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Free Improvisation:
Researching the Acoustic Space

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Abstract

Free Improvisation: Researching the Acoustic Space

Vaba improvisatsioon: uurides akustilist ruumi

This research presents ideas for incorporating a performance environment's acoustic context into relevant aspects of free improvisation. The aspects of improvisation are musical language, real time processes, and approaches in relating to a space. The Acoustic Context is a theoretical model provided by improviser/percussionist Le Quan Ninh which encompasses an overall view of a space's room acoustic and acoustic environment (i.e soundscape or background sounds). The purpose of such research is to provide additional options for improvisers in their creative endeavors, as well as gain deeper insight into how an improviser could make use of environmental phenomena in their own artistic practice.

This research was conducted through two case studies. Each study makes use of two uniquely different performance spaces. In each case, the acoustic properties of the performance space were measured using the Transfer Functions method developed by Swen Müller and Paul Massarini. The data from this was then applied to an experiential methodology known as the Kolb Learning Model. This model represents the learning pathway an individual takes in transitioning between experiences, observations, and conceptualizations. The concepts generated can then be used for conducting experiments. In each case study this model was used to derive concepts unique to the performance space's Acoustic Context. To fulfil the final experimental stage of the Kolb model, two live concerts were performed using the concepts. These concerts were reflected upon regarding their functionality for use in real time improvisation.

Results show a number of possibilities. Pierre Schaffer's sound object is functional for addressing areas of musical language and their incorporation into the Acoustic Context. In terms of processes that can incorporate the Acoustic Context, feedback systems proposed by Jeffrey Pressings and Evan Parker as well as outlined decision making strategies prove to be possible. The two main approaches discussed for relating to the Acoustic Context involve viewing the performance space as an instrument and/or as an ensemble.

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1. Introduction

This research was undertaken due to a set of my own experiences in the field of free improvisation. I am a free improvising guitarist who has worked with multi-channel diffusion and electro acoustic music in a variety of settings. My artistic output has often involved the combination of site specific ideas, prepared guitar, and instrument extension through analog and digital electronics. During a number of projects, I made several attempts to integrate concepts of site specificity into improvisation. I wished to develop improvisations that were consciously dependent on site specific properties of performance spaces. The idea occurred because I found myself performing in different types of venues such as concert halls, black box halls, book stores, coffee shops, libraries, and art galleries. Since these performance spaces differ in many ways, it seemed plausible to entertain the idea of site specificity in improvisation. Furthermore, developing such strategies could provide additional possibilities for how to create improvisations.

However, during many of these attempts I experienced shortcomings. I was only generally familiar with the perspectives possible for describing performance spaces. Room acoustics, room design, architecture, or social context are all possibilities for entertaining the notion. In order to incorporate them into my improvisations, I felt I needed a better understanding of each concept as well as some predetermined approaches.

The focus of this work is placed on the acoustic aspects of a performance space. This was isolated from the other possibilities in order to limit the broad scope of the idea. Furthermore, there are historical precedents for working with the acoustic aspects of a performance space, which are discussed further in this text.

The contents of this thesis are organized as follows. Processes involved in conducting free improvisations, its real time definition, theories regarding environmental considerations, and musical language are discussed in **Chapter 1**. **Chapter 2**, labelled Methodology, contains the applied methodology as well as theoretical descriptions of the phenomenon involved in the term Acoustic Context. **Chapter 3**, Analysis of Performance Spaces, presents some acoustic analysis of the performance spaces used in this research. **Chapters 4**, Conceptualizations for Improvising with the Acoustic Context, presents the observations and concepts I made for each performance space in this study. **Chapter 5**, Concert Reflections, presents reflections on two concerts which made use of the developed concepts. The final chapter labeled

Conclusions presents some reflections on this overall research and suggestions for how to further expand upon solving this artistic problem. Audio examples are provided when necessary, in the accompanying audio CD.

1.1 Improvisation and Real Time Creativity

This section focuses on identifying the concept of 'real time' as one the most important traits of improvisation. By real time, I am referring to the temporal or in situ experience of time. In order to create a clear distinction between the artistic practice of improvisation and other music making processes, it is necessary to point out the aspect of improvisation that allows it to exist as its own artistic field. This aspect is how real time relates to the creative action in improvisation, and how that may differ from the use of creativity in other musical domains.

To improvise is generally considered the action of creating without a forecasted plan. To the extent one is unprepared or experiences some percentage of unpredictable events during real time, they improvise. This can be taken into account in many everyday life experiences. Several of our actions occur with forecasted plans. However, they are never one hundred percent predicted, and to this extent we make use of improvisation (Shaw; Stacey 2006: 2).

The use of creative action inside of an unpredicted real time scenario is an important aspect to consider. During this moment the individual must produce new and/or original ideas while elaborating and evaluating those ideas during real time execution (Macdonald; Meil; Wilson 2010: 249). These actions share a commonality with how creativity has been defined by Ellis Paul Torrance, fulfilling his categories of flexibility, fluency, problem solving, and elaboration (ibid.). During improvised music making, the improviser makes use of these skills. This makes the resulting improvised music a kind of demonstration of real time creativity (Alperson 1984: 23).

This is a distinguishing feature of musical improvisation. During an improvisation, creative choices and execution processes are enacted inside the same temporal time span (Alperson 1984: 23). The creativity involved in producing the music is literally on display as part of the performance. This is a kind of universal quality of improvisation that is true regardless of the style of music under investigation (Macdonald; Meil; Wilson 2010: 250).

Real time creativity is what differentiates improvisation from other musical activities. The majority of a composer's or performer's creative actions occur prior to the performance. The result of a composer's creative action is the production of a final work which is intended to be performed repeatedly (Alperson 1984: 25). A performer likewise prepares the execution of a composer's musical work prior to the performance, typically through interpretive means (Alperson 1984: 20).

The improviser is not involved in the production of a musical work. Musical works are intended to be repeatedly performed (Benson 2003: 6–7). This would be a contradictory intention for an improviser, as repetition of an improvisation would disqualify it as an improvisation (Hamilton 2000: 177). The improviser is not in the same position as composer or performer, as their creative process is on display during the presentation of its results and is not intended to be the creation of a repeatable musical work.

However, even in a concert of through composed music, there can always be a certain percentage of unpredictability regarding performance. In some views this could be considered making use of improvisation. Performances always include some degree of unpredictability due to subtle differences in performance technique, whether made purposefully or not (Benson 2003: 85). When discussing composed notated music, there is a variety of opinions regarding how much the performer should interpret the notation, how much can be reinterpreted in real time, and what musical aspects can be modified during real time performance (Howat 1995: 3–6). The possibility of real time creativity can certainly be part of any performance, depending on the desired aesthetic or goal of the artwork.

Often the idea of improvisation is discussed based on a scale illustrating the amount of real time decisions that can be applied to a score or intention (Nilsson 2011: 31–32). Karin Johansson (2010) has discussed such a topic in regards to the performance of organ music. In Johansson's scale, more and more improvisation is included in the real time performance when less and less strictly notated music is involved. As the organist moves away from strict notation they rely on general concepts from which they create improvisations. Often these include the well established musical/structural language common in organ music. At some point even these traditional concepts become abandoned for completely free approaches which are framed by personal preference.

However, the issue of real time creative involvement in performance is somewhat difficult to address in such pure manner. It would be logical to assume that some music is appreciated precisely because of its improvisational quality. Though other types may contain improvisation to some degrees, this is not necessarily considered desirable (Hanslick 1957: 76–77). Regardless, the matter of real time creativity plays a more significant role in the identification of improvisation then in other musical processes.

1.2 Freedom in Improvisation

The context of this thesis is in the field of free improvisation. The definition of freedom in improvisation exist in theoretical vagueness (Borgo 2002: 168). This creates some difficulty in outlining any research, as many properties of the creative activity are often debated. It is common that improvisers refer directly to their actual practice instead of outlining any theoretical definitions of the music (ibid). To the best of my knowledge there is not a publication available for handling all of the issues of concern. However, I will restrict the conversation to important aspects found in the field which are relevant for framing this research.

Free improvisation is generally defined as improvisation in which no preconceptions regarding musical form, structure, and musical language are made prior to real time performance. The way form unfolds in real time is a result of the decisions made by the performers (Bailey 1980: 111). Structure, or how musical sounds relate to each other, to some degree, is invented in the moment (Prevost 1995: 26). Musical language, the sounds and techniques used by an improviser, also are considered to contain the possibility of being invented in the moment (Bailey 1980: xi).

This is somewhat different from other traditional uses of improvisation. Traditional Jazz revolved around repetitive chord sequences, stylistic approaches to phrasing, rhythmic feel, and specific repertoire (Berliner 1994). Generally, in Jazz the improviser creates overtop of a repetitive chord sequence which has been conceived prior to the performance. Even in Free Jazz, the approaches taken when abandoning some of Jazz's harmonic traditions were still referencing many of the common techniques, motifs, and melodic concerns found in a jazz improviser's vocabulary (Bailey 1980: 54).

Several concepts of freedom are debated amongst improvisers. Essentially the debate revolves around how much real time invention is occurring as opposed to habitual restating of musical ideas or processes. For example, guitarist Derek Bailey insisted that free improvisation only occurs when the improviser completely invents in the moment without relying on any previously formed habits (Bailey 1980: 112). However, saxophonist Evan Parker finds this idea to be absurd, and instead believes all improvisation is a kind of relationship between known and unknown parameters (Parker 1992, accessed April 20th 2014). For Parker, improvisation is simply a way of making music which allows certain types of discoveries to be made in real time and that these discoveries are always based on or are derived from past experiences (Parker 1992, accessed April 20th 2014).

These are just two of the contradictory beliefs contained in free improvisation. More can be found in reviewing the writings by members of AMM, Eddie Prevost (Prevost 1995) and Cornelius Cardew (Cardew 1971). Free Improvisation contains such diversity that often it is considered a field impossible to define (Bailey 1980: xi), and possibly difficult for research.

In order to avoid providing a definitive definition that encompasses every instance of free improvisation, I will rely on two aspects commonly discussed in artistic practices, philosophical, and psychological research. These are the aspects of musical language and real time process. This is not to say that these are the only concepts of relevance in the entire field. They simply function as concepts which are necessary for outlining the goals of this research.

Musical language is a major aspect often addressed universally in improvisation. Musical language refers to the kind of sonic materials used by the improviser. One can find several instances of jazz considered as a musical language (Berliner 1994: 65–81). Similarly, such a concept is also found in Indian Raga improvisation (Nooshin; Widdess 2003). The use of the term musical language in improvisation makes the general assumption that an improviser collects a bounded musical vocabulary overtime. Several free improvisers use the term to refer to a common stockpile of musical materials and techniques (Bailey 1980: 106). The materials of a style of music can cover a range of concepts including pitch, rhythm, timbre, articulation, tempo, harmonic progressions, and dynamics. Additionally, the term has been used by researcher connecting improvisation with linguistic philosophies (Bertinetto 2011) and cognition theories (Berkowitz 2010).

Musical language can refer to the way in which sounds themselves are described (Nilsson 2011: 159). To exemplify, most western music has made use of the concept of pitch in regards to an organization of intervallic relationships where as electroacoustic music has somewhat abandoned this concept. Instead there is a greater focus on the spectra or timbre components of a given sound (Smalley 1997: 108). Pitch can still be more or less present in many electro acoustic works, it is simply not always the point of greatest consideration for sonic description. These differences can be innumerable when comparing different genres.

From its first conceptions free improvisation has made use of uncommon musical languages for use in improvisation. Part of the idea of freedom in improvisation was to expand the types of musical languages used for creating improvised music (Borgo 2002: 168). For example, Bailey made use of atonal pitch structures which he derived from the study of scores by Anton Webern (Bailey 1980: 107). Parker’s approach embraces the spectral capabilities on the saxophone available through manipulation of the overtone series

(Borgo 2005: 38). Guitarist Keith Rowe, member of AMM, was inspired by abstract expressionism in painting and developed his own techniques through odd positioning of the instrument (Hopkins 2009). This involved positioning the guitar in an unusual manner in order to force Rowe to find new physical techniques for eliciting sound from the instrument. The variety of approaches are numerous and too abundant to thoroughly to discuss here, but Todd Jenkins *Free Jazz and Free Improvisation* (2004) provides a wonderful overview of the diversity contained in the field. It is generally considered beneficial that the improviser avoids musical material which is reminiscent of more traditional uses of improvisation (Bailey 1980: xi). This is because one interpretation of freedom is freedom from codified musical languages, which some felt had become too predictable in nature to enable real time creativity (Bailey 1980: 58).

In free improvisation there has been a strong suggestion that the individual improviser develops their own personal musical voice (Hopkins 2009). Typically, the improviser seeks to develop their own approach which both reflects knowledge of contemporary approaches but also contributes new ideas for sound making (Borgo 2002: 172). In doing so, the improviser creates a bounded system of identity which they then employ during the real time activity of improvisation.

It should additionally be stated that the concept of musical language could, in some ways, contradict or muddy the idea for freedom in improvisation. Firstly, an improviser typically chooses the types of sounds or techniques by which they practice/perform on their instrument. This choice is inherently an aesthetic one, as it is a choice to work with certain musical material over others. The aesthetic arrived at, the language developed, the physical techniques applied, and the approach used for identifying properties of sounds could all lead to predictability during improvisations. This is simply because the language itself creates a kind of bounded system, and all such systems can lead to redundancy and repetition (Pressings 1984: 16). It depends on the individual improviser's interpretation of the term freedom and the relevance of this redundancy. This can be an aggressive point of debate amongst different improvisation aesthetics, particularly as it applies to the term freedom (Bailey 1980: 113–117). However, I see such debates as beneficial to this type of musical creation, as it helps to avoid the development of dogmatic or hegemonic approaches to improvisation, something for which the field of Jazz has become regularly criticized (Macdonald; Meil; Wilson 2010: 248–249).

Process refers to the way in which an improviser operates in real time. Process in improvisation is heavily spoken about in the fields of motor skill processing (Pressings

1984), psychology (Borgo 2005), and by some artists themselves (Parker 1992, accessed April 20th 2014). The term can cover a wide range of topics in improvisation. Psychologist Jeffrey Pressings (1984) has correlated theories of motor skill processes with common statements made by improvisers regarding real time creation. Neuropsychologists have used similar methodologies in correlating the brains linguistic processes with improvisation (Berkowitz 2005).

One possible process in improvisation relies is the concept of intuition. The definition of the concept can be rather unclear when addressed by free improvisers. However, one possibility definition to consider is that prior skilled learned activities, or a collection of past experiences, instill a set of implicit memories (Snyder 2001: 76). During an intuitive decision making process implicit knowledge is made available (Pressings 1984: 15–17). One possibility for developing oneself as an improviser could be to purposefully engage in new learning activities in order to instill new implicit knowledge, which could then supply additional intuitions during improvisations.

However, the general use of the term process in this thesis refers to conscious activity conducted in real time. This is to say that an improviser engages in real time scenarios and is aware of the variety of ways to make musical decisions in real time. Typically, in the processes used are loosely defined enough so that the music created is not completely redundant in relationship to prior instances of improvisation (Parker 1992, accessed April 20th 2014).

One approach, relevant in this work, is the use of feedback systems. Feedback control systems are systems that operate on a cause and effect basis in which the output of the system is fed back into the input (Pressings 1984: 6). For an improviser, this would mean that the sonic output of their instrument during real time is fed back into the system (via listening) which results in another output onto the instrument. In this case, the improviser themselves function as the system in which input and output is fed into. An illustration of a feedback system is provided in **Figure 1**, on the following page. There are several variations of these types of systems available, but the fundamental premise remains the same regarding the general mechanisms.

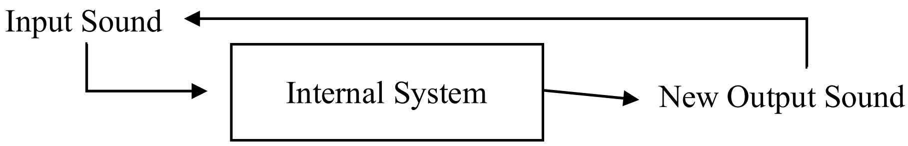

Figure 1.

Illustration of Feedback System.

The way in which this internal system operates is a heavily debated issue in improvisation research. Pressings (1984: 6) believed it to be an automatized system which is developed through years of practice and physical development. Other ideas range from Embodied Cognition (Ilyer 1997) to linguistic processing (Berkowitz 2010: 148). However, for the purposes of this thesis I view the process as possible for both conscious and subconscious or intuitive responses. This is to say that the improviser is aware of the processes involved in making one improvised utterance to the next. This is a necessary step for this artistic research, as it would be a bold assumption that introspection into my own subconscious processes is achievable, particularly in real time.

Conscious awareness of the internal mechanism is not an uncommon view to have. Parker proposes a kind of semi conscious system he labels Biofeedback. The term is adopted from the field of cognitive sciences. The Association for Applied Psychophysiology and Biofeedback defines it as:

"the process of gaining greater awareness of many physiological functions primarily using instruments that provide information on the activity of those same systems, with a goal of being able to manipulate them at will" (The Association for Applied Psychophysiology and Biofeedback, Accessed 20th of March 2018).

Parker's use of the term refers to the enactment of a particular goal on the musical instrument. During an action, either through accident or through new perceptual discovery, the instrumentalist becomes aware of new sonic possibilities available on the instrument while also the physical action required to create it (Hopkins 2009). This creates a kind of feedback loop where the improviser is being informed of possibilities on the instrument during his/her attempts to control it. In this mechanism the improviser must be aware of the goal they are pursuing, the output of the instrument, and the physical action which produced the output.

