

Self-Thinking and Self-Learning: Designing a Personal Tool for Making Visual Music

by

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Abstract

This Major Research Project illustrates the Inclusive Design principle of “one-size-fits-one” through an exploration of the process of designing a prototype of Visual Music making tool to match the needs and capabilities of one user—myself. Through an auto-ethnographic self-exploration and self-analysis of my dual identities as an international student from China and a junior graphic designer, I discovered my needs and capabilities as user of visual music tools. Using this information, I reviewed three popular visual music tools, to arrive at features for a prototype tool for myself, *supplemented* by basic features gathered through literature review. With these features, I designed a prototype music visualization tool named *MyTool* with interface mock-ups. *MyTool* is an experiment for creating customized tools through self-study, which could urge designers of popular tools to create more flexible tools, thereby expanding the user community of visual music makers like myself and kicking in a virtuous cycle of inclusion in the context of visual music production and consumption.

Keywords: Visual music, Self-analysis, Auto-ethnography, Inclusive Design, Customization, Personalization

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Dedication

To my dear dad and mom

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1 A Glance at the Project

"Inclusive design keeps the diversity and uniqueness of each individual in mind. As individuals spread out from the hypothetical average, the needs of individuals that are outliers, or at the margins, become ever more diverse. Most individuals stray from the average in some facet of their needs or goals. This means that a mass solution does not work well. Optimal inclusive design is best achieved through one-size-fit-one configurations." (IDRC, Web, n.d., n.p.)

This Major Research Project (MRP) illustrates the above Inclusive Design principle of "one-size-fits-one" through an exploration of the process of designing a prototype Visual Music making tool to match the needs and capabilities of one user—the author. Further, this MRP also addresses the three dimensions of Inclusive Design¹: 1) recognizing diversity and uniqueness; 2) creating inclusive processes and tools; and 3) aiming for broader beneficial impact, through 1) stretching the design scope of some popular visual music tools by positioning the author as an edge user; 2) providing a reference to other users outside of the main target user range; and helping the growth of the community where the author belongs through her participation and self-expression via visual music. The rhetorical structure of this report borrows from both scientific and auto-ethnographic narrative styles.

¹ <http://idrc.ocadu.ca/index.php/resources/idrc-online/library-of-papers/443-whatisinclusivedesign>

1.1 Background and Problem

Visual music, sometimes called "colour music", generally refers to the use of musical structure in visual imagery.² Evans (2005) called visual music "abstract animation" and defined it as the time-based visual imagery that establishes a temporal architecture in a way similar to absolute music, while Rokeby (1995) interpreted visual music as a translation of "visual information in the form of live video input into sound. " It also refers to methods or devices, which can translate sounds or music into a related visual presentation. Visual music has a long history, which can date back to the early 18 centuries with the emergence of the first color organ – a clavecin oculaire – one kind of musical instrument able to produce sound and the associated color simultaneously (McDonnell, 2002). The term "visual music" was, in fact, first used to express the musical feelings from paintings but this word has expended the range of definition as the time goes on.

Starting with the invention of the oscilloscope in the early 20th century, visual music has been experiencing a rapid development with the development of computer technology³. Development of computer graphics technology made the completely electronic process of

² <http://www.mat.ucsb.edu/~wakefield/amv/visualmusic.htm>

³ See details in Section 2.1.2 for details about graphical sound.

creating visual music possible (Schwichtenberg, 1992). With such digital technologies, visual music designers are able to overcome the limitations of physics, mechanics and optics, and the specific/general conflicts inherent in electromechanical and optomechanical visual instruments (Levin, 2000). Inspired by the media industry's mass-media marketing strategies, visual music became one of the most popular and essential expressions in the music industry for the purposes of music entertainment and enjoyment.⁴ Music and visuals became indispensable to each other through this process. The popularity of this understanding is evident from the fact that the abbreviation "MV" is frequently used to denote "music video".

Music video is a short film integrating music and imagery for promotional or artistic purposes (Moller, 2011). It has a variety range of ways of making, but most of which always taking the form of live actions, animations, abstract film or even simply a still image accompanying with the music for creating better and richer user experience to promote the sales of the music recordings. Visual music plays such an important role in abstract film that knowing how to create visual music is significant for designers and animators who have interest in music video creation.

⁴ <http://www.mat.ucsb.edu/~wakefield/amv/visualmusic.htm>

1.2 Personal Motivation and Inclusive Design

As a graphic designer, I have been interested in creating visual music art. However, every time I used one of the popular tools available for creating visual music, I discovered that it was not inclusive enough to allow me to express my understanding of the music piece optimally due to a mismatch between my needs and capabilities and the designing environment offered by that tool,⁵ which dampened the pleasure of creativity and free expression for me. Inspired by what I learned in the program about inclusive design, and enthused by my own interest in visual music, I took upon myself the task of designing a personalized visual music tool that would allow me to express myself freely within my own technical, cultural and linguistic configuration.

