it is created, might be about to change. As my discussions about Music Hackers and Music Makers illustrated, a clear move away from the concept of musical works as a fixed ontological entity towards music as a subjective experience of an ongoing creative process, seems to be happening. If this is a development that is also going on outside of the examples I have described, there is great potential for further investigation.

The focus of my dissertation has been on the technological developments from the 1980s onwards. My discussions have therefore had a clear retrospective scope. The recent years have seen an immense development and proliferation of complex technological tools for musical production. As I already have referred to, Robert Henke claims that making music by electronic means today is just as accessible and easy as playing the guitar (Goldmann 2015, p 41). With the flexibilities and creative potential afforded in present-day tools, how we will engage with and experience music in the future can be about to drastically change.

I previously mentioned Eisenberg's speculations about how technology will create a new musical reality. In his last speculation, he envisioned a digital tool that would enable any person to easily create complex music on the flow, fitting their mood and situation (Eisenberg 2005, p. 222-224). When first reading this, it seemed rather unlikely and futuristic; however, since then, a recent experience has changed my mind. At a very late stage in working on this dissertation, I had the fortune to witness the British artist Tim Exile demonstrating a new app he was developing. Earlier, he had designed patches for Native Instruments' *Reaktor,* a programming platform for sonic tools, not so unlike Max/MSP as I have earlier described. This was, however, an app for smartphones, that would enable the user to create complex electronic music through simple touches on the screen and the use of your own voice. The app is called *Endlesss,* and will be launched later in 2019[65]. The app promises deeper levels of creative engagement: by sharing what you create with others and allowing them to play further with your ideas, music becomes a social creative endeavour. What new tools such as this will mean for our understanding and enjoyment of music, is not possible to predict. What is important in my opinion, however, is that further research on

[65] see Endlesss´ web page, Retrieved 13 April 2019 <https://endlesss.fm/?fbclid=IwAR3maHob_AH3AOFo4NjMFaUQIoOAJljHaiYXiq1ygUcGJ15WhPKbCtTTFzc>

technology and music continues to focus upon how the musical ideals we take for granted can be in the process of drastic reconfiguration.

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