Concerning aesthetic issues, both the concepts of musical language and process are relevant. The musical language the improviser chooses as well as the processes they develop can all be considered part of the improviser's artistic offering, with clear preferences made towards certain sounds and real time processes chosen over others. In addition to this, there may be some point where it is difficult to distinguish between process and musical language. Naturally, the types of sounds developed by the improviser outside of real time could still hint at or influence the types of processes which will be employed during real time. Some improvisers even consider the possibility that the musical language is invented during real time improvisation (Prevost 1995: 17). However, for my purposes there is a need to distinguish between the materials used on the instrument and the ways in which decisions are made during improvisation. Distinguishing between these two phenomenon is a common approach in the field of improvisation for reasons provided in the prior paragraphs.

The major consideration in this thesis regards expanding some of the possibilities for real time creativity in free improvisation. The concepts mapped out for development are specifically musical language and process. This section provided the general definitions of these concepts. Following regards their interaction, and the main concern of this thesis, with the properties of performance environments.

1.3 Improvisation and the Performance Environment

This section presents the context of thought regarding the incorporation of a performance space's properties into improvised music making. The first addressed in the context of thought and the historical precedents already suggested in the field. After this, the concepts of Acoustic Context is outlined and concerns regarding relationship, musical language, and process are further discussed.

There is good reason to consider the properties of a performance space. Freely improvised music can incorporate a diverse set of possibilities for real time creation. Deriving approaches for creation from a performance space's properties could add to the amount of possibilities available for real time creativity. Furthermore, it has been suggested by Pressings as an element that could influence the feedback system, or any internal systems, operating during improvisation (Pressings 1984: 26). The general premise is that the interaction with environment is fundamental in complex real time decision making.

Additionally, there is the proposition put forth in Music Ecology which suggest the need to understand several aspects of a musical experience when analyzing any musical creation. The field of Music Ecology, as proposed by Eric Clarke, adopts the theory of affordances put forth by James J. Gibson. An affordance is what a given environment offers an individual organism through that organism's perceptual capabilities. In Clarke's case this idea is used to build a discussion on the possible systems, embedded in an environment, afforded to the listener for constructing musical meaning through their perceptual capabilities. These systems can range from historical issues, cultural systems, concepts of agency, socio-political issues, and a host of other systems all of which could influence perception. The performance space itself could influence the construction of musical meaning, as not only does it contain all of the previously mentioned concepts, it also can literally change our perception of a sound. (Clarke 2005: 17–47)

However, the possibilities offered by taking on ecological or motor skill processing perspectives may be too broad for the focus of this thesis. Investigating all of the possible affordances would firstly, fall outside my area of expertise. Secondly, my concerns are much narrower and I seek to rely on ideas which are put forth in my own field, improvisation. Use of ecological theories are based on the assumption that a system or structure is embedded in the performance space. Since my concerns are individual in nature, I find it more fruitful to firstly pursue my own approaches as an improviser. Ideas arrived at in this research may be useful in later research where a more ecological approach is taken.

To simplify my approach and rely on artistic offering from practitioners in improvisation, I focus on the concept of Acoustic Context. The concept was developed by percussionist and improviser Le Quan Ninh. The Acoustic Context is the sonic situation, as well as the properties influencing its experience, of a given site at a specific time (Ninh, interview April 10, 2017). This can include a room's acoustic properties or any intentional/ non-intentional sounds that occur in the space. Room acoustic concepts deal with such phenomenon as reverberation, standing waves, and frequency response. Intentional or non-intentional sounds points more towards the concept of Acoustic Environment, which is an entire aural portrait of the sounds emanated in a given area. More elaborate definitions of the aspects involved in the Acoustic Context are further discussed in **Chapter 2**.

Discussing a room acoustic's or its acoustic environment has some historical precedents in free improvisation. Firstly, the idea of responsiveness to a performance environment is already suggested by some of the first free improvisers. Bailey considered the improviser inherently equipped with the ability to respond to an audience's reactions (Bailey 1980: 38). Room acoustic aspects have been important to Parker regarding his perception of the overtone series created by the saxophone (Borgo 2005: 38). Improviser John Butcher has published an entire album of recordings entitled *Resonant Spaces.* Each recording took place in a different space which he believed produced interesting conditions for improvisation (Butcher 2018). However, not much analysis of these approaches has ever been conducted.

Japanese *Onkyo* developed around the site specific nature of its most common performance environment, Offsite (Novak 2010). *Onkyo* is a Japanese word which roughly translates to English as 'special acoustic'. Offsite was located inside of a residential space directly across from a noisy shipping harbor. The volume possible for the improvisers was minimal due to the surrounding residents. However, the noisy shipping harbor produced a large amount of sounds which penetrated the performance space's thin walls. These improvisers' approach was to integrate these sounds as part of their improvisations. This led to minimalistic improvisations which involved long sustained drones. Instead of focusing on generating a large degree of musical activity, the improviser focused on the changes that occurred in their perception while listening to the entire aural portrait of the environment.

As previously stated, a significant contribution to this thesis has been adopted from Ninh. Ninh believes the main function of improvised music is to reveal the conditions which frame our experiences of real time. He entitles this *"revealing the acoustic context"*. For Ninh, he believes that a given space provides musical ideas for the improviser, such as a hall that responds well to high frequencies. The improviser's input into the environment reveals these aspects of the environment. One could assume that Ninh's approach involves some amount of action-reaction in an Acoustic Context. (Ninh, interview April 10, 2017)

Considering how the Acoustic Context can be integrated into musical language, process, as well as our relationship to it, is the starting point for this thesis. Though these three aspects of improvisation are not the only issues of concern, they are at least clear points of departure. Furthermore, there is at least some suggestion in the prior precedents regarding how an Acoustic Context may influence or modify their contents.

The idea of relating to an Acoustic Context is the first important issue. In using the term 'relate' or 'relationship' I am identifying the perspective the improviser can have over an Acoustic Context. The easiest example of relating already discussed in free improvisation is how an individual improviser relates to an ensemble. It is commonly assumed that during collective improvisation individuals attempt to form some musical coherence while also attempting to satisfy individual aesthetic preferences (Canonne; Garnier 2011: 1). These two desires will frame the types of musical language and processes the improvisers enacts, essentially serving as a rough goal the improviser wishes to achieve.

There are already a variety of opinions regarding how the improviser can relate to an environment. As stated earlier, Bailey considered the performance environment as providing something to react to. This implies a kind of subject/object relationship in which the improviser responds to elements outside of themselves. Another example is found in *Onkyo* in which improvisers use the surrounding environment as part of the music they create, and a fundamental element for guiding their changes in perception. In this instance the improviser's relationship is to see themselves as just one element of an overall environmental context, relating to the space as if they are just one part of the music. Additionally, one could see Ninh's approach to revealing the Acoustic Context as a relationship, in that his relationship is one of exposing the Acoustic Context's properties.

Parker provides some practical thoughts on the idea. Changes in musical language due to Acoustic Context is specified in Parker's statement concerning the timbre of the saxophone. Parker states:

"…you can listen more closely to the specific resonances of the room, to the specific interaction with the acoustic, to the overtone components of the sound–the harmonic components of any note become more audible. The temptation to fragment individual tones into their harmonic components becomes very attractive because you can hear yourself that much more closely; you can hear the detail of what's happening in any sound" (Borgo 2005: 38).

Parker is alluding to how a room's acoustic can change the perception of an individual sound. He furthermore clarifies that this perception provides a new perspective on the sound. Parker's focus is still perceptually on the changes occurring to an instrument's sound, and what technical possibilities this affords him. One could inference that since the perception is mainly focused on the instrument, then perhaps Parker is viewing the space as an instrument extension.

However, the possibility that this experience occurs leads to interesting questions. In Parker's case he is referring to the advantages gained by a room's acoustic properties revealing the overtone structure of the saxophone. However, in order to do that Parker would already have to be listening for this overtone structure and already possess ways of aurally identifying it. If he were perhaps more concerned with observing motifs in a musical phrase, he may not recognize the changes a room's acoustic properties are generating.

The concept of listening, as proposed by phenomenologist Jean–Luc Nancy, suggest that the listener must already posses the ability to recognize parameters or properties of a sound (Nancy 2007). In Nancy's description, the listener is actually sending out a signal in search of the parameters they recognize. Similar to the words of a spoken language, the listener is only capable of recognizing sound parameters with which they are already familiar.

Though it is not clear if Nancy's proposal is of certainty, the implications of it for musical language in an Acoustic Context are drastic. If an improviser wants to relate to an Acoustic Context their language, or more precisely the properties by which they recognize that language, must be adequate for describing how parameters of that language are effected, modified, or perceived differently in an Acoustic Context. Only then could a specific type of relationship be achieved. Otherwise the improviser may be addressing sound in a way that is not adequate for perceiving its placement, or any effects, inside an Acoustic Context. For example, if an improviser is not aware of the possible ways a reverberant field could effect the sound they produce, then they may not be able to notice the phenomena during a concert performance.

Furthermore, improvisers typically do not form their musical language in one Acoustic Context. Forming a musical language involves years of practice, listening, and developing one's instrument. This is rarely done inside of one Acoustic Context, but instead, inside of several. This can lead to the improviser conceptualizing their sound as something separate from the influence of a room or space, causing the improviser to overlook the transformation in the perception of a sound that can occur.

Even though improvisers have specified types of relationships that can occur with Acoustic Context properties, they do not offer how this occurs in terms of musical language. Bailey does not offer any ideas regarding how is atonal musical language is used to react to an environment. *Onkyo* has mostly been discussed regarding its cultural aesthetic issues (Novak 2010), without considerations to how the improvisers precisely achieved their approach in musical language. Parker does shed some light on the issue, but his approach is mainly concerned with multiphonics on the saxophone, which is highly specific to the instrument.

The issue of process is essentially asking how can the properties of Acoustic Context be used for decision making in real time. The improviser may have a way of relating to an Acoustic Context, and also an adequate language for integrating the phenomenon. However, this in itself does not mean that the real time creations will reflect these two things. Though Parker suggests a realization regarding his instrument's sound in the performance space, it does not immediately suggest how he can use that information for real time creation.

The same issue arises regarding process as it does for musical language. There are many ways to make decisions in real time, but it would be an overstatement to assume all of those ways are adequate for incorporating a performance space's Acoustic Context. Since no improviser has clearly addressed this issue, the starting point for such an idea is rather open ended.

The degree of ambiguity in the statements made by these improvisers provides fruitful opportunities for conducting artistic research. The major points discussed here are the main parameters taken into account during this research. In doing so, the knowledge gained hopefully provides some new ideas for how improvisations might be created.

1.4 Research Aims and Objectives

The aim of this research is to add to the existing possibilities for creating free improvisations. Several approaches exist in the field concerning both methods and aesthetic intentions. However, due to the nature of free improvisation as a music that purposefully avoids conventions, there is a need to consistently provide new possibilities for how the improviser can create (Bailey 1980: 142). By incorporating elements of the performance space into improvisation process, I am simply trying to add to the options available for how the improviser creates in real time.

The main question of this research is how can aspects of a performance space's Acoustic Context be integrated into aspects involved in creating free improvisations. However, there are some particulars implied by this question. Firstly, it involves the concept of relationship. What are the possible ways of relating to an Acoustic Context? Secondly, it involves musical language, which is essentially asking what perspectives on sound are adequate for achieving a specified relationship within an Acoustic Context. Then there is also the concern of processes. This is to ask what process for improvisation can be employed in real time which integrates the conditions of the Acoustic Context.

Ideally, it would be most beneficial to find a few approaches which integrate all three concepts. That is to say that the way for relating can be shown in the approach to musical language and in the applied processes. Providing a concept which describes how a musical language and chosen process will achieve a specific relationship is the desired goal of this study.

However, it should be stated, due to the broadness of this question, the knowledge gained here will not encompass all the options available. The possibilities contained in the idea may or may not be numerous, and this is simply the starting point for what could be a vast array of possibilities.

2. Methodology

This chapter discusses the Methodology used in this research, as well as important concepts used in outlining the use of the term Acoustic Context. The main methodological concerns are addressed firstly. Following this is a description of significant phenomenon found in room acoustics, the use of Transfer Functions for conducting acoustic measurements, and a description of the concept of Acoustic Environment. The last section outlines Pierre Schaeffer's definition for Sound Object and its accompanying classification system. The use of this term was not initially part of the methodology. However, they became important after the methodology was implemented. It is placed in this section for the sake of reader ease.

2.1 Case Studies

A case study approach is taken in conducting this research. In each case an individual performance space was chosen. For each performance space a reflective research strategy was implemented, which is discussed in the following section. Additionally, acoustic measurements were taken in each space. The methodology for collecting measurements is presented in **section 2.4**.

The purpose of working on a case by case basis is two fold. Firstly, acoustic qualities can differ amongst several performance spaces. Addressing all possible performance spaces would be too impractical for conducting research. Secondly, it seemed more practical to find solutions to my questions by addressing one performance space at a time. In essence, this research could be considered on ongoing process where each new case presented could provoke new or interesting approaches.

Two spaces were chosen for conducting research. The two spaces are representations of the two different aspects of Acoustic Context. Issues concerning properties of the Acoustic Context are addressed in **sections 2.3** and **2.5**. One space was chosen regarding its room acoustic properties, and the other regarding its acoustic environment. The purpose of this was to find adequate theories for addressing the different phenomenon contained in an Acoustic Context.

2.2 Kolb Model

In each case study the Kolb Experiential Learning Model was applied, presented in **Figure 2.** This model was developed by David Kolb (Kolb, Fry 1974) as part of his research into the field of Experiential Learning. Experiential Learning Theory is based on the central idea that learning can be achieved through 'here and now' experiences. Kolb developed his model in order to illustrate the dynamic steps taken in transitioning experiences into the acquisition of knowledge. The learner makes use of different cognitive processes when transitioning between steps in the model such as, feeling, observing, thinking, and doing. Each step could be seen to represent different types of learning strategies; which certain individuals may excel at more than others. However, Kolb finds it necessary that the learner uses each part of the model in order to obtain a more holistic approach to learning. Generally, the model has been used by educators in order to design more diverse learning activities for classrooms. However, it can be applied to any Action Based research approach which seeks to solve a problem or gain new incite into a particular practice.

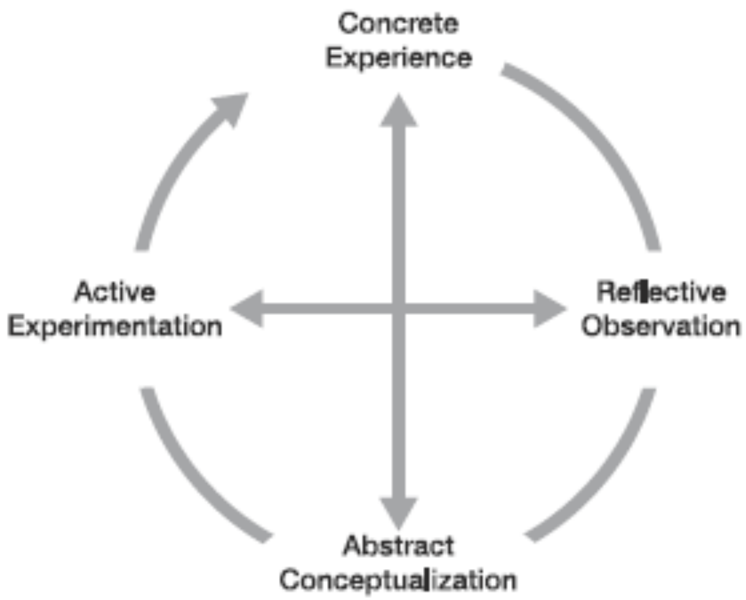

Figure 2.
Kolb Experiential Learning Model.

There are 4 stages to the model. Each stage specifies the use of different cognitive processes. Concrete Experiences refers to 'here and now' moments of learning. These must be specified in a concrete way; in the sense that a theme or topic of learning is known prior to the experience. However, the learner should enter into these experiences through perceptual based cognition, particularly through their emotional or intuitive responses. The Reflective Observation stage involves a kind of data collection. Here the learner takes on different perspectives and makes important notes regarding information they believed to be relevant to their prior experience. The learner should make use of their observational cognition. Abstract Conceptualization is a stage in which the learner investigates possible theories regarding the data they have collected. During this stage the learner makes use of what Kolb considered a thinking form of cognition. The final stage, Active Experimentation, involves taking a developed theory and attempting to place it into real life action. Here the cognitive task of doing is in focus. (Kolb; Fry 1974)

It is important to note a few additional particulars regarding this model. Firstly, it is not necessary that the learner progresses in a clear clockwise manner through the model. The learner may transition from Concrete Experiences to Abstract Conceptualizations before taking the time to collect clear observations on the initial experience. Different possibilities for transitions are denoted by the arrows on the interior of the model presented in **Figure 2**. It is significant that the learner is clear which stage they are making use of in order to understand what types of cognitive processes they should be applying.

Secondly, the transition between each of these stages creates an overlap in cognitive tasks. If the learner is transitioning from Concrete Experiences to Reflective Observations, then they are essentially moving from an intuitive stage to an observational stage. Likewise, if the learning is transitioning from the Reflective Observations to Abstract Conceptualization, they are moving from an observational stage to a thinking stage. Each of this transitions have been highlighted by Kolb as representing a specific type of learning personality. Some individuals may find transitioning from thinking into doing is an excellent learning strategy, while others may excel when moving from observation to thinking. (Kolb; Fry 1974)

This model is applied to my research through following the clockwise motion around Kolb's model. Improvisations conducted in each performance space serve as Concrete Experiences. From their I make observations based on my perceptions that occurred during the real time. During this stage I logged any thoughts or feelings I had during the improvisations into a research journal. During the Abstract Conceptualizations stage I formed a theory for how I was interacting with the performance space's Acoustic Context. The theories I formed attempted to transition what I was already doing into more concrete theoretical terms. I then applied these theories to a live concert scenario, which functioned as the Active Experimentation stage of the model. After this I assessed how functional the theories were for real time 'doing'.