I came to discover the existence of visual music through my interest in info graphics animations. Initially, I viewed visual music merely as a combination of visual elements and music that offers a richer and more enjoyable experience for the audience. In 2014, I created a visual music video named *UMI—The Sea*⁶, which was selected for display in OCAD University's Digital Interaction Show,

⁵ See details in Chapter 4 Tools Examination.

⁶ https://www.youtube.com/watch?time_continue=1&v=7QJiAhrasGY

2015. This encouraged me to devote more time to develop my skills and create more artworks. I gradually fell in love with this medium. During my forays into music video making, I used Adobe Aftereffects and Premiere, trying to express my understanding of the feelings in the song. However, as a novice, I found it difficult to create the mapping between visuals and sound, and I had to do it frame by frame, especially when I was trying to do the reflection on the starting of the song.

I read Thomas Ciufu's (2002) work, which claimed that although the combining of sound and image is a permanent topic, the synthesis actually progressed, especially with the help of computer technologies. Thus, I noticed that mapping between visual and music was possible through programming. But, after trying Max 7, I realized that doing this would be difficult and/or time consuming for people without technical background or programming skills, and it could take a long time to produce even a really small and simple piece. I felt stuck and confused about my next step.

Fortunately, my engagement with the Inclusive Design Master's program proved helpful. We learned that inclusive design is "design that considers the full range of human diversity with respect to ability, language, culture, gender, age and other forms of human difference"

(IDRC, n.d., n.p.). We also learned about the three dimensions of inclusive design, namely, (i) recognizing diversity and uniqueness of individuals for whom the design is intended, (ii) ensuring that the design process and tools are also inclusive, and (iii) striving to effect a beneficial impact beyond the intended beneficiary of the design. I was inspired by the first dimension, which further posits that optimal inclusive design is best achieved through one-size-fit-one configurations. This motivated my journey to discover the unique differences and strengths that are my own, and explore the mismatch between my needs and capabilities and the visual music creation environment popularly available, with the goal of designing my own visual music tool – a personalized version fitting me uniquely.

This personal tool can be seen as an experiment for software customization, which responds to the trend of constructing an inclusive and diverse learning environment, and my journey as an exploration of self-identity and personalization in the context of inclusive design.

1.3 Research Methods

1.3.1 Conceptual Framework

In considering the design of a “personal tool for visual music”, there are three key concepts: “personal”, “tool” and “visual music”. As such, three dimensions need to be taken into account: (i) study of

personal factors (about myself); (ii) research about current tools; and (iii) learning about visual music. These three dimensions provide the source for the design components that go into the design of the tool. Therefore, they define the framework for this research project. Figure 1 presents this conceptual framework.

