

Reinventing the piano for the 21st century: A case study of the Una Corda piano



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Joint research project
Spring 2015
Number of words: 7482

Introduction

When contemporary classical musician Nils Frahm complained to German piano builder David Klavins about the immobility of pianos and about the “junk pianos” that were offered to him at several venues, both men commenced a project for which the goal was set to realize a piano that would meet the demands of today’s pianists. For Klavins it was an opportunity to work on an idea he had for a long time: to build an upright piano that would have only one string per hammer, as opposed to multiple strings for most of its range. The project resulted in the oddly looking Una Corda piano (see figure 1), which made its public debut in Berlin on June 16th, 2014. Contrary to the conventional eighty-eight, its keyboard range is limited to sixty-four keys. The reduced keyboard range and the reduction in strings is paired by a reduction in tension that is contained within the piano, allowing for lighter framing. Altogether the piano weighs under a hundred kilograms, which makes it a remarkable instance in today’s piano design, especially considering its aspiration as a concert piano (Kirn, 2014). But why does this piano surface specifically now?

The design principles based on which today’s pianos are built have largely remained the same in the past 150 years. There are varying shapes in which the piano comes. Yet, the idea behind them is similar, with the Steinway concert grand as lead example of what a piano should look like (Good, 1982). Nevertheless, musicians have extensively experimented with styles of playing and modifying the piano, most notably by the likes of John Cage. Cage famously ‘prepared’ his pianos by placing screws and bolts between the strings in order to modify the sound to make it fit a particular style of playing (Cage, [1972] 2012). In relatively young instruments such as the electric guitar, the results of similar tinkering practices have often been taken up in the design of new instruments (Waksman, 2004). However, the principles on which pianos are built persist and it is piano makers such as Klavins who refuse to conform to these principles.

Numerous individuals preceded Klavins and attempted to reinvent the piano – to improve its design for changing contexts of use. Yet, none of their inventions had a lasting impact on piano building practices (Parakilas, 1999). A recent example of such an invention is the Bogányi piano, designed by the Hungarian piano builder Gergely Bogányi. He used carbon fiber as the primary



Figure 1 The Una Corda piano

material to build a piano that would “carry greater clarity, and be less susceptible to the vagaries of humidity, temperature, and other minor acts of God that make the piano technician’s job a finicky pain in the proverbial” (Service, 2015). As it remains to be seen whether there will be demand for additional copies of the Bogányi piano, it is expected “that it becomes another very expensive footnote in pianistic-organological history” (Ibid.). Indeed, “there are very few people who successfully turn their inventions into a real product that can be manufactured, marketed, and sold” (Pinch and Trocco, 2002, p.53) and thus turn it into an innovation. For the Una Corda it remains to be seen whether this is the case. Since its first appearance Klavins has offered to produce additional copies on his website, which is headed by the slogan, “The 21st century pianos”. By now, a total of five have been produced, while there are four more currently on order (Klavins interview).

Despite the limited scope of many of these inventions, they are important topics of study. In Science and Technology Studies (STS), discussions have recently been held on the difficulty of generalizing findings on such idiosyncratic cases. The question is, how to make sure that they become “not just another case study” (Wyatt and Balmer, 2007, p.620). I argue that case studies of such inventions reveal much about the cultures in which they circulate. Similarly, in STS it has been argued that case studies of ‘failures’ can be just as telling as successful innovations, and that

they are necessary objects of study in order to fully understand why some innovations are successful and not others (Pinch and Bijker, 1984). The trajectory of these inventions do tell us something about the aspects of their cultural context that are bendable, and those that are rigid. The same holds for musical instruments, as they “are used within highly developed and circumscribed social and cultural environments” and “can tell us much about music as a form of culture” (Pinch and Bijsterveld, 2004, p.639). In other words, what can be studied, are the cultural factors that have initiated and given shape to these inventions and that eventually allow it to become a real innovation or to become a mere footnote in history.

As the Una Corda resulted from the collaboration between musician and instrument maker - Klavins and Frahm - it is primarily their cultural environments I am interested in. While both individuals were previously active in unrelated fields, when they teamed-up to build a piano they brought together Klavins’ piano building practices and the aesthetic practices of Nils Frahm, that, as I will define later, take place within the context of an *aesthetic ecology*. The question this paper addresses is thus: *What aspects of the cultural environments of Frahm and Klavins have given shape to the Una Corda?* What follows, after briefly having discussed the method and the theoretical view taken on the relation between musical objects and their context of use, is a story about how cultural practices give shape to their instruments. In the broadest sense, it is a story about the coevolution of musical culture and the role of material objects within it.