Prior to embarking on the application of this model, some information was collected beforehand regarding the performance spaces used in each case study. I took acoustic measurements and listening observations of the performance spaces. The usefulness of this data was not initially apparent to me. However, I considered the possibility that listening to the spaces alongside collected data of their acoustic properties may improve my ability to hear the effects of each hall. These preparations could still be considered as part of Kolb's learning model. Measurements and listening sessions would classify as Reflective Observations in Kolb's model. Additionally, the outlining of musical language, process, and relationship would qualify as Abstract Conceptualizations made prior to developing this research. It should also be noted that I am aware of some similar ideas proposed by other professionals in my field (those noted in **section 1.3**). These also qualify as Abstract Conceptualizations, as they are essentially rough theoretical ideas regarding improvisation.

My choice in this particular methodology was due to one important aspect of improvisation. Often improvisers consider the best way to learn about this activity is by doing it (Bailey 1980: 109). This is because a great deal of improvisation relies on real time action. This involves such complex and diverse phenomena that modeling or theorizing all of the components involved is an enormous undertaking. It seems improvisers best learn about their craft through a combination of experiences, reflections, hands-on doing, and a sharing of ideas with more experienced improvisers. In my case, I seek to learn about how the improviser can make use of the phenomenon occurring in performance space's Acoustic Context. Though it may be possible to theorize or hypothesize about such an issue without the act of improvising, such ideas would be fruitless if they were not applicable to real time doing. The best course of action, then, seems to be an integration of experiential and reflective strategies. Using Kolb's model affords the opportunity to make the act of improvisation a part of the research strategy.

Lastly, this choice in methodology does reflect an approach I have used during my entire musical/artistic career. During my years as a musician a great deal of my artistic development has been a combination of questions, observations, and learning strategies. I have often found myself creating in an attempt to understand how one artistic idea could work, and in doing so learning new things about my instrument, musical voice, and/or new possibilities for improvisation. The choice in using Kolb's model reflects strategies I have often found myself using already, prior to the development of this research. With this in mind, it seems rather natural to consider Artistic Research to be somewhat akin to a learning pathway by which the artist utilizes different cognitive tools during various stages of their artistic development.

2.3 Properties in Room Acoustics

This section provides a brief overview of important concepts in room acoustics which are relevant for my use of the term Acoustic Context. It is not my intention to provide a detailed description of all acoustic variables, as the topic would be too complex to cover in one thesis. However, this section is designed to help the reader in understanding topics discussed later in the text as well as provide general background for reader's unaware of the field of Room Acoustics. For further consideration *Acoustics and Psychoacoustics* by David M. Howard and Jamie A.S. Young (1996) is suggested. This text was heavily referenced for this research.

The study of room acoustics is the attempt to explain the ways which sound behaves in an enclosed space. This includes phenomena such as: early reflections, reverberation field, frequency response, and room modes. Most rooms contain these phenomena to certain degrees, however anechoic chambers do not as they are specifically designed to prevent sound reflections (Angus; Howard 2009: 169).

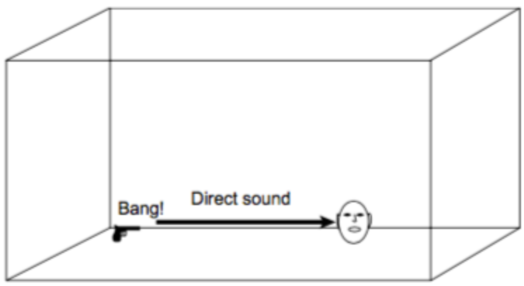

Figure 3.

Idealization of the the impulse excitation pistol shot. Displaying the pathway of Direct Sound.

Figure 3 displays an illustration of the impulse excitation pistol shot typically used for measuring reverberation time (Angus; Howard 2009: 280). This version displays the occurrence of direct sound. Direct Sound refers to the pathway a sound takes from source to listener without encountering any boundaries (ibid). The most significant effect on direct sound is its change in intensity due to distance. The inverse square law states that sound in a free field (uninhibited by any boundaries) decreases in intensity by a square of the distance from the source. This occurs because sound expands into a larger area of space as it radiates further from its source. Generally sound intensity decreases by six decibels per doubling of distance (Angus; Howard 2009: 36–37).

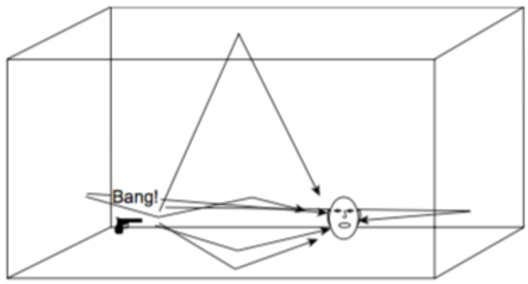

Figure 4.

Early Reflections occurring after the Direct Sound.

Figure 4 displays the early reflections that occur when the direct sound encounters a boundary. Early reflections are the first reflections arriving at the listener's position. As sound travels from its source it encounters boundaries in its pathway, such as walls, floors, or ceilings. At these boundaries, the sound reflects back into the space. Reflections can occur separately in both time and direction, and can vary as the source sound or listener moves through a space. (Angus; Howard 2009: 281–282)

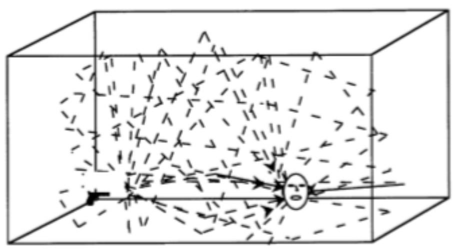

Figure 5.

The reverberant field built up of several reflections.

Figure 5 displays the reverberant sound field. The reverberation field is made up of three components in time; build-up, steady state, and decay. The build up refers to the increase in the number of reflections over time. As the direct sound continues inputting into the room, several reflections occur. The number of reflections increase, each with their own respected differences in time. The time the build up takes is related to the distance between boundaries and the amount of absorption occurring at each reflection. For example, in larger rooms it will take a longer time for the build up to occur before entering the steady state. (Angus; Howard 2009: 286–288).

Once a certain amount of build up has occurred the reverberation field enters the steady state mode. The steady state mode is achieved when the level of the sound inputting into the field is balanced by the amount of sound energy lost due to absorption. This is illustrated in **Figure 6**. The illustration displays how the sound input entering a room builds up to a point

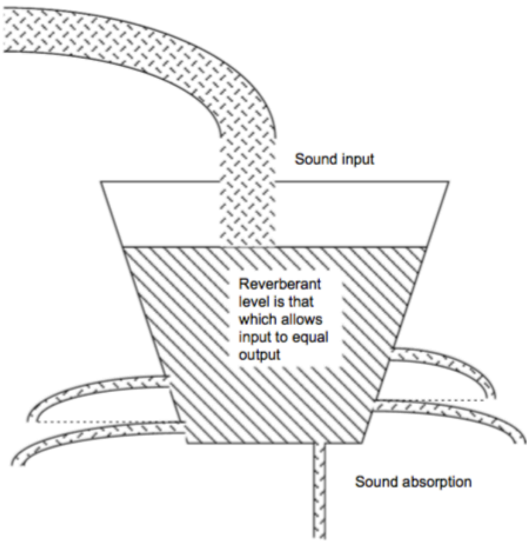

Figure 6.

Leaky Bucket model of reverberant steady state level.

where the energy entering the room is equal to the energy lost due to absorption. The leaking of the bucket represents the energy that is lost due to absorption. Rooms with higher absorption will have a lower sound power level in the steady state mode due to a higher loss of energy at each reflection. Likewise, rooms lower in absorption will have a higher sound power level due to the fact that there is less energy lost at each reflection. Transient tones, very short sounds, cannot reach a steady-state mode, as no sound source continues feeding the reverberation field. (Angus; Howard 2009: 291–295)

The reverberation decay, or sometimes considered a reverberation tail, occurs after the inputting direct sound has stopped. The steady state will not stop immediately, but will decay as each boundary absorbs the residual energy of each reflection. Rooms with less absorption will have a longer decay time as it takes longer for each sound wave to loose energy. (Angus; Howard 2009: 288)

The frequency response refers to how a room reacts to different frequencies. Absorption at boundaries is frequency dependent. Different materials used in building the surfaces of a room absorb certain frequency components while reflecting others (Angus; Howard 2009: 339). This means that the SPL of frequencies in the reverberation field and early reflections is also dependent upon absorption materials.

Measurements of reverberation are taken by determining the amount of time it takes the reverberant field to decay by a specified SPL. RT60 refers to the amount of time it takes the reverberation field to decay by 60 decibels. Sometimes, due to background noise interference, RT30 levels are used. This is the amount of time it takes for the field to decay by 30 decibels. Early decay time (EDT) refers to the decay of the reverberant field by 10 dB and is used to calculate other aspects of the reverberant field, such as brilliance or clarity. (Angus; Howard 2009: 305–316)

An additional phenomenon that effects interior listening environments are a room's modal resonances. Room modes are cyclic paths by which sound energy reflects throughout a space. These cyclic reflections are created due to the phenomenon of standing waves. Standing waves occur when a sound wave reflects back and forth between boundaries. The simplest version of this is illustrated in figure **Figure 7** (Angus; Howard 2009: 51).

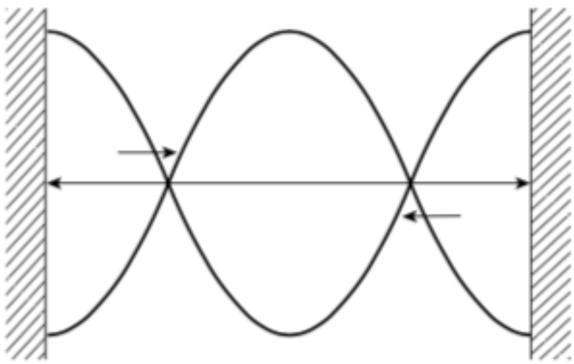

Figure 7.

Displays the cyclic pathway occurring in a standing wave.

This illustration is of a standing wave occurring between two hard boundaries. The sound wave reflects back and forth between two surfaces. The wavelength of most frequencies will not be related to the distance between the two boundaries. However, when a frequency's half wavelength does relate to the distance between the two boundaries, a standing wave will occur. This is because the compressions and rarefactions of the waveform will begin to retrace themselves between each reflection. Pressure of the converging reflections will be reinforced at antinodal points and canceled at nodal points. A listener must be between the nodal points in order to possibly observe the wave. (Angus; Howard 2009: 49–51)

Room Modes can occur at axial, tangential, and oblique pathways. Axial modes occur between two opposing surfaces. Tangential modes occur between four surfaces. Oblique modes occur between all six surfaces of a room. The acoustic effect of room modes is that some sound energy will not be part of the evenly diffuse reverberation field. (Angus; Howard 2009: 322–325).

There are further issues concerning room acoustics and perception. Measurements exist for assessing some other acoustic parameters such as Clarity, Brilliance, and Warmth. However, the issues discussed here contributed the most in the course of this research and were more manageable in terms of conducting individual artistic research.

2.4 Acoustic Measurements and Transfer Functions

In order to gain deeper knowledge into the acoustic phenomenon occurring in each space I took acoustic measurements and recordings of each space. For conducting acoustic measurements, the Transfer Functions approach proposed by Swen Müller and Paulo Massarani was applied (Massarani; Müller 2001: 443–471). This method utilizes a sine sweep stored on a computer's hard disk as the excitation signal for propagating a room's acoustic. The sine sweep signal can be adjusted in regards to its length, amplitude, and frequency range. The file is made audible into the room through a loudspeaker that is connected to the computer via a digital to analog converter. A new file is recorded simultaneously with the playback in the room. The response of the room to the excitation is transduced by an SPL meter also connected to the computer through an analog to digital converter. During loudspeaker playback the SPL meter converts the sound pressure levels occurring in the room into electronic voltage. The electronic voltage is converted into a digital signal recorded on the computer's hard disk. The two separate files, the original one and the newly recorded one, can then be compared in order to calculate the effects the hardware and room acoustic had on the transferring the original audio signal through converter, speaker, room acoustics, and SPL meter. This comparison is done through an algorithm which allows various adjustments in window, phase correction, and octave smoothing in order to view differences occurring at specified time scales after the initial impulse.

The program Room Equalization Wizard (REW) was used for all measurements. This program utilizes the transfer functions method for displaying data concerning reverberation time, frequency response, and calculating room modes. The software features additional possibilities for controlling the bandwidth of the sine sweep and calibrating the SPL meter with the chosen sound card.

Equipment used is the same for each performance space unless otherwise noted. A Macintosh Pro 2011 running Maverick OS was utilized for running the software. The soundcard was an M-Audio Fast Track Pro. The SPL meter was a UNI-T UT352. The loudspeaker for diffusing the sine sweep was a Meyer Sound UP Junior.

2.5 Acoustic Environment

Acoustic Environment encompasses the existing sounds of an agent's surroundings. Defining boundaries of the environment under observation can include areas as large as a city, or as small as enclosed closet space. Another example of a way to conceptualize an environment is through its cultural viewpoint, referring to the cultural activity that occurs in the defined area. The term is generally used to begin analyzing the effects of sound on personal and social aspects of society. This can pertain to health, perception, and attention levels. (Davies 2012)

Soundscape is a term typically used in describing Acoustic Environment. Soundscapes refer to the immersive sounding components of a particular point in space (Schaffer 2012: 97). Components of a soundscape are real sounds that transmit into the environment from natural or mechanical occurring events. For example, city soundscapes often involve the sounds of automobiles, church bells, traffic lights, playgrounds, and additional sonic bi-products of city habitation. The soundscape of an office environment could contain sounds of printers, telephones, squeaking chairs, ventilation shafts, or buzzing central heating unit.

The use of these terms in relationship to Acoustic Context is to refer to any and all sounds that may occur in a performance space. One lens for investigating a performance space is to look at its room acoustic properties. However, another possible was is to consider the types of sounds that occur in a performance space. One could consider the Acoustic Context of a performance space to contain a kind of Soundscape identity, which means the types of sounds one would witness when being present in a specified environment.

2.6 Sound Object

This section discusses the concept of Sound Object. This concept became relevant during the course of research. For theoretical ease it is described here in detail for future reference in the text. The concept became a main source for deriving many of the theories discovered during the research process.

The concept of sound object was put forth by composer and researcher Pierre Schaffer. Schaffer spent a number of years researching sound from a phenomenological perspective, attempting to elicit a new approach to the perceptual description of sound. The sound object is way of reducing the elements of sound down to an acoustic action and an intention of listening (Schaffer 2002: 271). Michel Chion prefers to describe the sound object in terms of what it is not, which is perhaps the simplest approach to defining it (Chion 2009: 32–36). The sound object is not the physical signal that produces the sound, nor is it the psycho-acoustic mechanism that allows the auditory system to perceive the sound. Additionally, it is not the notation in which attempts are made to prescribe or describe a sound, such as done in a composer's score (Chion 2009: 14). Sound objects are essentially the sounds themselves, as they are perceived by the listener purely through the sense of hearing, without cultural context, physical identification, or attempts to assign meaning to sound.

The classification system in Schaffer's work is represented in his Tautology of Sounds or TARTYP (*TAbleau Récapitulatif de la TYPologie*) chart, displayed in **Table 1**. This particular chart is a translated and modified version created by Robert Normandeau. Normandeau developed this chart after years of teaching and coming into conflict with some of Schaffer's original classifications (Normandeau 2010: 22). However, the terminology used in this chart is purely of Schaffer's creation. To some degree, the assignment of a perceived sound to a particular category in the chart could be subjective, but the general terminology used in the chart itself is clearly defined.

	Disproportionate duration Macro-objects No temporal unity		Measured duration Temporal unity Reduced duration Micro-objects			Disproportionate duration Macro-objects No temporal unity		
	Unpredictatble facture	Non-existent facture				Non-existent facture	Unpredictatble facture	
			Formed sustainment	Impulse	Formed iteration			
Definite pitch	En	Tn	N	N'	N"	Zn	An	Definite pitch
Complex pitch	Ex	Tx	X	X'	X"	Zx	Ax	Complex pitch
Slightly variable pitch	Ey	Ty	Y	Y'	Y"	Zy	Ay	Slightly variable pitch
	Causal unity				Multiple causes		Multiple causes	
Unpredictable variation of mass	E	T	W	F	K	O	A	Unpredictable variation of mass
			<— Held sounds		Iterative sounds —>			

Balanced objects	Redundant or short objects	Eccentric objects
N: Tonic mass	T: Drones	E: Eccentric
X: Complex mass	Z: Iterative redundant sounds	A: Accumulation
Y: Variable mass	F: Fragment	O: Ostinato
': Impulse	K: Cell	W: Large note
": Iteration		

Table 1.

TARTYP Chart.

Parameters used for categorization are the concepts facture, mass, and duration (Chion 2009: 135–137). Horizontal columns depend on different degrees of facture. Facture refers to the way a sound evolves over time, with categories of formed (clear and repetitive changes), non-existent, and unpredictable. The vertical columns represent differences in the formation of mass. Mass is an extension of pitch with categories definite, complex, variable, and unpredictable. Columns labeled measured duration refer to balanced objects which contain a temporal unity. Schaffer's terms state that balanced sound objects are easily perceived as such due to the right amount of duration, facture, and mass. In contrast to this are sounds outside of these columns, labeled unbalanced. These exhibit unusual changes in mass, facture, or duration. The unusual changes in these features cause the listener difficulty in viewing these sounds as individual objects.