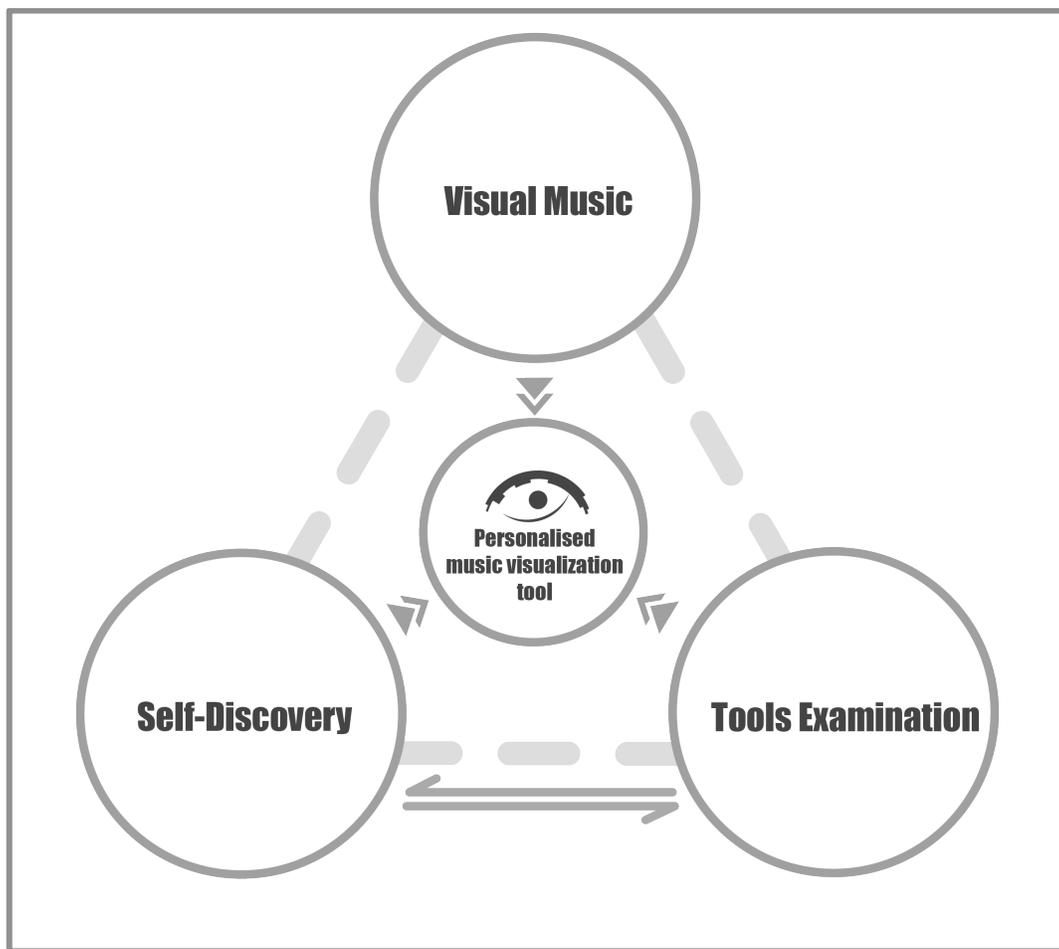


Figure 1: Conceptual framework model 1.

A review of the literature on visual music in Section 2 provides the basic structure for the tool, an exploration of my self-identity in

Section 3 leads to the discovery of my differences and strengths and an examination in Section 4 of some popular visual music tools in the light of those differences and strengths provides further design components for my personal tool.

Thus, through the following three Sections covering the three concepts—Visual Music, Self-Discovery and Tools Examination—the framework Model 1 in Figure 1 is expanded to arrive at the basis for the initial prototype design of the personal tool named *MyTool*.

1.3.2 Research Approach and Methods

This study adopted a qualitative approach to tackling the inclusive design challenge of creating *MyTool* using a triad of methods. First, a literature review on visual music was undertaken to discover the history and makings of visual music: how it emerged and changed through the time and how the tool for creating it has been created, developed and improved along the centuries. Secondly, an auto-ethnographic journey of self-analysis of my double identities as an international student and a graphic designer was undertaken, leading to self-discovery of differences and strengths. Finally, an environmental scanning of current tools and their examination in the light of my unique needs and capabilities was conducted to discover and construct the basic frame of the tool by looking into the basic

functions, what they are for, what the mismatches are and how they can be resolved.

1.3.3 Auto-ethnography

Auto-ethnography constitutes the primary method for this Major Research Project. Auto-ethnography is a form of self-reflection and writing that explores the researcher's personal experience and connects their autobiographical story to wider cultural, political, and social meanings and understandings (Ellis, 2004; Maréchal, 2010). Ethnography normally involves a tension between the roles of the researcher as an insider vs. an outsider (Dwyer & Buckle, 2009). But auto-ethnography is different, in that here, the researcher takes the role of the participant as well, thereby there is no separation as insider and outsider, rather there is only a combined role of insider + outsider. The advantages and disadvantages of conducting research as an insider has been discussed as being able to obtain faster and more complete acceptance but being easier to get stuck in role conflicts and negative influence on accuracy and objectivity. However, auto-ethnography focuses more on subjectivity, the process of seeking the "true me" through self-conversation as "whether we call a work an auto-ethnography or an ethnography depends as much on the claims made by authors as anything else" (Ellingson and Ellis, 2008, p449). Therefore, it cannot be assessed with the same criteria as for theory-

driven or hypothesis-examined research. However, the purpose of research being subordinate to design in this study, such concerns are not material.

Even though the goal of my MRP is to build a personal tool, the entire focus of the research is not just on the design prototype produced, but also on the whole process of making it. All the self-observation and reflections that happened in the process constitute a journey of seeking self-nature. It is a story in which we care about the end but we also care about how we reach the end.

1.4 Report Outline

This introductory Section provides a glimpse of the scope of this project, followed by the second Section on Visual music, presenting the history of visual music, the ways of creating visual music as well as some new representations. Section 3 describes my journey of self-analysis as an international student and a junior graphic designer, which describes my experience: the challenges, changes and progress. An examination of current tools is conducted in Section 4, analyzing the good and bad features of those tools via my experience in using them to create visual music. Section 5 summarizes all the requirements from the previous chapters and presents a prototype of the personal tool named *MyTool* that is created based on the design

criteria. Screen mock-ups and descriptions are provided in this Section. Section 6 that follows presents a reflection of the process and outcomes of the research. The report concludes with Section 7 highlighting the unique contributions this study has made to the field of inclusive design, and mentioning the limitations and future steps.