Method

For this case study a variety of qualitative sources was used. In a Skype interview with David Klavins he provided me with an oral history of the development of his design approach and the building process of the Una Corda. Carel Teerink, a piano restorer and tuner, who owns a workshop in Wijlre, Limburg and who works at the conservatory of Maastricht, provided me with knowledge about the principles along which most of today’s pianos are built. Unfortunately, an interview with Nils Frahm was not possible, as he was fully occupied with his concert tour during my research. However, many existing interviews with Frahm published online were used to analyze his approach to music, and to take his story of the invention of the Una Corda into account. Furthermore, I attended a concert of Frahm and used videos of his live performances to observe his musical practices. Additionally, books on the social and technological history of the piano were

used to sketch the developments that led to today's conventional design principles. Finally, album reviews and other online sources such as Klavin's website and the website of Erasedtapes – the label with which Frahm is associated - served to provide general background information.

Where possible, I triangulated the various sources to overcome problems associated with oral histories and matters of self-representation. Where my sources proved contradictory, both stories were included. For instance, Klavins and Teerink contradicted each other in some matters. Where this was the case, I have tried to include both their perspectives without manifestly preferring one perspective over the other. After all, my concerns are with the piano as cultural object rather than with design issues themselves. As such, these contradictions are of considerable interest to this story.

The relation between music and its mediators

To tell the story of coevolution, it is necessary to conceptualize the relation between material objects and their cultural context of use. Many scholars have wondered about this relationship. Christopher Small (1998), for instance, was burdened by his "ambivalent relationship with the Western classical tradition, with the works that are assumed to comprise it, on the one hand, and, on the other with the institutions through and in which it is disseminated, performed, and listened to today" (p.15). He thus asserts himself that "there must be a link between the nature of symphonic works and the nature of the events at which they are played" (p.16).

In the sociology of arts, however, much of the work focused on music as a mirror for social relations, without paying attention to the materiality of music. Musical practices are determined by social structures, while the objects that make these practices possible and that reflect social structures are passive in and of themselves. Consequently, "the works do nothing and the processes involved in their appreciation lose their specificity or specialness" (Hennion, 2002, p.81). Music is reduced to something around which social groups organize themselves (Ibid.). As a consequence, "much scholarship in the sociology of arts is vulnerable to accusations of reductionism for failing to address the specificity of the aesthetic and of the art object" (Born, 2010, p.174). To resolve this problem, Hennion (2002) argues that it are the mediations that "are the art itself ..., they are the art which they reveal and cannot be distinguished from the appreciation they generate" (p.82). The conclusion is then that if we want to study the subjective

effects of art, what art *does*, we have to look at the way it is mediated (Hennion, 2002; Born, 2005; 2010).

The mediators that together impose an effect on the listener consist partly of material objects, such as settings or instruments. A material object offers a variety of uses that each can be perceived in its material characteristics and which are best understood as affordances (Krzysz-Acord and DeNora, 2008). Taken from the psychology of perception, affordances refer to the specific uses that environments - or more specific objects - have to offer to the individual and as such, they are neither a characteristic of the individual nor of the object, but are situated in the relation between subjects and objects (Gibson, 1986).

The concept of affordances has already been taken up in the sociology of arts in order to investigate the relationship between implicit and explicit culture (see for example: DeNora, 2003). The question asked is "how groups or individuals come to 'latch on' to particular aesthetic objects to connect their own situated action to wider cultural frameworks" (Krzysz-Acord and DeNora, 2008, p.228). It is argued then that instruments "come with a set of carefully designed affordances which guide exploration and constrain action" (Windsor and De Brézenac, 2012, p.109). The affordances of an instrument that are perceived and used depend on the aesthetic and cultural framework that is adopted by its user. As such, the meaning that is attached to an instrument is flexible, but within the boundaries of its carefully designed material characteristics - a point well understood in STS (see for instance: Pinch and Bijker, 1984; in music see: Pinch and Trocco, 2002; Bijsterveld and Peters, 2010). Culturally informed aesthetic approaches thus form an indispensable link for understanding how new affordances are explored and perceived, and how novel affordances are taken up in the design of new instruments. It is to the affordances of the piano that I will now turn.