The table expands outwardly, starting from the center. The middle three columns labeled 'measured duration' contain objects which Schaeffer considered as balanced. Extremely short sounds are labeled impulse. Formed sustainment refers to sounds that sustain for as long as around a human breath without too many changes in their evolution, or facture. Formed iteration refers to sounds that have some repetitive impulses over their duration. Impulse would be something like a staccato pizzicato note on the violin. Formed sustainment could refer to a single quarter note on the piano, where iteration would be something like a tremolo quarter note bowed on the violin. (Chion 2009: 135–137)

The sound objects placed under the categories of Disproportionate Duration are sounds that contain unusual durations. On the left hand side of the column are sounds labeled drones (T) and eccentric (E) which share a common feature in that they are held without any repetition in articulation (or clear iteration). Drones are sounds that contain little to no changes in facture over their duration. Eccentric sounds are ones that contain very sudden changes in facture at some point in their duration. (Chion 2009: 145–147)

On the right hand side of the graph are sounds that are labeled 'disproportionate duration' which occur through iterations. These are labeled Redundant (Z) and Accumulation (A). Redundant sounds are those which contain very predictable iterations. An example would be the sound of a motor running. Accumulation are sounds that contain unpredictable iterations, such as that of a water fall trickling on pebbles. (Chion 2009: 152–153)

All of these categories can contain variation in their mass. N represents a mass with a definite pitch. X represents sounds in which the mass is of a stable nature but does not contain a clear fundamental frequency. An example of such a sound would be a crash cymbal or filtered white noise. Y represents a variation in pitch, such as heard in vibrato or a single bird chirping. Unpredictable masses are those which change in unpredictable ways with each having their corresponding facture. (Chion 2009: 135)

Additionally, there is some terminology important in Schaeffer's work that is relevant for this research. The terms Group and Motif refer to a structure of notes or sound objects which, can be broken down into individual units, but, due to the structure of their relationship, are better recognized as a whole (Chion 2009: 154). In Schaeffer's terminology a group refers to more traditional notes, where as motifs refer to more experimental sound objects. The term Grain refers to a micro particle of a sound object, which can be recognized as significant to the perception of an overall sound object's character (Chion 2009: 171). Attack refers to the beginning instances of sound object, and it bears some relationship to the traditional use of the term articulation (Chion 2009: 176). Sound objects can have various types of attack such as: abrupt, strong, gentle, or soft.

3. Acoustic Analysis of Performance Spaces

This section discusses the room acoustic properties of the spaces used in each case study. The purpose of taking these measurements were twofold. Firstly, I simply wanted to see concrete data which I could correlate with my perceptions of each room's acoustic. I assumed that by seeing such data I could more adequately recognize the acoustic qualities of each room. Secondly, I wanted to see if knowing this data could influence my real time creativity during improvisations. I had no way of predicting or hypothesizing how this could happen, so the simple act of 'doing', an element of Kolb's learning model, was decided upon.

3.1 Estonian Museum of Applied Art and Design (EDM)

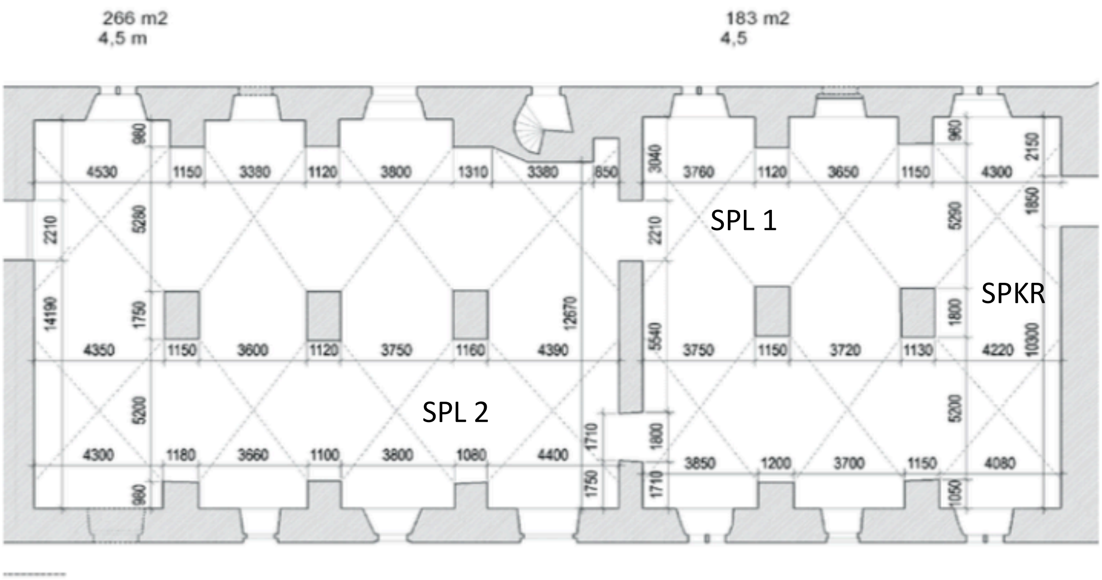

Figure 8.

Architectural Drawing of EDM Exhibition Halls 1 and 2. The abbreviation SPKR denotes the speaker position and SPL denotes the sound pressure level meter positions.

The architectural drawing in **Figure 8** is of the exhibition halls at the Estonian Museum of Design and Applied Arts (EDM). The space is divided into two halls that are connected via two doorways. The main entrance is located in the upper right corner of the drawing. Large columns are located in the center of each hall with an average length and width of 1.74x1.14

meters. The ceiling in both halls is vaulted, marked by the dotted x-lines. They are approximately 4 meters in height. Interior column measurement's average 0.98x1.12 meters. The numbers located in between each column signify the distance between columns, which vary throughout the space. The walls of the hall are covered in white plaster and the floors are concrete. Much of the hall is uniform in appearance, with little visual information that distinguishes one area from another. For further understanding please refer to photographs of the hall in the appendix.

When first observing the space there were already some interesting features to note. When the hall is empty, there is little to no background noises present in the hall. Additionally, the reverberation time seemed rather long, and the frequency response seemed different depending on one's location.

The diversity of the space presented some difficulties in conducting measurements. To adequately understand the characteristics of each spot in the hall would be enormously time consuming and require more advanced technology then was at my disposal. Instead, two different measurements were taken in which the SPL meter was placed at different locations, denoted in **Figure 8** as SPL 1 and SPL 2. These two locations were chosen to compare the effects of the boundary between the two rooms. Furthermore, they were also locations I imagined I would use for my own playing position later on in the research process. The speaker placement is denoted with the abbreviation SPKR. The sine sweep used as an impulse was calibrated to produce 80dB in sound pressure level.

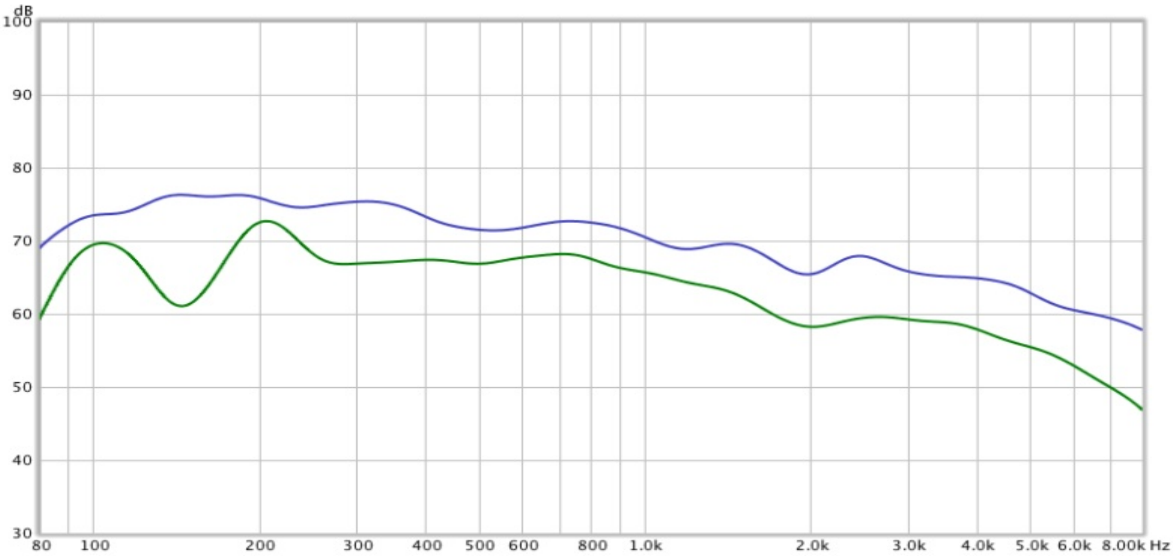

Figure 9.

Comparison of Room Transfer Function: SPL 1(Blue) and SPL 2 (Green), windowing set to 100 ms after impulse.

Figure 9 displays the Room Transfer Function of SPL 1 (Blue) and SPL 2 (Green) occurring 100 ms after the initial impulse. Restricting to 100 ms allowed me to see a small sample of the initial part of the reverberation field. Viewing the initial part of the reverberation field may show the influence of early reflections, which may differ from the established reverberant field (Hidaka; Yamada; Nakagawa 2007: 326). The x-axis of the graph represents frequency and the y-axis represents sound pressure level, measured in decibels.

The biggest difference between the two measurements is in the general SPL level. This is most likely due to the distances between the separate placements of the SPL meter. However, an interesting feature is the two spikes occurring in SPL 2 at 100 Hz and 200 Hz. These outline a very different contour then found in the SPL 1. Perhaps at the location of SPL 2 there is some room resonance or sound focusing, caused by the curved domes, which is not occurring at SPL 1. In both measurements it shows that several frequencies are still reflecting in the space 100 ms after the initial impulse.

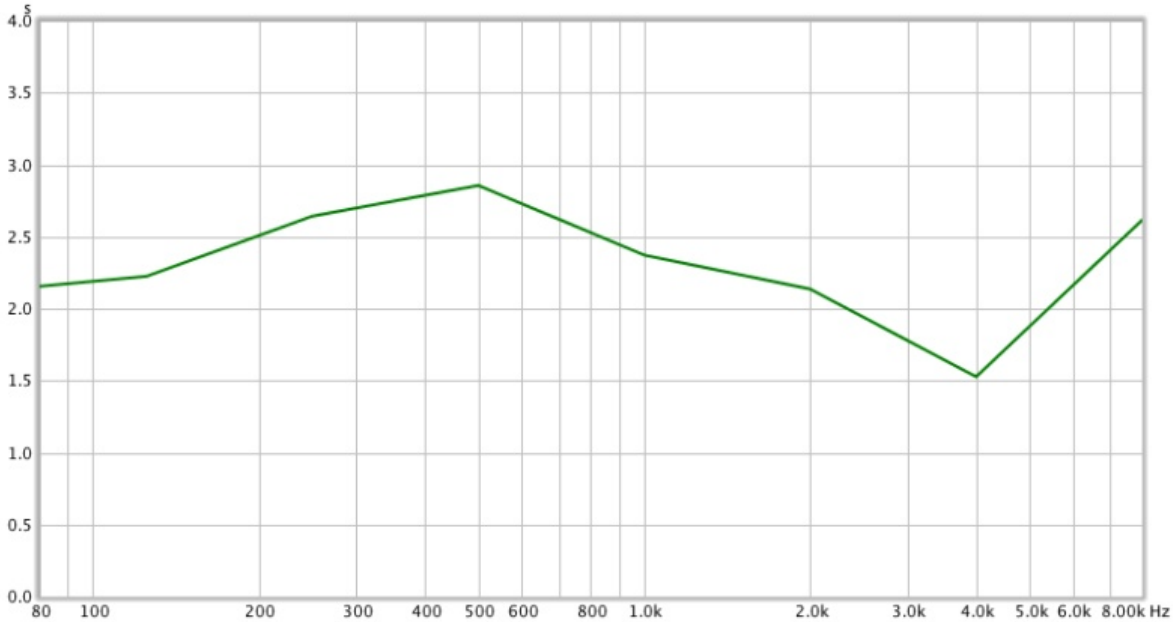

Figure 10.

RT30 of measurement SPL 1.

Figure 10 displays the RT30 times at the location of SPL 1. RT30 is the length it takes for the SPL of the initial sound sweep to decay by 30 dB. For the frequency of 500 Hz the reverberation time is 2.9 seconds. At 8 kHz the reverberation time is well above 2 seconds. This is somewhat unusual as high frequencies tend to lose energy quickly due to a greater possibility for absorption. Additionally, what I found interesting was that even 1.5s after the initial input high frequencies have decayed by only 30dB.

Figure 11 displays the RT30 times for SPL 2. A notable difference from SPL 1 is the longer reverberation times for frequencies between 200-800 Hz. In SPL 1 there is a sharp spike at around 500 Hz which descends on either side. However, in SPL 2 the reverberation time stays well above 2.5 seconds for a larger frequency bandwidth.

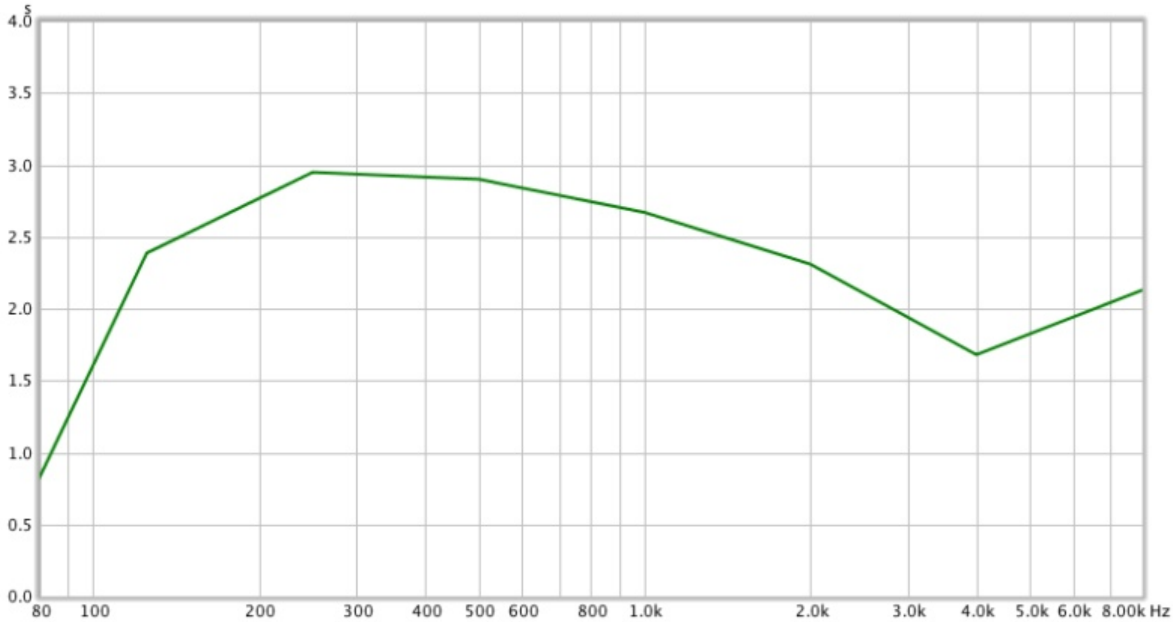

Figure 11.

RT30 of measurement SPL 2.

3.2 Kiek in de Kök

Figure 12.
Photo of the 6th floor of Kiek in de Kök tower.

Figure 12 is a photo of the 6th floor of Kiek in de Kök tower. The room ceiling is dome shaped and the material for the construction is limestone brick. Rough measurements of the space are 10 meters in diameter and 7 meters at the highest point in the dome. The wall is a textured rough surface. The entire room is a circular shape, with small cubby holes protruding out from the room at each window. The floor is a solid wooden surface, with the exception of the glass plate located in the center of the room. In the center of the room hangs a large sphere installation provided by a local artist from Tallinn, Estonia.

Acoustic measurements were taken differently than in the prior project. The SPL meter was situated towards the center of the space approximately 3 meters from center. This was the chosen placement as it seemed to be the location at which I myself would prefer to perform. The sine tone frequency sweep was set to 200 Hz to 10 kHz at 80 dB. This was done because there was some low tone background noise bleeding into the space. I was worried that this would interfere with the measurements, so I changed the sweep to start at a higher frequency. The speaker location was at the top of the dome ceiling.

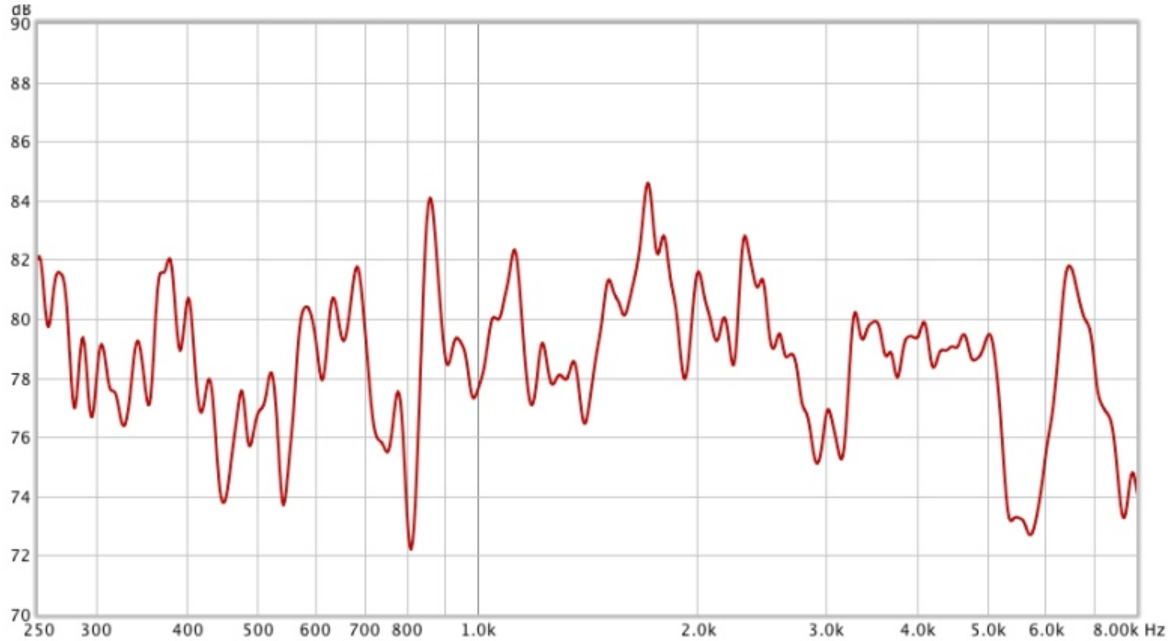

Figure 13.

Room Transfer Function in 6th floor of Kiek in De Kök.

Figure 13 displays the Room Transfer Function 100 ms after the impulse. In this case a smaller octave smoothing band width was chosen, as it more adequately displays that amount of change occurring across the entire response. The amount of changes occurring here are more frequent then those occurring in EDM. Frequencies above 6 kHz up to 8 kHz experienced a large boost in energy with much more dB then those located in the low mid range, between 400 Hz and 600 Hz. Several areas of the response are greater than, equal to, or only 5 dB less then the direct sound. Sound pressure at frequency bandwidth 800–900 Hz and around 1.7 kHz are actually above the SPL level of the initial sine sweep.

One possible reason for these extreme difference from EDM's measurement could be the large ball hanging in the center of the room, the curvature of the stone wall, as well as the domed ceiling itself. Both of these could cause sound focusing, where several sound waves reflect at different points in the room, but converge together at a single point. Additionally, the SPL meter was located between the large ball installation and the wooden floors. It could be possible that standing waves occur at this location, and the SPL meter is simply in the proper placement for observing them.

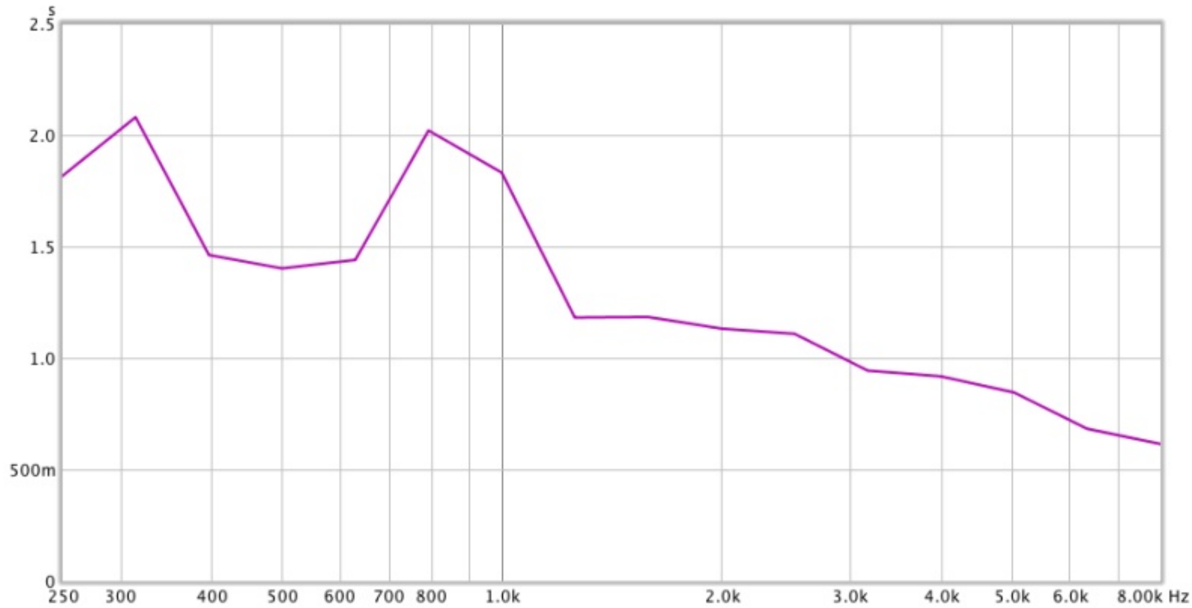

Figure 14.

RT30 of Kiek in de Kök 6th floor.

Figure 14 displays a graph of the RT30 time of Kiek in de Kök 6th floor. The highest peak occurs at around 325 Hz, reaching up to 2.1 seconds. The second highest peak occurs at around 800 Hz, slightly above 2 seconds. What is interesting to note is that above 2 kHz the RT30 is much shorter, spanning between 700ms to 1.3 seconds. In the 100 ms measurement displayed on the prior page frequencies above 2 kHz have quite a lot of energy. However, it appears they die out rather quickly in the reverberation field. This is not totally unusual, as in small spaces the reflections occur more frequently due to the small distance traversed between surfaces. This causes the sound waves to loose energy more quickly, as each reflection experiences some degree of absorption.

2.3 Assumptions Regarding EDM and Kiek in De Kök

There are some assumptions that can be drawn from viewing the data collected on these two spaces. Though it is not my intention to create a clear portrait of all the acoustic differences occurring between EDM and Kiek in De Kök, it is important to note some of the assumptions I made about these spaces before attempting improvisations in them. These assumptions are presented here to understand the mindset I developed after conducting the measurements.

In EDM, I assumed a number of things. I knew that many sounds presented in the space would be perceived as longer than if they occurred in a space with less reverberation time. I also assumed that there could be a correlation between dynamic and time. Sounds with a higher SPL will last longer in the space simply because there is more energy in the initial sound wave. With more energy in the initial sound, then more energy will be contained in the reverberant field, causing the decay of the field to last longer. I also assumed that the space would be muddy or blurry in quality due to the ability of several frequencies to continue reflecting past 1.5 seconds. This might make it difficult to perceive the subtle nuances of a sound once it is inputted into the reverberation field.

In Kiek in De Kök I considered a number of ideas. Firstly, I thought that there may be difficulty in localizing sound in this space. The high boost of energy occurring at 850 Hz, 1.75 kHz and 7 kHz in **Figure 15** could cause some error in perceiving the location of a sound inside of the space, instead perceiving some reflections as direct sound (Angus; Howard 2009: 107–111). Otherwise I assumed that the room would sound quite clear. Though the hi-mid range bandwidth (between 600 Hz and 1000 Hz) has a 2 second reverberation time, the higher frequency bandwidths (such as those above 4 kHz) are still present in the reverberant field (between 500 ms and 1 second).

Generally speaking, I had no preconceptions regarding how this data could effect my playing. Since there were no immediate ideas regarding this, I left such ideas open for my experiences while improvising. Any ideas regarding these measurements and their significance are addressed when appropriate in the following chapters.

4. Abstract Conceptualizations for Improvising with the Acoustic Context

This chapter presents the findings for the 2nd and 3rd phase of the Kolb Learning Model. The first phase, Concrete Experiences, was achieved through conducting improvisations in each space. Following this I entered into the Reflective Observations stage by noting common thoughts and/or experiences I had during these improvisations. After this stage I entered into the Abstract Conceptualization stage, where I formed concepts for how to approach relationship, musical language, and process for each hall. Each stage is presented with it own section. Please refer back to pages 16–18 and **Figure 2** if necessary. In each section, a table of the Kolb Learning Model is provided for clarity. The table will indicate which stage is relevant for that particular section's information.

4.1 Estonian Museum of Applied Art and Design (EDM)

4.1.1 Reflective Observations

Concrete Experiences	X
Reflective Observations	X
Abstract Conceptualizations	
Active Experimentations	

Table 2.
Position inside Kolb's Model: Concrete Experiences and Reflective Observations.

This section provides some of the reoccurring experiences, observations and reflections I made while improvising in the hall. The position inside of Kolb's Model is illustrated in **Table 2**. After several improvisations in the hall I collected reflections and observations that occurred and logged them into a research journal. The observations documented here occurred the most frequently. They are also the ones which made the most sense to me when reviewing the previous acoustic measurements.

The first observations made pertained to alterations to properties of sound. For example, short sounds transformed into longer sounds. There were also changes in the expected dynamic. Generally, everything I played sounded much louder than intended. Furthermore, there was a lack of clarity which made it difficult to hear all properties of a sound clearly. I did expect some of these phenomenon to occur based on my prior measurements. However, the degree by which they were different was surprising. I typically practice in smaller rooms which contain less reverberation time. In EDM, I felt I was hearing many of the sounds I was familiar with on my instrument in a new way.

These observations applied mostly to the perception of my musical language. The types of techniques and sounds I usually produced on my instrument were different than expected. One observation applied to reverberation time, and how it lengthened the sounds compared to what I was use to. Secondly, I could notice some changes in the general spectrum of sounds. They appeared to me as having been adjusted through some equalization process, where certain bandwidths of the sound appeared more strongly than others.

This led to a few reoccurring themes. One was the idea of sound transformation, meaning certain properties of sound transformed because of the room's acoustics. A second theme was the feeling that I was playing through an extra stage of signal processing. My guitar set up involves a handful of pedals for processing the signal in various ways. Improvising in EDM consistently gave me the impression of having some extra stage of signal processing which I had no control over. It was as if my instrument had been extended or shifted. Of course I mean this purely perceptually, as my techniques for performing on the instrument remained the same as in other acoustic conditions.

These observations made logical sense when reviewing the acoustic data. I theorized most observations occurred predominantly because of the reverberation time. Quieter sounds becoming louder made sense, due to the increase in the number of reflections occurring in the space. With each reflection an additional amount of energy is added to the level of the reverberation field. Short sounds transforming into longer was also predictable. Due to the length of reverberation time in the space, it was natural to assume that short sounds would appear longer in the context of the hall.

The most common problem I experienced was an inability to make any sort of decisions regarding the changes I observed in the hall. Though, collecting the acoustic data did seem to influence my ability to hear sound in the space, analyzing my experiences through the terminology of such data seemed too taxing for real time creativity. During improvisation I thought in room acoustic terminology while also thinking in terms of my own musical language. This meant that I had to make a kind of separation in my perception between the hall and my instrument. I had not spent anytime prior to these rehearsals attempting to think of my instrument's relationship to room acoustics. This meant that I needed some way of thinking of my musical language that could include the types of observations I made regarding the room's acoustic effects.

Additionally, I had no way in which I was relating to the space. During real time, it certainly felt as if the space somehow responds to me, or was an influential partner. But the information I perceived during this exchange seemed unmanageable. I simply had no way of reacting to the hall. Without a specified relationship between myself and the space, it seemed impossible to take advantage of any of the ways the hall interacted with my sound.

4.1.2 Abstract Conceptualizations: Acoustic Context as Instrument

Concrete Experiences	
Reflective Observations	
Abstract Conceptualizations	X
Active Experimentations	

Table 3.

Position inside of Kolb's Model: Abstract Conceptualizations.

Given the observations discussed previously, this section focuses on the Abstract Conceptualizations I arrived at for improvising based on The Estonian Museum of Applied Art and Design's Acoustic Context. The concepts stated here are part of the third phase of the Kolb Learning Mode, the position of which is illustrated in **Table 3**. Described below is each idea and train of thought I followed in arriving at it. Any criticisms of the conceptualizations are discussed in the Concert Reflections chapter.

The first idea I pursued regarded how I related to the space. I decided to attempt thinking of the space as if it were an instrument, or an extension of my instrument. This made sense with the prior observations regarding the room acting as an extended stage of signal processing. Since I felt my instrument was transformed by the space, one way to think of the new perceptions was as if they were literally part of my own instrument and not an acoustic interaction with the hall. I entitled this relationship Acoustic Context as Instrument. This idea related some degree to Parker's experiences in realizing a room's acoustic conditions which provided new ways of perceiving the instrument (Borgo 2005: 37–38). Following this idea, I needed to think of instrumental processes and musical language description which would incorporate the new perceptions I was experiencing in the hall.

My first idea was to consider if the types of feedback loops discussed by Pressings and Parker were applicable for integrating room acoustics. The experience of inputting a sound into the room's reverberant field and receiving a different/unexpected aural output back alluded to this type of structure. A model of this idea is presented **Figure 15**. This model is a modification to the original feedback model presented in **Figure 1.** The feedback loop depends heavily on the modifying mechanism; in this case the room's acoustic. The modification produces a new result which can then be fed back into the knowledge used for producing the original input signal. For example, if an input sound becomes louder due to the reverberant field, then the original input sound could be analyzed to see what parameters of the technique for producing that sound are tied to modification of the new output.

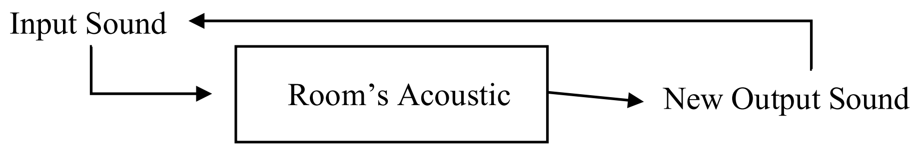

Figure 15.

Illustration of Feedback Loop with Reverberant Field.

However, the problem with this idea was that it required similar sonic descriptions on both sides of the transforming mechanism (room's acoustic). This applied to how I categorized my own musical language. Whichever terminology is used for analyzing the output after the room acoustic effects would have to be the same for describing the input sounds. This is in order to make the workflow between the two function in a speedy fashion. Too much analysis between input/output would require a lot of time, and could result in too slow of thinking for improvisation. Before conducting this research, I had already worked with Schaeffer's Sound Object classification system and found it fruitful for describing my musical language on guitar. I decided to see if this system would provide a solution to the problem.

The essential question was whether I could use Schaeffer's system for classifying my perceptions in the hall, the output phase of the feedback mechanism. If so, then I would have a way of sonically describing both sides of feedback mechanism. I theorized that perhaps a transformation of Sound Objects, as identified by Schaeffer's TARTYP chart, would occur because of the exhibition halls acoustic properties. This meant that sounds I had previously classified one way on my instrument would appear under a different classification when performed in the space. I also assumed that the additional terminology created by Schaeffer regarding envelope of sound objects would also provide a way understanding how the techniques I used on the guitar were related to the transformation occurring in the room's acoustics.

The first transformation I discovered occurred so horizontally in the chart. For example, impulses transformed into formed sustainment and formed sustainment transformed into drones. Several transformation results are presented in **Table 4** with accompanying **audio tracks 1–24.** The columns, as read left to right, are the initial sound object, its audio track, the new sound object created by the room's acoustic, and an audio track example of it.

Several of these transformations could be summed as occurring because of the long reverberation time. Impulses transformed into formed sustainment because the reverberation time extended the existence of the sound after the input into the space. Likewise, the same could be said regarding formed sustainment's transposition into drones. Iteration transposition also occurred because of this. Each iteration occurring in a given sound became difficult to observe due to the masking effect of the reverberant field. It was simply very difficult to hear the articulation of each iteration. This was also the case with eccentric sounds. The unpredictable fluctuation in facture were not so sudden anymore. This was because once a fluctuation in facture occurred, its instance was conjoined with the previous aspect of the sound still reflecting in the room.

Initial Sound Object	Audio Track	New Sound Object	Audio Track
Impulse N’	Track 1	Sustainment N	Track 2
Impulse X’	Track 3	Sustainment X	Track 4
Impulse Y’	Track 5	Sustainment Y	Track 6
Sustainment N	Track 7	Drone Tn	Track 8
Sustainment X	Track 9	Drone Tn	Track 10
Sustainment Y	Track 11	Drone Ty	Track 12
Iteration N’’	Track 13	Sustainment N	Track 14
Iteration X’’	Track 15	Sustainment X	Track 16
Iteration Y’’	Track 17	Sustainment N	Track 18
Eccentric En	Track 19	Drone Tn	Track 20
Eccentric Ex	Track 21	Drone Tx	Track 22
Eccentric Ey	Track 23	Drone Ty	Track 24

Table 4.

Sound Objects transposition due to EDM’s room acoustic properties

Some transformations occurred vertically in the chart. Some sounds that are identified with unclear or nonexistent pitch (denoted with an X) transformed into one’s with clear pitch (denoted as N). This can be heard in **audio tracks 9** and **10.** This particular instance was difficult to theorize why the phenomenon occurred. It could be perhaps because a standing wave formed in that particular point in the room, which was elicited by some frequency component of the sound. It also could have been that the frequency is located in the original sound but the frequency response of the hall simply provided enough energy to that frequency bandwidth to make it audible. Additionally, variable pitch objects with iterations, such as a single note with vibrato, transformed into definite pitch. This can be heard on **audio tracks 17** and **18.** This was due to the speed of iterations. The changes in frequency, if minute in interval, simply overlapped causing one frequency to predominate in the space.

After attempting this theory in the space and witnessing the results, I took a step back from discovering more sound object transformations. Additionally, I also put aside the technicalities involved in analyzing what aspects of the sounds or physical techniques for producing the sound caused transformations. Though it was certainly possible to theorize why each individual sound object transformed, the process of feedback loops relied on discovering these transformations during a real time improvisation.

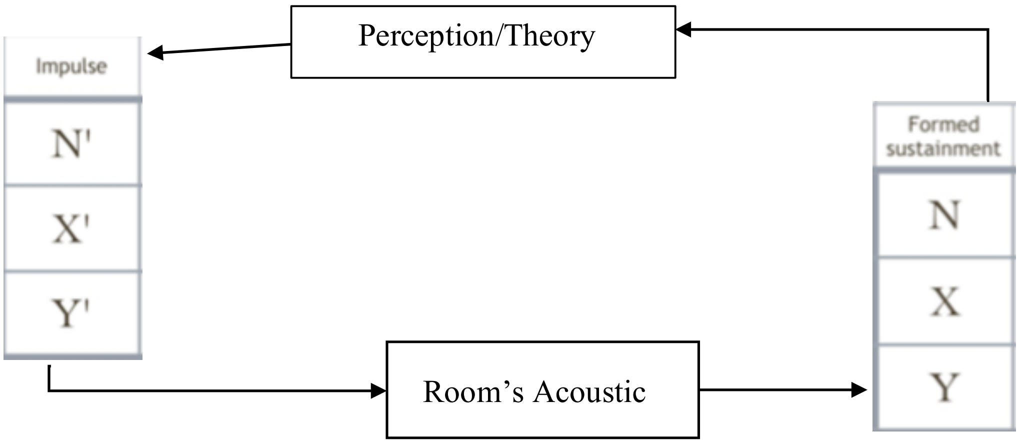

Figure 16.
Visual Description of Feedback Model.