Building the modern piano: Concert-halls, industrialization and standardization

The development of the piano as we know it today has a long history that is intertwined with processes of industrialization and the emergence of concert halls. As Western societies were transformed under the spell of capitalism and industrialization from the eighteenth century onwards, emerging middle-classes acquired resources that were to be spent on leisurely activities.

Attending concerts, a phenomenon previously exclusive to a small elite, then became a reality for anybody who was able and willing to pay for it. This created a commercial incentive for concert hall owners to expand, as every extra attendee meant additional income (Blanning, 2008). Consequently, expanding concert halls required instruments that could fill these spaces with sound (Teerink interview). Piano innovations in the eighteenth and nineteenth century thus primarily aimed to increase loudness (Good, 1982). Yet, piano builders, who relied on wooden frames, faced a challenge they were unable to meet, as the “demand for ever-louder sound in pianos of all sorts led to ever-increasing tension on strings. Coupled with the inconvenience caused by the ease with which pianos of the day went out of tune, this made evident the need for stronger framing” (Good, 1999, p.56).

Two features of industrialization were key to overcome these challenges. First, iron offered some advantageous properties, such as its rigidity and a low susceptibility to humidity and temperature. The introduction of iron thus meant substantial improvements in the amount of tension the frame could bare and in its endurance for holding a tuning (Good, 1982). Second, as Loesser puts it, it was since this period that “mankind speculated in the crazy custom of first making things on a vaguely huge scale and then trying to induce people to buy them” (Loesser, 1954, p.16). Processes of mass production reduced production costs, but meant that the supply side had to create a demand for their goods. American producers were most successful in adapting to these inverted dynamics. “The achievement of the American makers, especially of Steinway & Sons of New York, was, first, to combine the [existing] innovations and, second, to persuade masses of buyers to purchase the result” (Good, 1982, p.166). The piano that was marketed effectively contained...

...a cluster of innovations that supported one another, not a set of unrelated devices that served disparate purposes. Together they produced a grand-piano sound that filled larger concert halls than ever before and by the end of the nineteenth century was inspiring new kinds of musical expression from composers and performers. It also became the sound that the manufacturers of smaller pianos needed to emulate. (Good, 1999, p.60)

The Steinway sound that would set the benchmark for other pianos was known for being ‘rich’ and ‘alive’, which was partly seen as the result of the use of multiple strings and cross-stringing,

as, similar to the dynamics of a choir, interaction between strings that are never exactly tuned alike, makes the sound come alive (Teerink interview).

The success of the Steinway sound, was paired by a reluctance to diverge from its design principles in later years. According to Klavins, the excitement about the improvements in piano design led some to believe that “this must be the end of the road” (Klavins interview).¹ This is not to say that the Steinway piano is widely regarded as perfect. There are various slight imperfections in its design that are well-known, such as a crude transition between the sound of base strings and steel strings. Yet, Steinway & Sons has been reluctant to change its design (Teerink interview). There are a number of reasons for this stability, most of which can be found in the characteristics of piano building practices. First, the widespread availability of Steinway pianos for professional pianists who have access to them in most music venues, an achievement of Steinway’s early twentieth century marketing strategy, tempers the demand for variations. “At the beginning of the twentieth century, the 1920s, 1930s, Steinway was totally dominating the concert world, the concert halls and the professional pianists and kept on continuing this policy until today.” Second, to make cast-iron frames is extremely expensive, especially if you make only a single one. It is considered unprofitable to make less than five frames at once. Experiments with framing design therefore barely occur and the risk of costly experiments that lead to unsatisfying conclusions may repel those interested in novel design. Finally, the production of pianos is fragmented. “As the piano industry grew, some companies came to specialize in making frames or soundboards or actions for sale to firms that assembled the completed instruments” (Good, 1982, p.25). Due to the economies of scale, the production costs can be lowered. The flipside is that parts become standardized and these “interchangeable parts may produce a certain homogeneity among instruments” (p.25).

The piano that was successfully marketed since late nineteenth century incorporated a variety of innovations and produced a loudness previously unheard of. Its strings were under great tension and except for the base range it was equipped with multiple strings per hammer, which was held not only to increase loudness, but also to enrich its sound. However, this meant a substantial increase in tension, which required the use of heavy cast-iron frames. The combination of these novelties defined the basic principles pianists would have to work with since then.

¹ From here on quotes refer to the interview with David Klavins, unless specified otherwise.