Figure 16 is a block diagram describing the elaborated feedback theory. To me this model seems most closely related to Biofeedback, articulated by Parker. I believe this because in this feedback loop the improviser is essentially discovering their instrument in the particular Acoustic Context of the exhibition halls in EDM. The model in **Figure 16** provides an illustration of the following concept. A sound object is chosen and inputted into the room. A new sound object is then produced. The new sound object is perceived and then theorized as to what alterations in the technique could effect the transformation. This theory is then applied to the original sound object to see if a change occurs. The results are then inputted again, created a chain of action reaction, achieving the intended feedback loop.

This theory answered the main questions of my research. First to see how a musical language could be modified, related, or applied to an acoustic context. In this case the Schaeffer's TARTYP provided a way to view the sound modification created by a hall with longer reverberation time, which I entitle Sound Object Transformation. In regards to processes that integrated room acoustics, Biofeedback provided a way for integration. The room's acoustic condition, or mainly my perception of it, became the main component by which input effects output, and can generate new input.

Furthermore, because this process involved defining instrumental language and perceptions using the same descriptive qualifications, the relationship of Acoustic Context as Instrument could be achieved. In this case I was not viewing the Acoustic Context as something objectively different from myself. I was not part of the environment, as suggested by *Onkyo* improvisers, nor was I attempting to reveal anything about the acoustic conditions as in the case of Ninh's approach. I was simply using the room's acoustics as a way of exploring my instrument in that particular context.

4.2 Kiek in De Kök

4.2.1 Reflective Observations

Concrete Experiences	X
Reflective Observations	X
Abstract Conceptualizations	
Active Experimentations	

Table 5.

Position inside Kolb's Model: Concrete Experiences and Reflective Observations.

This section highlights some of the observations I made while improvising in Kiek in de Kök. As in the prior case study, only the reoccurring observations are stated here. The position inside of Kolb's Model is illustrated in **Table 5**. The same method was used in this case study as in the prior, in which improvisations in the space functioned as Concrete Experiences from which to draw Reflective Observations.

The first major observation I made was that my prior theory regarding Transforming Sound Objects was not applicable in this space. Most of the sound objects I used on the guitar did not transform into new ones. There was one example in which there was some degree of transformation. Percussive impulses, if loud enough, did achieve a sense of Formed Sustainment. However, this was far less profound then I had experienced in the design museum. I could perceive my sound more clearly in Kiek in de Kök than in EDM, but this was not a significant enough observation to warrant any ideas for how to improvise. I did experience a degree of localization issues depending on the placement of amp in the hall, which was not surprising given the rooms transfer function (**Figure 13**) discussed chapter 3.

The most interesting observations concerned the soundscape that entered into the hall from the surrounding city. There were two main static textures that occurred almost constantly. One was the sound of traffic from the major intersection located roughly 100 meters from the tower. Second concerned the sound of birds located in the park that was directly below the tower's windows.

However, though these could be considered generally static, there were gestural components inside of the textures themselves. For example, the general density of the sound of traffic could change over a period of time. Occasionally there was the sound of an isolated engine that predominated the texture, such as that of a motor cycle, or a quickly accelerating automobile.

The bird textures contained much more diversity. There is a variety of birds located in the park next to the tower. This created a dense texture that also changed in density. However, upon further listening different types of bird chirps could be recognized. The perception of distance was also prominent as some birds were closer to the windows while others farther away. Occasionally some birds were so close to the windows the flapping of their wings could be observed.

Additionally, there were the sounds of conversing individuals or groups of people. Outside of the the tower is Tallinn's Old Town, a major point of commerce and tourism in the city. The sound of people passing by the tower were very common. This was quite unpredictable when compared with the traffic or bird sounds that occurred. This seemed to have a great deal to do with the distance some individuals were from the tower. Passersby that were directly below the tower could be observed clearly, but were extremely difficult to localize. Further groups of people from the tower could be observed very subtly and sometimes faded away due to the sound of traffic.

There were some sounds that occurred rarely. Bell sounds from the churches inside of the Old Town entered into the texture periodically. The distance of each bells sound was quite observable, with closer church bells being clearer in pitch. Occasionally ambulance or police sirens occurred, but were also rather difficult to localize in the soundscape.

In deciding what to focus on in this space I came to the conclusion that soundscape phenomenon was the most significant feature. This would be the core for developing concepts for the space. I also decided this because it was a different Acoustic Context phenomenon to address then the concepts in room acoustics handled in EDM.

4.2.2 Abstract Conceptualization: Acoustic Context as an Ensemble

Concrete Experiences	
Reflective Observations	
Abstract Conceptualizations	X
Active Experimentations	

Table 6.

Position inside of Kolb's Model: Abstract Conceptualization.

This section describes the Abstract Conceptualizations I developed for improvising in Kiek in De Kök's Acoustic Context. This is the third phase of the Kolb Learning Model, illustrated in **Table 6**. Any criticism of the developed concept is discussed in the Concert Reflections section.

My first concern was to find a way in which I could relate to the soundscape. The relationship I decided was to treat the soundscape as if it were an ensemble. This meant that all sounds existing in the soundscape were to be treated as equal partners in the creation of the music. It also meant that my real time creative decisions had to be based on attempting to make some kind of musical coherence alongside the soundscape's input. Perhaps this is a similar view Japanese *Onkyo* improvisers had when they attempted to be part of the space. However, in my chosen approach, I did not want to rely purely on drones, silence, and static textures. I desired a more interactive approach with the soundscape, not one in which I purely focused on how my perceptions changed over time.

This required a number of different tasks. The first regarded description. I needed a system for describing the sounds in the ensemble/soundscape. If I expected to create sounds somehow related to the soundscape, then I needed terminology by which I could identify aspects of those sounds. Furthermore, the same system would also have to be applicable for describing sounds on my instrument. This would afford different ways of relating the sounds I created on my instrument with components of the soundscape.

Using Pierre Schaeffer's sound object TARTYP chart was the first logical choice. This proved useful for describing many soundscape components. For example, the sounds of variations in wind could be considered accumulation with complex pitch. Distant accelerating motor sounds, such as those sounding from a motor bike, could be perceived as Drones with variable pitch (Ty). The sounds of chirping birds could be described with several sound object categories, such as accumulation with complex pitch (Ax), iterative redundant with variable pitch (Zy), or eccentric sounds with variable pitch (Ey). Which classification depended on how focused is one's aural view. If focusing on one bird sound, then a different classification would be assigned than if focusing on all of them at once. The sound of tram line or trolley line running created a high pitched sustained drone (Tn). There were also occasionally church bells heard from the city center. These could be iterative redundant (Zy) or accumulation with complex pitch (Ay), Additionally, there were sounds which were produced by room objects, such as chairs which could be classified as impulse with complex pitch (X'). The sound of feet moving on the floor produced impulses with definite pitch (N') and complex pitch (Y').

Once commonalties could be drawn between soundscape and instrumental sounds, I set out to find different ways in which I could make decisions regarding the soundscape's components. This involved setting up various types of decision making processes. These decisions would be made in response to observations of the soundscape, either its overall texture or its individual sound objects.

I created four categories for decision making. These were labelled: Imitation, Dialogue, Part of the Space, and Opposing the Space. Each included focusing on different aspects of the soundscape and developing a relationship with them through one of the categories. In the case of Imitation and Dialogue there was some degree of overlap between the two, which is discussed further in this section.

Imitation refers to the mimicking of specific sounds located in the soundscape. In this category the strictest approach was to directly imitate. This would involve finding a sound on my instrument that was the same sound object classification as found in the soundscape.

Additionally, I decided I could also imitate specific parameters of a sound object, I titled Parametric Imitation. For example, the increasing volume of a speeding motorcycle could be parametrically deduced into several different sound properties. One could imitate the pitch of this sound object, or the increase in volume without imitating the entire sound object. This opened up more lenient possibilities, as I could work with different sound objects on the instrument but still have some imitation relationship.

Examples of imitated soundscape objects with audio examples is provided in **Table 7**. The table is laid out left to right, with the left most column being the classification of the soundscape sound object with sound object classification followed by audio track number. The last column provides the audio track number for the instrumentation imitation.

Soundscape Sound Object	Audio Track	Imitation Audio Track
Wind–Accumulation (Ax)	Audio Track 25	Audio Track 26
Motor Cycle Engine –Drone (Ty)	Audio Track 27	Audio Track 28
Collection of Bird Sounds –Accumulation (Ay, Zy, Ey)	Audio Track 29	Audio Track 30
Individual Bird Sound –Redundant Iteration (Zy)	Audio Track 31	Audio Track 32
Trolley – Formed Sustainment (N)	Audio Track 33	Audio Track 34
Church Bell –Redundant Iteration (Zn)	Audio Track 35	Audio Track 36
Chairs –Accumulation (N, Y, Ex)	Audio Track 37	Audio Track 38

Table 7.

Examples of Imitated Sound Objects.

Parametric imitation could include numerous possibilities, too many for presentation in one thesis. However, some examples would be observing the sound of automobile traffic and only imitating the frequency that sound object created. Another could be observing the chirping of a bird and only imitating the number of iterations occurring.

The second category of decision making was entitled Dialogue. Dialogue I defined as imitation of a sound object's parameters but with a variation approach. In the previous example of automobile traffic, instead of precisely imitating the number of iterations that occur in the sound, I could fluctuate in the number of iterations inside any sound object applied to my instrument. This could then be used as a kind of call and response gesture with an object in the soundscape. This meant picking a sound object in the soundscape, quickly analyzing its properties, applying those same properties to whatever sound object I was producing on my own instrument, and then creating variations in that specified parameter.

This particular category seemed to focus mostly on sound objects in the sound scape that had an evolution to one of their parameters during their time span. Accumulations, Eccentric, Drones, Iterations, and Redundant Iterations, were all possibilities because these sound objects contained parameters which changed over time. In the case of Formed Sustainment's or Impulse, it would be difficult to dialogue with such a sound object as they did not contain properties that changed over time.

The final two categories apply to a broader view of the entire soundscape. Being part of the soundscape, which I adopted from Onkyo improvisation, applied to analyzing the entire texture created by a soundscape and finding what frequency bandwidth was currently unoccupied. Then, on the instrument, attempt to find a sound object that would fill that bandwidth void. During this process, the idea was to simply find a place to exist inside of the soundscape without interfering with other sounds inside the texture.

The final category, opposing the soundscape, involved thinking of sound objects I could imitate on my instrument that were not naturally or at that moment part of the soundscape. Initially I thought of this geographically. I thought about phenomenon that occur in landscapes or cityscapes which produce sounds but were not part of the soundscape occurring on Kiek in De Kök. For example, the sound of a train was not present in the soundscape. In such case I could attempt creating the sound of a train on my instrument and interjecting it into the soundscape. I also considered that opposing the space could be done through dynamic control. This would mean using a sound object not derived from the soundscape, and doing it at a high enough dynamic to cover up or mask the soundscape itself.

These categories outlined a decision making process for how I would relate to the soundscape. Decisions made in real time would relate to each one of these categories. This way meant that every improvised utterance would be done so in response to the sound scape.

I also considered my previous assumption regarding the acoustic measurements of this space. I did have problems occasionally localizing sound, especially if I moved around the hall while listening. I saw this as an advantage, as perhaps then my sound would diffuse into the space as if it were part of the general soundscape coming in from the windows. The soundscape contains individual sounds which were difficult to localize. Having my guitar sound experience the same problem seemed, to me, to be an advantage gained by the room's acoustic.

With this theory formed, I had some new answers to my original research questions. Firstly, the way of relating to the space was Acoustic Context as Ensemble. In this strategy the sounds created on the instrument were defined using the same description for perceptions through Schaeffer's TARTYP chart. Instead of generating a feedback loop with the Acoustic Context, I developed decision making strategies. These strategies should be implemented in real time and would rely on the perception/descriptions of the soundscape.

4.3 Summary of Abstract Conceptualizations

This section presented the observations and conceptualizations I had arrived at for the two case studies investigated in this research. For the Estonian Museum of Applied Art and Design the concept decided upon was Acoustic Context as Instrument. This concept utilizes Sound Object Transformation in the process of Biofeedback to handle changes in musical language caused by the room's acoustic properties. In Kiek in de Kök the main concept was Acoustic Context as Ensemble. Schaeffer's Sound Object terminology was chosen for relating to soundscape phenomenon as a musical language. For real time process a decision making strategy was outlined.

In addition, it did occur to me that some of these ideas could be framed inside of the application of affordances proposed in Music Ecology. One could interpret each space as a kind of acoustic system which affords me, an improviser, the possibility of discovering these ideas. Though this was not initially my concern when traversing Kolb's model, placing these ideas inside of Ecological domains could be possible. However, a discussion on this issue would have to focus on the degree by how meaning is constructed, which was not particularly the focus of these propositions.

According to Kolb's model, following the creation of these concepts, they should be placed into an Active Experimentation. In each of these case studies, a live concert was chosen to function as an Active Experimentation. Discussions regarding this stage are presented in the following chapter.

5. Concert Reflections

Concrete Experiences	
Reflective Observations	
Abstract Conceptualizations	
Active Experimentations	X

Table 8.

Position inside of Kolb's Model: Active Experimentation.

This section discusses the concerts which functioned as the final stage of the Kolb Learning Model. The position inside of Kolb's Model is illustrated in **Table 8**. The last stage of this model is Active Experimentation with derived conceptualizations. I used public concerts as an experiment. The concert scenario places me in a real time situation where I have to make use of these theories in front of an audience. Technically, any interpretation or analysis of the conducted experiment could function as creating new Concrete Experiences and Reflective Observations which could lead to new Abstract Conceptualizations. In this case, due to the need to end the research process, no new Abstract Conceptualizations were developed after the concerts.

A reflective strategy was used for assessment of these concerts. After each one I logged my initial thoughts post concert. These were rather general observations regarding either successes of my applied concepts, or problems I faced executing them during the real time. The concerts were recorded so that later on I could listen to stimulate my memory and search for a more detailed understanding for how my theories worked out in a real time improvisation.

5.1 Estonian Museum of Design and Applied Art (Acoustic Context as Instrument)

The concert at the Estonian Museum of Design and Applied Art occurred on September 14th 2016. The concert was organized so that audience members could freely move around in the space and observe its acoustic properties. The performance lasted approximately 45 minutes and was recorded using two DPA omni-directional microphones. These were placed in the first room of the exhibition hall. I positioned speakers in several different point in the hall in order to elicit different combinations of direct sound and the reverberant field. The positions were at the four far corners the hall. The choices in placement were not based on any acoustic analysis of the space. Instead, during rehearsals I tried using my own listening to search for interesting positions in the space. This was so that during the real time concert, I at least knew in advance that the speaker positions achieved an acoustic effect which I was capable of observing.

The first observation I made following the concert was that my conceptualizations did not incorporate an approach to the generation of form. By form I am referring to the development of the music over a longer scope of time, as opposed to immediate decisions made in situ. Some improvisers have suggested that formal decision making is an unimportant aspect of improvisation (Bailey 1980: 111). However, my main concern is with form is in keeping the music from becoming too monotonous or existing in one particular sonic area for too long. Both Sound Object Transformations and Biofeedback are mainly concerned with the immediate real time and not longer formal development. There is no suggestion in my theory for this which relates to room acoustics. Since I did not anticipate this issue, I had to find a solution during the live concert.

In order to find a solution, I turned my attention to observing the space. I quickly noticed that the audience was very noisy. Many audience members talked during the first minute, and the shuffling of their feet through the space created additional noise (**track 41**). This outcome was unanticipated and occurred because of allowing the audience to move freely throughout the space. To my ears, this was a bit shocking, as I had prepared myself to only listen to my own instrument, and not any background sounds emanating from the space. The texture created by the audience was quite dense, in the sense that the space was filled with a great deal of sound. Because I had only ever thought of the hall as my own instrument, I made a connection between the density of the audience's sound and the density of textures I could create with my own instrument.

This led me to view the entire space of the exhibition hall as a kind of hollow object that can be filled with various densities of sound texture. My interpretation of the concept of density of texture simply meant how much sound is occurring in a space. I used this as a decision making tool for making sectional changes. For example, one could quickly transition from a thick dense texture to a rather thin one. I decided from the start of the concert that new sections or new material would be introduced by quick changes in the amount of sound density in the space.

This last minute choice to work with density of texture for making formal decisions proved useful. There was quiet a range of densities I could choose from. Furthermore, the perception of density of sound texture can be effected by a room's acoustic condition (Meyer 2009 :203). However, I should note that it seemed that during the concert I did not take advantage of all the possibilities that could be contained in this idea. Instead I relied on the repeating pattern of building up the texture to a thick density and then transitioning quickly back to silence. Many other possibilities could exist for managing this. For example, quick transitions between two types of textures, or moving from one very dense texture to a very thin one over the course of the entire 45 minutes. It should be noted that this approach to form generation does not fit neatly into the concept of Acoustic Context as Instrument, as the impulse for the idea came from observing the space as it own identity.

There are also some additional considerations I experienced regarding Sound Object Transformation. I still found the system functional for real time use. However, I often found myself confused for unanticipated reasons. During most of the concert I used two sound objects at once (**track 42**). In the audio example there are actually several Sound Objects occurring. Using more than one Sound Object at once created a problem in being able to recognize the transformations caused by the room's acoustic properties. I found it difficult to focus on all sound objects at the same time while also physically performing them. Furthermore, there is also the possibility to view all three sound objects in combination as one individualized sound object. The extent of this possibility I did not anticipate, which caused problems in recognizing any transformation necessary for initiating the feedback loop.