Exploring affordances

Although the piano barely changed during the twentieth century, its context of use did transform. The piano was used within genres that each appropriated it differently and musicians explored its affordances extensively. Jazz musician Thelonious Monk, for instance, developed a percussion-like style of playing, in which he “struck the keys forcefully, jabbing dissonant chords and clusters and releasing them abruptly” (Parakilas, 1999, p.305). Instead of pressing the keys, avant-gardist Henry Cowell played the piano by plucking its strings. Rock musicians like Jerry Lee Lewis used the piano symbolically to shape their identity – some more aggressively than others. He used the piano as object of physical assault to establish his identity as a rocker. As a consequence, classical pianists “needed to shun aggressiveness in order to distinguish themselves from rockers like Lewis, just as Lewis needed to pounce on the piano to show that he was a real rocker, even if he did play the piano” (p.364).

For some composer-pianists the affordances that the piano offered them were not sufficient. A variety of Charles Ives’ compositions, for example, were to be performed on multiple pianos and required one of them to be tuned differently - a laborious adaptation. In later years, John Cage tinkered with his pianos. Tinkering is understood as a “rather informal process of experimentation and adjustment in pursuit of results that were sometimes not clearly defined until they were achieved” (Waksman, p.675). By placing screws and bolts between the strings, Cage modified the sound of his piano to fit his particular style of playing (Cage, [1972] 2012). These experiments were nevertheless a search for some specific...

...even if we explain it as the desire to get away from old sounds.... Schoenberg would not have wanted to use the new sounds discovered by Cage - who was briefly his student - and cage would not have wanted to find Schoenberg’s. To serve any musical purpose, a new sound has to provide the composer with some feeling of recognition. (Parakilas, 1999, p.366)

In his aesthetic practices Nils Frahm has appropriated elements of such earlier searches for affordances. He uses for instance toilet brushes as drum sticks in the performance of *Toilet brushes* – *More*, for which the piano serves as drum-kit. While the toilet brushes are taken out of their conventional context of use to be deployed as drum-sticks, the piano is turned into an object on which one can rhythmically slam toilet brushes (erasedtapes, 2013). But Frahm also modifies pianos. Reluctant to infringe upon the sonic privacy of his neighbors, he dampened his piano at

home by preparing it with felt patches, while plugging a pair of headphones to a pick-up placed at the bottom. When turning up the volume, the ‘unintended’ sounds of the piano became audible. Frahm perceived aesthetic value in these ‘accidental’ sounds, which he then decided to include on the recording of his album *Felt* (Keenan, 2011). This album, which was released in 2011, forms a prelude to the formation of an aesthetic approach that shows concern for the environment within which music is made. To fully apprehend the cultural specificities from which the Una Corda sprouted, the next section will turn to this aesthetic approach that became clearer in later works.

Aesthetic ecology: Inclusion, imperfection and spontaneity

In his latest concert tours Frahm performed amidst a jumble of instruments (see figure 2). For instance in the *Spaces* tour he seated himself amidst “a grand piano, upright piano, synthesisers, electric piano and tape delays.” In his current tour - *Nils Frahm has lost his mind* - he added “drum machines, a Mellotron (tape replay keyboard containing pre-recorded self-made sounds), his ... Una Corda and a custom made, electronically-controlled wind organ to his new live set” (erasedtapes, 2015). To understand Frahm’s musical practices, his approach is defined here as *aesthetic ecology*, which refers to an approach to music preoccupied with the construction of an environment with which individuals interact to create music and that gives preference to spontaneous creation over well-rehearsed performances.

Aesthetic ecology points to a shift in the locus of artistic creation. Typically, music is created through predefined relations between composers, performers and instruments that produce sounds that we can variously think of as beautiful or not. The emphasis is on the performer who can show him or herself virtuoso by mastery of the instrument. What this mastery looks like is variously defined across genres. In the ecological approach, however, music is made within the context of an aesthetic environment and the locus of aesthetic creation can be situated anywhere therein. The construction of such an environment requires much effort. Instruments are linked to each other, pianos available at the venues are opened up and modified, and a series of microphones have to be installed.²

² This laborious construction of the aesthetic environment has been filmed and became an official music video (see: erasedtapes, 2014).



Figure 2 Nils Frahm's set-up

But this environment consists of more than only instruments, as it also includes spaces and audiences. According to Frahm, the space in which music is made partakes in artistic creation. He has for example recorded albums in his living room (*Felt*), or in a church (*The Bells*). Before writing music, he “records at a random place, as you just have to see how the piano sounds, how the rooms sounds and how it feels” and because he doesn’t “like the piano in its natural condition” he then works “on microphone positions” (Frahm in Guler, 2012). Only in the final stage he composes music for the particular set-up and its sound. The music is thus partly seen as the product of its environment. Likewise, audiences are also part of this environment and take part in the creation of music. When commencing his new tour, his record label announced that Frahm would “develop new ideas live on stage, thereby involving the audience in the process of production”, who would thus become “part of this next big creative step of developing new material on new instruments” (erasedtapes, 2015).