Upon listening to this recorded example (**track 42**), I could notice the effects of the rooms acoustic on the sound objects. In particular, there is a low frequency sound object occurring that I usually assign as as N'', a formed iteration with definite pitch. In the room's acoustic this transformed into Tn, or Drone with definite pitch. Furthermore, there is a high frequency sound object which alternates between to pitches. I typically would assign this a Y'' classification due to the alternation in pitch with clear iterations. In the room's acoustic this transforms into Zy, or an iterative redundant object with variable pitch. The reverberation of the room appears to cause the frequencies to overlap each other, making the attack of each frequency difficult to perceive. Additionally, there are three open strings articulated on the guitar, which I would assign a Group, in which each individual note could be considered a N, but they more logically fit together as one unit. At 20 seconds into the example there is a long drone sound object. This appears to mask the other sound objects, creating a quite blurry texture. The Group of pitches are almost unperceivable during the drone. Though this sound object did not transform in any way, it did cause a difficulty in perceiving the other sound objects. Masking of sound object over others was not a consideration I provided in my theory.

Problems such as this example occurred throughout the concert. There was both the technically difficulty of performing several sound objects at once as well as a difficulty in perceiving the transformations that occurred. However, since I could observe these effects when reflecting on the recording, it seems that this is simply an error in preparation or a need to develop additional skill sets for execution. The idea of Sound Object Transformation itself was still quite functional, with perhaps some amendments being made to how sound objects may interact with each other in certain acoustic conditions.

Regardless of these problems, there were still cases where Sound Object Transformation and Biofeedback were useful. The first example comes from the beginning of the concert (**audio track 43**). In this case the sound I was inputting into the space is classified as an Impulse with clear pitch (N') which transformed into a Formed Sustainment in the hall. This was somewhat predictable as I already knew this transformation prior to the concert. However, what initiated the feedback look was the experimentation with different frequencies, attacks, and noise bandwidths, classified as N'' and X'' (**track 44**). Additionally, I was also experimenting with how close each action occurred. During these moments I was searching to see if one particular noise or frequency created a longer sustainment then another.

As the process continued I observed that short impulses, if spaced closely together, would turn into an Eccentric sound object (a sound objected with a sudden change in its facture) (**track 45**)**.** This was obviously due to the reverberation time of the hall which caused the sounds to last longer in the space. Each impulse transformed into a formed sustainment. However, if they are spaced close enough together, appear as part of one unified sound object.

This experimentation continued to a point when I tried spacing several impulses, with and without pitch, closer and further apart in time (**track 46**)**.** This feedback loop led me to creating an entirely different sound object which could be best described as accumulation with variable pitch (AY). Once arriving at this sound object each impulse could be viewed as a grain inside of the AY sound object. I then thought of each individual grain in regards to volume, frequency, and individual lengths and how these effected the character of the sound object AY. When reflecting back on the recording I noticed that this approach created different types of AY sound objects.

However, I also found that I did not need to think inside of Schaeffer's classification system in order to make use of Biofeedback. These moments were both hard to describe during the concert and in post reflections. Occasionally, I found that I responded to the hall almost directly, without any need to think in terms of musical language. I was simply familiar with a particular sound I made on my instrument and noticed that it sounded different in the context of the hall. Furthermore, it was not always possible to tell if the unpredictable responses, which are needed to create the feedback loop, were caused by my instrument or by the acoustic properties of the hall. This has to do with the type of relationship I had built between myself and the hall. Since I aurally viewed the space as my own instrument, it was impossible to tell if the discovering of a new sound on my own instrument, or transformation of a familiar sound, occurred because of room acoustic, or simply because the technique used in real time.

To summarize the review of this recording, some general ideas could be added to the Abstract Concept of Acoustic Context as Instrument. Firstly, the issue of long term form generation is difficult to assess if using a Biofeedback process. Secondly, Sound Object Transformation is functional and applicable to the Acoustic Context at the Estonian Design Museum. However, there may be other ways by which to handle description of one's musical language in relationship to room acoustic phenomena. Lastly, the relationship of viewing the space as one's own instrument is functional. It allows for the integration of the room's acoustic conditions as part of the creative process in real time without the need to analyze the space through room acoustic terms. However, it can lead to some problematic issues. For one, it could be difficult to assess if discoveries made because of Sound Object Transformation or Biofeedback are always because of the Acoustic Context. There may be situations where the improviser discovers a new sound on their instrument which is not due to the Acoustic Context.

5.2 Kiek in de Kök

The concert in Kiek in de Kök occurred on June 6th 2016. The audience was seated throughout the circumference of the space, with my position directly at the center of the room. Speakers were positioned in various locations, allowing me to choose which point in the space from which my sound diffused. The positions were chosen in order to create confusion over the location of my sound, allowing it to be perceived as more integrated into the entire soundscape. Two speakers were placed in the ceiling of the dome, one underneath the floor, and one pointing outside of the north window of the tower. The concert was recorded in stereo with two DPA omni-directional microphones, placed roughly three meters from the center of the room.

The initial problem I experienced was identifying the soundscape as an ensemble. During the concert I simply could not anticipate what sounds would occur in the soundscape. The texture of the soundscape was rather constant, but the changes in its content seemed so random to my ears that it was difficult to have any understanding of what may happen from moment to moment. In **track 47** I attempt to imitate the sound of a motorcycle engine accelerating. The significant part to note is that there is rather long time before responding to this sound. This was not done as an artistic or creative choice, but simply because it took me that long to analyze the sound, prepare a sound in response, and execute it.

When reviewing the recording, I concluded that this problem had to due with my previous experiences in improvising ensembles. In ensemble playing, there tends to be some amount of mental capacity dedicated to predicting future events. This is probably done in order to have a faster reaction time to elements of the music as well as to restrict the decision making process to more manageable possibilities. Though highly unpredictable situations are certainly a kind of benefit for enabling real time creativity, if the situation is too unpredictable its hard to establish any range of what, why, and how some musical material may develop.

Though I observed this flaw in my theory during the performance, I could more concisely express it after reflecting on the recording. My assumption to treat the soundscape as an ensemble overestimated how I typically respond to real ensemble musicians. Usually, in ensemble improvisation, there is the assumption that individual members are reacting to each other, through some conduit of understanding or interpretation of each improvised utterances (Canonne, Garnier 2011). However, a soundscape composed of aleotoric sounds, which are essentially byproducts of non-performative actions, do not function the same way individuals do while acting and reacting during interactive improvisation. There is no two-way street in which my sound is interpreted by another whom then reacts in someway. Since the soundscape was not in fact functioning as a willing partner, this collaborative idea was unachievable in real time. Because of this, my input into the soundscape always seemed dominant, and not part of an overall ensemble presentation.

During the concert I simply abandoned this idea. Instead I tried to draw influence from the soundscape through the same categories which I developed in my theory. This meant that I would listen to the soundscape for a particular piece of information and use this information in crafting a musical sound and its development.

Through the decision making guidelines imitation, being part of the space, and opposing the space I could still achieve influence or inspiration. An example of this can be heard in **audio track 48**. Here, the same motorcycle is used as in the prior audio example. I classified this as a drone. At the time the motor cycle occurred I had already been working with another sound object that imitated a bird chirping sound. I used the imitation of the motor cycle as a way to interrupt this previous sound object. I then started altering some parameters of the motor cycle imitation by lengthening it, changing its dynamic, and also its frequency while also creating variations to the previous bird sound. This influence here is not purely imitating the sounds, but in thinking of the motorcycle interrupting the sounds of the birds. This influence appears to be more structural in nature, and once deciding on that, I was not paying attention to the soundscape anymore. However, the general decision could be similar to Imitation of the Soundscape, in the sense that the initial impulse was derived from imitating the motorcycle.

This occurred similarly with additional bird sounds (**track 49)**. In this particular audio track, it may be difficult to locate my own sound, as I placed it at the same volume as the real bird sounds that were part of the soundscape. However, there is no direct action reaction to the bird sounds themselves. I was mainly focused on using material as a way to be part of the soundscape. The sound the real birds produce is simply imitated and used as the basis for a musical idea. I did use the texture the soundscape created as a structural component. I altered the volume of my sound in attempt to go in and outside of the soundscape texture. I wanted to occasionally pop out of the soundscape as a dominant or foreground sound. Again, direct imitation was never used, nor was any of my timing completely based on listening to the soundscape. I was simply influenced by phenomenon occurring in the soundscape and used it to make decisions.

The influence or inspiration approach did lead to some problems during the real time. I had a great deal of trouble quickly identifying individual sound objects in the sound scape. It all arrived at my ear as one big texture. It took great concentration and slow reaction time to focus enough to be influenced or inspired. Once this occurred then I had to categorize the sound object of significance, analyze its classification, and then reproduce this on the instrument. Because of this the entire concert was rather meditative and included long periods of silence and/or repetitions of an idea.

Occasionally I used a sound object not related to the soundscape as Opposition to Soundscape. In those cases, I still used real events occurring in the soundscape as triggers by which to react to (**track 50)**. Here I use short impulses whose timing is decided by quick responses to changes in the soundscape. None of the impulse sound object themselves were derived from the soundscape.

When listening back to the recording, I quite liked some of the results. The silences and repetitions which occurred let the sound of the soundscape appear as an important part of the overall music. However, I was displeased that this was a result of my inexperience, inability, or inefficiency of the original intention. It was not part of my artistic intentions to have this result due to inadequacies in my own performance.

In reviewing the theory, there were a number of specific amendments I would make. Firstly, I would suggest that treating the soundscape as an ensemble is a drastic over estimation for how to prepare one's experience of it. A better idea would be to consider the soundscape as some sort of partner which can influence the improviser's choices in material or development. This is a different type of relationship which would be better defined as viewing the Acoustic Context as a sources of possible influence or inspiration.

Secondly, I believe that the decision making categories themselves, Imitation, Dialogue, Being Part of the Space, and Opposing the space, be reshaped. The general categories work well if they are simply considered as various forms of influences for generating sound. To think of them as strategies for how to develop a sound seems to place a significant burden on managing several different skill sets at one time. To listen moment to moment to an unpredictable soundscape while maintaining the development of one's musical material seems too taxing for use in real time.

However, it should be noted that perhaps some of the skill sets needed to execute my theory need improvement. Perhaps more time can be spent listening to soundscapes through Schaeffer's sound object theory. This may create a better ability in predicting events as they occur. Also, greater familiarity with a particular soundscape may also speed up this process. Knowing exactly which sounds to expect may increase the ability to predict and react to what happens during the real time.

6. Conclusions

This chapter presents the final thoughts on this research. This could be considered a continuation of Kolb's learning model, as these are reflections on the overall research process and would qualify as Reflective Observations. As previously stated, in Kolb's model the learning process is continuous, and certainly more can be learned following the completion of this research. However, the final thoughts here pertain to knowledge gained, some general criticisms, and suggestions for further research.

The main aim of this thesis was to research if a performance space's Acoustic Context could provide improvisers with additional possibilities for creating in real time. The main aspects of improvisation under consideration were relationship, musical language, and process. With some variability, the two case studies presented here show possibilities for how this can be achieved. Generally, it can be stated that investigating performance space's Acoustic Context could certainly broaden the possibilities for creating improvisations.

The two types of relationships with Acoustic Context determined were 'Acoustic Context as Instrument' and 'Acoustic Context as Ensemble'. Viewing the Acoustic Context as an instrument proved to be the most useful in relationship to room acoustic properties. This relationship allows the improviser to focus on the transformations occurring to their sound because of room acoustic phenomenon without the need to make use of room acoustic terminology.

Acoustic Context as an Ensemble did not live up to expectations. This approach looked at the side of Acoustic Context focused on soundscape material. The failure to integrate the soundscape as an ensemble was due to expectations of how ensemble individuals respond and handle collaboration. Perhaps the general assumption could still be possible if there was a different approach to ensemble playing in general. However, a new possibility occurred during the real time I titled 'Acoustic Context as Source of Inspiration'. This possibility functioned in real time and would be worth exploring in future research.

In both cases the type of relationship was decided first before musical language description and process. In this sense, discovering musical language connections and process connection with Acoustic Context were derived by first deciding what relationship I wanted to achieve with the space.

It is possible to find processes which can integrate the Acoustic Context. Biofeedback proved useful for exploring and reacting to the changes in sound occurring due to room acoustic properties. Outlining decision making strategies which are derived from soundscape phenomenon also proved useful. Perhaps it could be possible to outline a process for being influenced or inspired by an Acoustic Context, however this can only be hypothesized without further research.

Use of Pierre Schaeffer's Sound Object Classification system proved useful in both case studies. The system allows for recognizing changes to sound due to room acoustic properties. It also is functional for relating instrumental sounds with soundscape sounds. Additionally, the terminology used for describing sound in Schaeffer's system was left somewhat unexplored in this work. Qualities described by Schaeffer such as attack time (which applies the first moments of articulation in a Sound Object) could provide a deeper connection with Acoustic Context.

Some criticisms should also be considered when reviewing this research. Performance spaces can vary quite widely in their Acoustic Context. It may be that some of the ideas presented here are not functional for every performance space. Concerning musical language, though Schaeffer's system proves to be functional, there may be other possibilities that are more suitable, as there were examples in both case studies where I did not make use of the system.

Regarding the Acoustic Measurements taken in each case study, it is unclear to me precisely how these effected my reactions to the space. The predictions I made after taking the measurements in each space proved to be true. Furthermore, after collecting measurements I began to perceive some of the effects that are shown in the data. Its possible these perceptions became stored into my long term memory, which had effects on implicit or unconscious abilities of perception (Snyder 2000:73). I do believe they had influence, and in the case of both concerts I found myself using intuition in reaction to the performance space's Acoustic Context. Perhaps the concept of intuition could be explored in this regard. Intuition is a heavily discussed concept in improvisation, with some vague ideas which regard intuition as an ability to connect directly with reality through perception (Pressings 1984: 15). So one possibility for expanding the use of measurements in room acoustic would be to instill implicit memories which can then guide the improvisers intuitive creative impulses towards an Acoustic Context. However, this must be considered speculation at this moment.

Regarding the methodology, I found the Kolb Learning Model quite useful. It allowed for me to understand what types of thoughts applied to which step inside of the organized system. However, applying this methodology was not as strict as anticipated. This is perhaps because it is possible to move between the several points inside of the model quite fluidly. In my experience its was rather natural to move between observational stages to conceptualizing stages in one stream of thought. Personally, this presented no problem in terms my own development. However, it can present difficulty when attempting to write about the knowledge obtained, as the thought pattern taken towards a particular idea may be difficult to represent in a written text.

I also think its important to note that all of this research pertains to my own listening, experiences, interests and awareness. A concern for the audience could easily be addressed inside of the main theme of this text. The location of audience members can influence their perception of sound, and this may lead to different interpretations of musical meaning. Individual audience members also bring with them their own experiences of understanding sound and space, all of which could provide different ideas for the types of questions asked in this work. Furthermore, the possible systems available for interpreting the performance space are quite diverse. There is no reason why the general notion of this thesis cannot be expanded into considering other phenomenon about a performance space, such as its design or history.

My suggestions for further research involves a diverse set of approaches. Firstly, more case studies should be conducted in different types of performance halls. There may be completely different answers to some of the questions posed in this work due to changes in Acoustic Context. There may also be others ways to achieve the types of relationship described. I would imagine more research needs to be done on how one adapts, modifies, or understands their musical language in the context of room acoustics and soundscapes. As previously stated, working with one's own intuition could also provide completely new understandings. Lastly, I believe a broader perspective could be provided on this idea by obtaining information from fields other than room acoustics and improvisation. An ecological approach which views the performance space through multi–layered systems of possible understanding could be a very interesting divergent road to attempt. Perhaps an inter-disciplinary approach with acousticians, sound artist, ecologist or music psychologist would yield interesting results. Such variety of perspectives may lead to a better understanding of the possibilities available in this activity.

Sources

Interview

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Töö lühikokkuvõte

Käesolev töö “Free Improvisation: Researching the Acoustic Space” (“Vaba improvisatsioon: uurides akustilist ruumi”) on kirjutatud doktorikraadi taotlemiseks Eesti Muusika- ja Teatriakadeemia doktoriõppe loomingulises harus. Teadustöö puudutab ruumiakustikaga seotud kontseptsioonide kasutamist vaba improvisatsiooni valdkonnas. Uurimustöö on motiveeritud minu kogemusest kitarristi, vaba improviseerija ja elektroakustilise muusika mängijana. Pärast aastatepikkust kogemust esinejana erinevates ruumides, hakkasin huvituma kohaspetsiifilisuse ja improvisatsiooni integreerimise ideest. Töö laiemaks eesmärgiks on leida uusi ja täiendada olemasolevaid viise, kuidas luua improvisatsioone. Minu töö peamine uurimisküsimus on: Kuidas saaks improviseerimisprotsessi hõlmata erinevaid aspekte kontserdi- või etendusepaiga ruumi akustilisest kontekstist?

Improvisatsiooni võib määratleda kui muusikalist loomingut, mille puhul loometöö loomine ja selle esitamine publikule toimuvad samaaegselt. Improvisatsiooni ajal teeb improviseerija otsuseid muusikalise materjali, struktuuri ja vormi kohta reaalajas. See erineb mõnevõrra sellest, kuidas toimub loomeprotsess teistes muusikavaldkondades. Komponeerimisel loob helilooja tavaliselt teose üleskirjutatud partituuri kujul. Samamoodi valmistub esineja enne esitust selleks spetsiaalselt ette, uurides partituuri ja tehes otsuseid, kuidas paremini heliteose esitamisel täita helilooja poolt kavandatut. Loovus nendes valdkondades toimub enamasti enne muusikateose tegelikku esitamist või kõlamist. Improvisatsioon erineb siin selles suhtes, et loominguline tegevus toimub valdavalt reaalajas.