By explicitly referring to spaces and audiences as taking part in creative production, Frahm’s approach seems to be inclusive. Still, there are boundaries to the environment. In the production of his music, he exclusively uses analogue or acoustic equipment:

Yeah, that's I think the wonderful aspect of having analogue equipment because the track 'Says' is basically a loop but it's a real loop – it's not like a loop in the computer that's exactly the same over and over again – but it's like slightly different because the delay that's connected to it is wobbling a little bit, it's imperfect. (Carry, 2014)

This appreciation of imperfection found in analog equipment befits the wider phenomenon of the analog-revival, referring to “a widespread desire among synthesists for a real musical instrument, something imperfect, a living-breathing entity that you can interact with and even fall in love with” (Pinch and Trocco, 2002, p.319). In the ecological approach, the idea of spontaneity takes up a prominent place. 'Spontaneity' has been used by independent do-it-yourself micro-labels - a cultural phenomenon in which Frahm's label *erasedtapes* can be situated as well - as a marketing tool, with which they set themselves apart from the uniformity of the music industry (Strachan, 2007). The precision of digital devices, common in mainstream music, may impair the suggestion of spontaneity and is therefore excluded from the environment.

Flirting with ideas of imperfection on itself is nothing new, but the way Frahm handles imperfection seems distinct. Monk, for instance, “went after a radically different aesthetic, reminding listeners that it was he ... who took full responsibility for the apparent 'wrong' notes, smudged intervals, and 'accidents' that ... turned out to be right and deliberate after all” (Parakilas, 1999, p.305). Monk's style of playing can therefore technically be improved. Whereas Monk's aesthetically valuable imperfections are still intended, the kind of imperfection Frahm is aiming at is different. Frahm does not deliberately produce imperfections, but creates a space within which accidents occur. His aesthetic approach permits these accidents to carry aesthetic value in and of themselves. Nevertheless, in Frahm's approach not every accident is a happy accident, as became clear in one of his concerts:

Frahm started playing the organ, which was controlled through a keyboard that was situated among a variety of other keyboards. A tape-delay machine was connected to the organ. After having played a number of tones, Frahm started to create layers of sounds by looping. At some point he could not get the loop as he wanted and the music seemed to lose its momentum. Frahm, took up the microphone, holding it as if he wanted to say something, while he was fiddling with the machine with his remaining hand. After a couple of seconds, he placed the microphone back in its stand, without having said anything and he continued making music, apparently satisfied with the layers of sound he created in the end. (Author's fieldnotes)

Although not intended, these moments may enhance the suggestion of spontaneity and induce sympathy from the audience. But they also serve another function, as Frahm explains:

Well, of course it doesn't work every single night, but I try to be as conscious, open and positive about each possible accident that can arise. Because when you get into certain patterns and you do things a certain way, you get kind of deaf and blind – accidents happen and you just freak out; you want it your way instead of thinking and reflecting about all the untapped possibilities. Personally, that often leads to something new, and that's where I really learn something – on stage. I've learned so much about music ever since I started playing live shows. (Harding, 2013)

Accidents, whether aesthetically valuable in themselves or not, are necessary evils that prevent a player from becoming insusceptible to the value of accidents.

In this ecological approach artistic creation is not situated in the relation between instrument and player, but encompasses a more inclusive locus. The concept of ecology has already been used to understand the role of the body in relation to its material environment in the process of artistic creation (see for instance: Harlow, 2013). However here, aesthetic ecology refers to music making practices that *explicitly* foreground the importance of the environment in artistic creation. And doing so, there are boundaries to what can be included in this environment. Technologies have to be operated manually; they have to be instruments. Instruments that can be attached to each other. But the construction of such environments are laborious. For contemporary musicians who tour around the globe and perform at different places every night, this is a nuisance. And this nuisance gave shape to the Una Corda.

Piano experiments: The past as repository

Another part of the backdrop necessary to explain the occurrence of the Una Corda, is formed by the piano building practices of David Klavins that are stooled upon a particular approach, which he developed from his experience as a piano restorer. Like Frahm, this approach is geared to open up the piano, to change what it affords. Yet, the means and goals to do so differ. While Frahm modifies his pianos to make them suit a particular environment, Klavins developed a design approach that aims to create a softer and warmer sound than conventional pianos, based on the idea to use a single string per tone - the una corda principle.