Selles töös kirjeldatakse kolme aspekti või kontseptsiooni, mida olen valinud vaba improvisatsiooniprotsessi iseloomustamiseks: Need on **muusikaline keel, protsess** ja **suhe**. Taoline kitsam valik on oluline selleks, et piirata lõpmatut mitmekesisust, mille abil indiviid suudab luua improvisatsioone. Kuna vaba improvisatsioon pakub nii palju erinevaid võimalusi erinevate kontseptsioonide ja ideede näol, siis teatav piiramine ja kitsendamine on siin vajalik, et saavutada selgem fookuse antud valdkonna uurimisel.

Muusikaline keel on selle töö puhul määratletud kahel viisil. Esiteks kasutatakse seda terminina, et kirjeldada helisid, mida improviseerija oma instrumendil on välja töötanud. Teiseks on see seotud terminoloogiaga, millega me üldiselt helisid kirjeldame. Helide

kirjeldamiseks kasutatav terminoloogia võib olla oluliselt erinev, erinevate idioomide, esteetika ja kogemuste puhul.

Protsess viitab sellele, kuidas improviseerija reaalajas toimetab. See võib hõlmata paljusid võimalikke strateegiaid. Siia hulka võivad kuuluda nii reaalajas otsuste tegemine, intuitsiooni kasutamine kui ka eelnevalt visandatud struktuursete komponentide kasutamine. Improviseerija kasutab neid strateegiaid kiirete otsuste tegemiseks reaalajas.

Suhe viitab viisile, kuidas improviseerija vaatleb oma tegevust oma instrumendi, ansambli või isegi improvisatsiooni kui nähtuse suhtes kõige üldisemalt. Näiteks võib tuua Derek Bailey, kes määratleb improvisatsiooni kui ettearvamatute või ettenägematute asjaoludega suhtlemist. Improvisatsiooni määratlemine sel viisil kirjeldab Bailey viisi suhtestuda parajasti kulgeva ajaga, mida ta kasutab kui kanalit, mille kaudu toimuvad avastamised ja üllatused.

Märkimisväärse osa puhul oma uurimistööst on Bailey võlgu improviseerijale ja löökpillimängijale Le Quan Ninhile ning tema loodud terminile **akustiline kontekst** (ing. k. *Acoustic Context*). See mõiste kirjeldab suures osas kuuldelist keskkonda (*Soundscape*), samuti mehhanismi, mis kontrollib ja mõjutab antud ruumis esinevate kuuldeliste nähtuste tajumist. Käesolevas töös käsitletakse akustilist konteksti kui kombinatsiooni, mis hõlmab nii ruumi puhtakustilisi omadusi kui ka *soundscape*'i. Ninh vaatleb improvisatsiooni kui viisi, kuidas nähtavaks teha ja esile tuua akustilise konteksti elemente. Seda võib käsitleda kui Ninhi viisi tekitada suhe ruumiga, mis määrab, kuidas ta kasutab improviseerimisel oma vahendeid.

Üks selle töö oluline osa puudutab ruumiakustikat, ehkki siin vaadeldakse vaid mõnd kõige olulisemat ruumi akustilist omadust, nagu reverberatsiooni aeg, sageduskarakteristik ja ruumi moodid. Reverberatsiooni aeg näitab, kui kaua kestavad ruumis heli peegeldused peale heli lakkamist. Sageduskarakteristik iseloomustab ruumi reaktsiooni erinevatel sagedustel. Ruumi moodid viitavad seisvatele lainetele, mille moodustumisel on olulised ruumi konkreetsed mõõtmed.

Ka mõiste *soundscape* on selles töös oluline. Selle all mõeldakse antud kontserdipaiga kuuldelist portreed. Analoogselt maastikuga hõlmab *soundscape* kõiki kontserdi ajal vastavas paigas kuulda olevaid helisid, mis ei pruugi üldse olla tekitatud muusikute endi poolt. Termini paindlikkus seisneb selles, et määratud asukoht võib olla sama väike kui rõivakapp majas või sama suur kui kogu linn. Esituse ajal hõlmaks kogu kontserdisaali *soundscape* nii lavalt tulevad helid kui ka kõik saalis esinevad taustamürad.

Selles uurimuses käsitletavad teemad puudutavad eelpool mainitud improvisatsiooni aspekte (muusikaline keel, protsess ja suhe) ning nende võimalikku kaasamist **akustilisse**

konteksti. Selles uuringus vaadeldakse akustilist konteksti kui nähtust, millega improviseerija suhtestub mingil teatud kindlal viisil. Otsustades, kuidas tekitada suhe akustilise kontekstiga, peab improviseerija tekitama ja kasutama muusikalise keele ja protsessi strateegiaid, mis aitavad seda suhet saavutada. Selleks, et akustilise konteksti tajumist ja tunnetamist improvisatsioonis kaasa hõlmata, peab kasutatav muusikaline keel olema selleks adekvaatne. Samal ajal peab improvisaatori poolt valitud protsess olema alati suuteline akustilise konteksti aspektid kaasa haarama reaalajas läbiviidavasse strateegiasse.

Uurimistöö peamiseks meetodiks oli üksikjuhtumite uuring. Valiti kaks esinemispaika, mis oleksid erinevad oma akustilise konteksti poolest. Need ruumid olid Eesti Tarbekunsti- ja Disainimuuseum (EDM) ja Kiek in de Kök, mis mõlemad asuvad Tallinna vanalinnas. Kummaski ruumis viidi läbi akustilised mõõtmised Swen Mülleri ja Paulo Massarani poolt välja pakutud *Transfer Function* meetodil. Nende mõõtmiste jaoks kasutati tarkvara *Room Equalization Wizard* (REW). Need mõõtmised tehti selleks, et näha, kas ruumi akustilistel omadustel võiks olla mõju sellele, kuidas töö autor tajub ruumis helisid.

Mõlema juhtumi kirjeldamisel kasutati ka Kolbi õppimismudelit (*Kolb Learning Model*). See mudel aitab kirjeldada ükskõik millise õppimisega seotud protsesse. Ka käesoleva töö puhul, kuna püüdsin töö autorina improvisatsiooni osas midagi uut õppida, oli mudel sobiv. Mudel kirjeldab erinevaid kognitiivseid protsesse ja nende vahelisi üleminekuid, mis tekivad konkreetsete kogemuste transformeerumisel uuteks teadmisteks. Mudeli kohaselt toimuvad õppimise protsessis üleminekud **konkreetsete kogemuste**, **refleksiooni**, **abstraktse kontseptualiseerimise** ja **aktiivse eksperimenteerimise** vahel. Igal õppimise etapil toimuvad vastavad konkreetsed kognitiivsed protsessid.

Vaatlesin oma uurimistöö protsessi, jagades selle erinevateks staadiumiteks vastavalt Kolbi õppimismudelile. Esimese staadiumi sisuks oli **konkreetsete kogemusete** *(Concrete Experiences)* tekkimine proovides, mis toimusid mõlemas kontserdipaigas. Teise staadiumina käsitlesin nendes proovides saadud kogemuste **refleksiooni** (*Reflective Observations*), mille kohta tegin märkmeid uurimispäevikus. Kolmandaks staadiumiks oli reflektsiooni põhjal toimuv **kontseptualiseerimine** *(Conceptualization)*, mille sisuks oli teatud teoreetiline selgitus ja põhjendus, kuidas võiks nendes konkreetsetes kontserdipaikades eelnevat arvesse võttes improviseerida. Pärast seda etappi rakendati kontseptualiseerimist *live* kontsertidel. *Live* kontserdid toimisid kui Kolbi mudeli **aktiivse eksperimenteerimise** (*Active Experimentation*) staadium. Iga kontsert salvestati ja seejärel kuulati üle, et hinnata, kui efektiivne oli esialgne kontseptualiseerimine reaalajas rakendamisel.

EDM-is tehtud akustilised mõõtmised näitasid, et selle kontserdipaiga reverberatsiooniaeg on umbes 2,9 sekundit, sõltuvalt sellest, millisel sagedusel seda vaadeldakse. Sagedustel, mis on 1,5 kuni 8 kHz vahel võtab heli vaibumine aega vaid 1,5 sekundit.

Kogemus kontserdipaikade omaduste mõõtmise ja vaatlemisega viis kahe järelduseni. Esiteks, ruumi omaduste analüüsimine kasutades selleks ruumiakustika terminoloogiat on reaalajas improviseerimiseks liialt aeglane. Teiseks, ruumi akustikat võib vaadelda kui mingit helide omadusi transformeerivat mehhanismi. Pikk järelkõla aeg tekitas muutusi selles, kuidas helid selles ruumis kõlavad, võrreldes mõne teistsuguse akustikaga ruumiga.

Mis puutub muusika keelde, siis kasutasin siin Pierre Schaefferi **heliobjektide** (*Sound Object*) kontseptsiooni funktsionaalses võtmes. See võimaldab kirjeldada nii instrumendil tekitatavaid helisid kuid seda, kuidas vastavat heli tajutakse, kui see kõlab konkreetsete kontserdipaikade akustilises kontekstis.

Instrumendil tekitatavaid heliobjekte kirjeldatakse ja liigitatakse vastavalt Schaefferi TARTYP-kaardile. Selle rakendamine EDM puhul näitas, kuidas heliobjektid selles ruumis teisenesid. See tähendab, et instrumendil toodetud heliobjekte, mis liigituvad vastavalt TARTYP-kaardile tavaliselt ühel viisil, tajutakse ja nad liigituvad teisiti, kui nad kõlavad EDM'i akustikas.

Otsustasin proovida rakendada ka Evan Parkeri poolt pakutud **biotagasiside** (*Biofeedback*) teooriat. Vastavalt sellele teeb improviseerija otsuseid läbi teatava oma instrumendi võimaluste uurimise, kus proovides instrumenti kasutada erinevatel viisidel, saab ta teadlikuks uutest helidest ja tehnikatest, mis on sellel instrumendil võimalikud. Kasutasin seda lähenemisviisi EDM puhul. Vastavalt sellele teooriale genereeritakse kõigepealt EDM'is mingi heliobjekt. Ruumi akustilised omadused muudavad selle esialgse heliobjekti mingiks veidi teistsuguseks heliobjektiks. Seejärel reflekteerib improviseerija oma tehnikat, mida ta kasutas algse heliobjekti tekitamiseks ja katsetab selle parameetrite muutmisega, nagu näiteks dünaamika või liigendus. See loob tagasisideringi, kus improviseerija uurib ruumis kõlavat heliobjekti ja sellega reaalajas toimuvaid muutusi.

Taolise käsitlusviisi puhul tekkivat suhet võib vaadelda kui akustilist konteksti, mis toimiks nagu muusikainstrument. See tähendab, et improviseerija vaatleb kontserdipaika koos selle akustiliste omadustega, nagu enda muusikainstrumendi laiendust või osa ja teeb kõik oma reaalajas toimuvad otsused taolisest laiendatult mõistetud instrumendist lähtudes. Sellise lähenemisviisi korral hoidub muusik mõtlemast ja kujutlemast, nagu oleks akustiline kontekst justkui tema objektiivselt eksisteeriv ansamblipartner – keegi teine. Vastavat võimalust vaatleme üksikasjalikult aga alljärgnevalt.

Kiek in de Kökis kasutati teistsugust lähenemisviisi. Selle saali reverberatsiooniaeg jäi vahemikku 500 ms kuni 1,5 sekundit, sõltuvalt sellest, millisel sagedusel seda määrati. Selle kontserdipaiga puhul vaadeldi improviseerimisel ruumi *soundscape'*i kui **akustilise konteksti** fookust. See tähendab, et igasugune ruumis või ruumi väljastpoolt tulev heli (mida kostus läbi avatud akende Kiek in de Kökki ümbritsevast linnast üsna palju) toimis fookusena **suhte** loomisel.

See tähendab, et Kiek in de Köki puhul vaadeldi *soundscape'*i kui justnagu objektiivselt eksisteerivat „teist", kellega luua musitseerimisel **suhe**. Otsustasin kujutleda, et see **suhe akustilise kontekstiga** oleks nagu suhe mingi minuga koos musitseeriva muusikute ansambliga. See tähendab *soundscape'*i helide käsitlemist nii, nagu oleksid nad tekitatud minu ansambli liikmete poolt – kujutlesin, et minu enda improviseeringud on vaid nagu üks osa kogu muusikast.

Taolise suhte puhul püüdsin taas rakendada Schaefferi TARYP kaardi heliobjektide terminoloogiat. Kiek in de Kökis oli olukord siiski teistsugune võrreldes EDM-ga. Kiek in de Kökis püüdsin ma omistada *soundscape'*i helidele mingi kategooria Schaefferi TARTYP-kaardilt. Siis püüdsin neidsamu helisid reprodutseerida iseenda instrumendil. See toimis päris hästi, sest paljusid *soundscape*'i helisid oli võimalik kirjeldada TARTYP skeemi abil, samuti oli TARYPi skeem rakendatav paljude helide puhul, mida tekitasin iseenda instrumendiga.

Nüüd pidin mõtlema selle üle, kuidas visandada *soundscape*'i sisu poolt dikteeritud otsuste strageegiat. Võimalikele strateegiatele andsin nimed imitatsioon, dialoog, ruumi osaks olemine ja vastandumine. Imitatsioon tähendas teatava *soundscape*'i heli otsest imiteerimist või selle mingi kindla omaduse jäljendamist. Dialoog tähendas mingi suhte võtmist *soundscape*'i vastava komponendiga. *Soundscape*'i osaks olemine tähendas oma instrumendil tekitatud helile koha leidmist, et tekitada ja paigutada see nii, et see ei segaks ühtegi teist helikomponenti olemasolevas *soundscape*'s. Vastandumine tähendas sihikindlat heliobjektide kasutamist, mis ei kuulunud *soundscape*'i ja/või *soundscape*'i blokeerimist helitugevuse või mõne muu helilise tegevuse abil.

Seejärel viisin ma läbi oma tegelikud improviseerimiskontserdid mõlemas esinemispaigas, püüdes järgida eelpoolkirjeldatud kontseptualiseeringute konstruktsioone – **akustiline kontekst** kui muusikainstrument ja **akustiline kontekst** kui ansamblipartner. Neid avaklikke kontserte võib käsitleda kui Kolbi õppimismudeli lõppstaadiumi, milleks on **aktiivne eksperimenteerimine**. EDMis toimus kontsert 2016. aasta 14. septembril. Heliobjekti transformatsiooni ja **biotagasiside** meetodite rakendamise tulemused kontserdil olid edukad. Suhtumine **akustilisse konteksti** kui muusikainstrumenti tundus kontserti andes täiesti ühe võimaliku lähenemisviisina. Siiski tundsin esinemise ajal raskusi vormi puudutavate otsuste tegemisel. Lisaks tekkis mõnikord olukord, kus heliobjektide transformeerimisele mõtlemine ei tundunud olevat vajalik. Ma arvan, et see oli tingitud sellest, et EDM'i akustika ja minu enda instrument olid mulle juba väga tuttavad. Ma arvan, et ruumi akustiliste omaduste mõõtmine ja selles ruumis mängitud helide eelnev kuulamine võimaldas mul kontserdi ajal teha sel hetkel vaid intuitsioonil põhinevad hästi toimivaid otsuseid.

Kontsert Kiek in de Kökis toimus 2017. aasta 7. juunil. Selle kontserdi puhul kogesin, et minu kontseptualisatsioonid ei toiminud alati oodatud moel. Kujutlemine, et **akustiline kontekst** toimib nagu musitseerimisel partneriks olev ansambel, osutus sobimatuks. Kontserdi ajal ei olnud ma eriti võimeline ette ennustama, millised muutused toimuvad *soundscape*s, et neile reageerida. Usun, et see oli seotud minu harjumuspäraste ootustega ansamblis mängimisel, kus ma tajun oma partnerite võimalikke reaktsioone või suhtlen erineval moel nendega. *Soundscape*'i helid on oma olemuselt aleatoorsed ja ei ole seotud kavatsusliku muusikalise eesmärgiga. Seega oli üsna võimatu toimida nii, nagu oleksin musitseerimisel võrdne ansamblipartner *soundscape*'iga.

Siiski oli üsna inspireeriv, kui mõtlesin Kiek in de Kökis erinevate võimalike strateegiate peale kuidas improviseerida. Tihti ma kõigepealt jäljendasin *soundscape*'i helisid ja seejärel arendasin seda muusikalise materjalina omal viisil edasi. See tähendab, et ma pöörasin *soundscape*'ile oma tähelepanu ainult aegajalt.

Selle teadustöö tulemusena võib väita, et esinemispaiga **akustilisele kontekstile** keskendumine võib pakkuda improviseerijatele erinevaid võimalusi oma improvisatsiooni arendamiseks. **Muusikalise keelega** seotud küsimusi saab käsitleda Pierre Schaefferi **heliobjektide** abil. Otsustamisviiside ja **biotagasisidi** kasutamine saab toimuda **akustilise konteksti** omadusi kaasates. **Akustilise konteksti** saab vaadelda kui muusiku instrumendi osana. Seevastu **akustilise konteksti** käsitlemine ansamblipartnerina ei osutunud eriti mõttekaks. See eest oleks ehk sobivam lähenemisviis näha seda kui võimalikku inspiratsiooniallikat. Selle teema edasiseks uurimiseks oleks huvitav juhtumiuuringuid läbi viia suuremas hulgas erineva akustika ruumides. Oluline oleks uuringute interdistsiplinaarsus. Kaasata tuleks muusikapsühholoog, et uurida täpsemalt ja sügavamalt, millised vaimsed protsessid toimuvad improvisatsiooniga seotud ideede kavandamisel ja teostamisel.

Appendices

Photos of EDM hall, Estonian Kitchen and Glass Exhibitions