As a piano restorer, Klavins had an interest in the variety in design amongst pre-modern pianos. While initially having worked “in a piano store as a tuner and as a technician ... during those two years I found out that all those piano dealers actually disregarded the old pianos very much as junk.” Dissatisfied with this attitude towards old pianos, Klavins started working on his own in 1976, as a self-employed piano restorer.

And it was actually then, during the next close to ten years, from '76, while I was rebuilding old pianos, that there were so many differences in many regards – string scaling, soundboard design, action of course - but I was mainly interested in the acoustic side of these pianos. So, I did a lot of in-depth digging and research of my own, trying to find out what those differences mean and how those differences come to be, and that was the time when I realized, that actually the piano as it is built today is far from being complete in any way, I mean from being perfect.

Imbued with a disregard for the idea of the modern piano as a piano that cannot be improved, Klavins asked himself what he considers to be the “core questions” of piano design. “What kind of sound would you like to achieve, what kind of design” and “does it necessarily have to be a grand piano design? Or could it even be better, or ... superior to that one – in the case you are willing to change.” Led by these core questions, Klavins started to look for knowledge on the effects of different variables on the sound that is achieved.

For reasons described earlier, it is inconceivable to experiment with piano design by making prototypes. Still, Klavins developed feelings of contempt for existing knowledge as it was taught at instrument maker schools and he did not see any use in “trying to approach the subject from the angle of those principles that were spread in the typical piano builders’ literature.” His solution was to develop his own approach by measuring the impact of a number of variables on the resulting sound himself.

My only source was my practical work. So it was all empirical.... I applied changes, I listened to what kind of result those changes would have.... As I had lots of materials with the old pianos that I got, I often did restringing of pianos.

Restringing allowed him to make slight changes in the string scale of which he then measured the effects. He explains further:

I discovered the value of calculating all the physical factors of string scale - piano string scale - by utilizing the very first program for calculators. I analyzed the old string scale by measuring all the physical data - length, thickness, relation copper/steel. ...

And then I recalculated those scales, put on the new strings and listened to the piano, what happened. How much and to what extent would this improve the piano sound and in which regard.

Based on experiments like these he developed his “own thinking” and his “own feel” about how the piano should be designed and “what is happening in the piano.” Old pianos thus acted as a repository of knowledge for Klavins to develop his single-strung approach. In 1987, he applied these findings for the first time by building a novel piano, the *Klavins-Piano Model 370* (see figure 3). This piano is “the world’s biggest piano: its soundboard has twice the size of a concert grand of 2,75 m” (Klavins, n.d.). The piano is 3.7 meters high and is accessible via an attached staircase. The central idea is that the increased size allows it to be single-strung without having to compromise on loudness. Its design aimed to afford the clarity of single-strung pianos, with the loudness of grand pianos. The 370 gathered much attention and its sound has been recorded for use in digital pianos, sold as *The Giant*. Moreover, eighteen musicians have recorded an album on it, among whom Nils Frahm (Kirn, 2014).

Figure 3 Klavins model 370



The Una Corda: Two approaches coming together

Both men were looking for ways to open up the piano. Frahm sought to change what the piano affords, by modifying it. But to redo modifications for every concert was a time consuming affair. Klavins, on the other hand, became disappointed with conventional piano building practices. His own approach aimed to design pianos with new affordances, specifically to afford the sound of single-strung pianos for concert purposes. Still, “I was looking out for - without knowing it – ... somebody who is really interested in utilizing what I would invent.” While Frahm was interested in novel ways to use pianos, Klavins was unconsciously looking for someone interested in a single-strung piano.

It was the 370 piano that brought together Klavins and Frahm to exchange ideas about piano making. Initially, both men were unaware of each other’s practices. But, objects like musical instruments possess acting power to mobilize people around them (Bates, 2012). According to Klavins, after Frahm got to know about the 370, he “expressed his wish to work with the piano, which meant he wanted to record.” Klavins decided to invite Frahm, who accepted the invitation. Befitting his ecological approach, Frahm travelled to Tübingen without any music that he had written in advance; the space and the instrument were to take part in the creation of the music. As he explained: “It seemed wrong to write songs on a normal piano and bring them to an exceptional piano and think that they would work. I thought it would be a good challenge to be guided by the resonance of the previous note before I played the next one” (Frahm in Masters, 2015). The result was “a session of four days at the location where he then recorded the album (Solo).”

During the recording sessions they discussed their approaches to change the affordances of the piano. As Klavins was “servicing the piano” over the course of the recording sessions, they “were constantly in touch” with ample opportunity to discuss their approaches. Klavins talked about his goal “to build a piano that only has one string per note”, while Frahm expressed “a love for small instruments” (Frahm in Wallace, 2014). They found common ground in their approaches:

At some point he complained about "how come pianos are so damned heavy, you can't take the piano with you. It's a pity, because, you know I get all kind of kinds of junk pianos presented on my concert tours and it would be so nice if I could travel with my own piano." So that was when I mentioned that I had this idea many years ago, that actually the Una Corda could be a solution to make the piano much lighter and more beautiful sound in the piano, on the expense of loudness, that would be the only sacrifice.

But for Frahm loudness appeared not be an issue, as he was already used to amplify the standard pianos, to adapt these to the aesthetic environment. As Klavins recalls, Frahm replied: "Oh that sounds interesting. We should discuss it, because loudness doesn't make any difference to me. I amplify the piano as I need it, so that is no point for me." Thus having found a common interest, they started to discuss plans for making a piano. Klavins explained "that I would use stainless steel for the frame, that we would make it una corda ... and that it would be an open design, without any case cover, which is actually a demerit for sound emanation." Frahm became interested to have a custom-built piano that would allow him to bring it everywhere, modified as he wanted it.

Yet, when Klavins specified the technical aspects of his idea, the sound that would result from the design fudged precise expression. "I, myself, had like a 95% correct perception of the final outcome of sound and I tried to communicate it to him by describing it to him: 'It will have a warm sound, it will have a clear sound, it will have this character, that character.'" On Klavins' website, the Una Corda sound is described as 'natural'. But how exactly the piano would sound escaped precise description. When trying to describe sound, like describing a painting or a picture, much of the detail gets lost compared to when we actually hear or see it. Klavins puts it like this: "It's like you try to describe a taste to somebody. For example, if you try to describe how a mushroom tastes to somebody who has only eaten, let's say, one kind of mushroom." Without exactly knowing what the resulting piano would sound like, Frahm took the risk and commissioned the building of the Una Corda based on the principles as they had discussed it.

One of Klavins' earlier creations thus brought him together with Frahm to discuss their approaches and from which the Una Corda would spring. Klavins' principle idea to design pianos with the una corda principle could be unified with Frahm's desires to have a small and portable instrument. Frahm's ecological approach not only meant that he did not bring any pre-written music to the recording session on the 370, which gave him and Klavins ample time to discuss their ideas. It also meant that Frahm was willing to commission an instrument of which he did not exactly know what it would sound like. Instead of building an instrument that would fit a particular style of music, an instrument was built that befitted their approaches and that would later assume the role of an active agent in the creation of new music.

Traditionalism: Appearance, keys and direction

The Una Corda that resulted from the collaboration is a piano that offers substantially different affordances than conventional pianos. Frahm can take it with him on tour and does not have to rely on “junk pianos” anymore. Additionally, its open design facilitates modification: It assures that Frahm can both easily play the snares directly and amplify it. Frahm thus concludes that “[the Una Corda] basically shows that pianos can be improved. They don’t need to have eighty-eight keys, they don’t need to be black and shiny, and they don’t need to look like a coffin” (Frahm in Wallace, 2014). Others, like Teerink, do not agree with this statement. For Frahm’s aesthetic practices the Una Corda may offer a set of affordances that mean an improvement, but this is not universally so. Some pianists were missing affordances that conventional pianos do have.

After its introduction some pianists that liked the Una Corda sound asked Klavins to build an eighty-eight key version. According to Klavins, when these people tested the Una Corda, they said “I love it, I want to have it, but please make it with eighty-eight keys. I need the all range keyboard. I want to play Chopin and other music I like.” For piano players that rely on existing compositions, it is important that the key-range is adequate. Additionally, piano players that have played instruments with eighty-eight keys for their whole life may prefer to stick to this range, as changes therein may confuse them. It is due to ‘tacit skills’ that players may prefer conventional design characteristics (Bijsterveld and Schulp, 2004). Reduced string tension made the sixty-four key version mobile. The additional twenty-four keys meant an increase in tension from 4ton to 5.6ton. While this “is still much lower than in a regular piano”, the additional weight makes the piano suitable, “for private people, or for studio use.”

Klavins is also planning to make a horizontal version of the Una Corda. Ideally, he prefers to have the soundboard vertical, as “having it horizontal is like putting a loudspeaker ... on its back faced to the seating.” With a vertical soundboard, “the sound emanates directly into the room.” According to Teerink it is indeed true that speakers are quite “directional” especially for the higher tones. Nevertheless, pianos are relatively open, on the top as well on the bottom, leaving enough space for the sound to emanate. “The tones thus radiate in every direction.” (Teerink interview). Moreover, Teerink states that “the upright is inferior to the grand piano”, because the action of a concert grand is more reliable as it depends on gravity rather than on springs to revert hammers to their original position. The plan to produce horizontal Una Corda’s suggests a general

preference for horizontal piano over its vertical counterpart and piano builders such as Klavins have to conform to these preferences to meet the demand-side.

The Una Corda offers affordances which makes it a piano that serves the purposes of Frahm's approach to music well. Yet, others want different things from it. The affordances those players are looking for happen to be similar to the affordances that were lost by diverging from conventional design. Although adaptation to these demands does not mean that the Una Corda becomes a conventional piano with the characteristic of having only one string per tone, it certainly marks a move towards conventional piano design. Its future success depends on the culturally determined demand for the affordances that its design has to offer. This demand is not rigid, but is give shape by numerous factors. As Steinway's success in creating a demand for its pianos in early twentieth century has shown us, demand can actively be given shape. But relying on less resources, Klavins will not be able to achieve this alone. He needs musicians like Frahm.

Conclusion

The story of the Una Corda is about the coevolution of musical practices and the material objects enrolled therein. Both Nils Frahm and David Klavins were looking for ways to expand the affordances of the piano. Yet, their goals and strategies differed. Frahm was looking for novel ways to modify and amplify the piano in an attempt to incorporate the instrument in the various environments within which he uses it. As these modifications are time consuming, Frahm was searching for ways to bring his own piano on tour. At the same time, Klavins became unsettled with conventional piano designs and developed a desire to design pianos befitting the una corda principle. In his activities as a restorer of old pianos, he acquired an appreciation for the variety in design and sound in the pianos he encountered. While using them as objects for experiments, he developed his own approach towards piano building. The practices of both men envelop an engagement with and are partly determined by existing pianos and their desires to open up its affordances, each in their own way, have drawn them together with the Una Corda as result.

The idea that technological objects and practices co-shape each other is not novel, as it has been central to STS. However, telling stories of coevolution provides us with insights on the cultures that form the backdrop of these stories. We have for example seen how piano builders that try to innovate are confronted with obdurate piano building networks. These builders try to build

pianos that offer new affordances. Yet, stable knowledge, conventions and production networks inhibit design innovations to take off. And even after an innovative design is introduced, the demand for additional production proves to be conditional on adaptations that partly mean a return to the ideal of the grand piano.

Simultaneously we have seen how Frahm's aesthetic approach, which I defined as aesthetic ecology, does not situate artistic creation in the relations between composer, player and instrument, but within an aesthetic environment that contains instruments, players, audiences and spaces. Central to the approach is the idea that aesthetic value can be found anywhere within this environment. Although it is an inclusive approach to music, it also sets boundaries. Practices are geared to unpredictability and spontaneity within predefined conditions. Therefore, the precision of digital looping devices is barred, as the devices that make up the ecology have to have an element of imperfection to them. They have to be instruments. It is then from the complex set of interactions between the artist and his aesthetic environment from which at least the suggestion of 'spontaneous' music springs.

As STS is preoccupied with material practices in which knowledge and technology are embedded, it similarly provides ways to understand the role of objects within musical practices. As discussed, the story of the invention of the Una Corda provides insights in the cultural environments from which it springs. The contingencies that have led to its coming into being highlight those cultural practices that are rigid (e.g. the body of knowledge on which piano builders rely) and those that are bendable (e.g. a shift to an appreciation for unpredictability and spontaneity). An STS perspective, then, hands useful equipment to become attentive to these contingencies. One of its central theses – that society and technology coevolve – has become a storytelling technique that can be a valuable component to the study of music. It allows us to become sensitive to changes in musical culture and the strategies people embrace to change the material objects of these cultures.

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Figure 1: Klavins, D. (2015). *The Una Corda piano* [photograph]. Retrieved May 24, 2015, from: http://klavins-piano-manufaktur.com/e/unacordapiano_en.htm.

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