2 Visual Music

2.1 History of Visual Music

In 1912, art critic Roger Fry first coined the term "Visual Music" to describe artist Wassily Kandinsky's paintings (Ward, 2006). Kandinsky claimed that he could actually hear the sound of the color, and throughout his life he created several abstract paintings describing and reflecting his understanding and expression of the pictorial form of music (Düchting, 2000). Originally, "visual music" emphasized the connection between music and painting. William Moritz, the best historian of visual music, took "visual music" into a broader range – a genre of media showing correspondence between music and imagery. Moritz uses this term in his research and he advocated that the beginning of "visual music" is marked by the emergence of abstract films, particularly in his analysis of the filmmaker Oskar Fischinger, which shows the new principles of aesthetics to create "visual music" (Moritz, 2004). McDonnell explained that current use of "visual music" has arisen mainly from exhibitions and events that present visual music works (McDonnell, 2010).

2.1.1 Color Organs

As an important element in visuals, color has a lot to say within the development of visual music, with color organ being the earliest form of visual music. Artists or inventors "built instruments, usually called 'color organs,' that would display modulated colored light in some kind of fluid fashion comparable to music." (Moritz, 1997) The tools or installations applying color as a medium to reflect the rhythm of the music are called "color organs". They usually use light in the performance of translating music with the electronic devices during middle 20 century, therefore are increasingly called "light organs" as well.

William Moritz described color organs in this way, "The dream of creating a visual music comparable to auditory music found its fulfillment in animated abstract films by artists such as Oskar Fischinger, Len Lye and Norman McLaren; but long before them, many people built instruments, usually called "color organs," that would display modulated colored light in some kind of fluid fashion comparable to music." (Moritz, 1997)

As "the early history of this art was driven by an interest in color. (Collopy, 2000, P336)", the famous French mathematician and physicist Louis Bertrand Castel built up the first color organ—the

Ocular Harpsichord—around 1730. Castel firmly believed that there was a solid relationship between the seven colors and the seven units of the scale and he made a clavecin oculaire, a light-organ and a new musical instrument, which could produce both sound and the “correct” associated color for each note at the same time. The ocular harpsichord had sixty small coloured glass panes, each with a curtain that opened when a key was struck (McDonnell, 2002). This instrument was such a great success and has constructed the initial rudiment of color organ that “Castel predicted that every home in Paris would one day have an Ocular Harpsichord for recreation” and “dreamed of a factory making some 800,000 of them”, but history shows that it was only a well-done experiment where the “clumsy technology did not really outlive the inventor himself, and no physical relic of it survives.” (Moritz, 1997)

Since then, artists all over the world achieved further development of color organs. “Others, including D.D. Jameson, Bainbridge Bishop, and A. Wallace Rimington, created color organs through the next century.” (Collopy, 2000, P336) Sir David Brewster came up with the idea to take the Kaleidoscope as a form of visual music expression in 1816. Bainbridge Bishop published his scheme of correspondence between color and notes in 1893. He also made several color organs with “little windows glazed with different-colored

glass ". The instruments were lighted attachments designed for pipe organs that could project colored lights onto a screen in synchronization with musical performance (Bishop, 1893).

The development of electricity has enhanced the production of color organs. During the 1920s, Thomas Wilfred created the color organ the Clavilux, and named the art form of color-music projections "Lumia." He stressed polymorphous, fluid streams of color slowly metamorphosing. One of the most significant aspects about Wilfred's invention is that his instrument can project color image, not only color lights like those in the initial stage. In later periods, artists continued to make contributions for color organs, including Mary Hallock Greenewalt, Alexander Laszlo, Charles Blanc-Gatti, Walther Ruttmann and Oskar Fischinger.⁷

Color organ was one of the most crucial components in visual music. It provided a way of expressing music with colors, which was widely used in several music installations and performances in the following decades. It was an amazing invention in the early centuries as it showed the possibility for allowing the deaf or partially hearing-

⁷ <http://www.centerforvisualmusic.org/Library.html>
& <http://homepage.eircom.net/~musima/visualmusic/visualmusic.htm>

impaired to enjoy music in another way (seeing the movements of color or light).

2.1.2 Graphical Sound

In the early 20th century, the emergence of film and animation technologies made it possible to create animations with more possibilities rather than variation of colors (Rokeby, 1995). With the development of technology, the definition of "Visual Music" began to expand. It also refers to the mutual translation between sound and visual forms with a specific mechanism. And Graphical Sound is one of the most important ones.

Graphical sound or drawn sound, a technology that can synthesize sound by creating graphical patterns on optical sound tracks of the transparent film, was created with the development of sound-on-film technology (Robertson, 2010). During the early 20th century, several practical experiments were conducted in different areas of the world, offering the possibility of creating sound not only by recording but also by synthesizing and manipulating by creators' own preference.

Arseny Avraamov was the originator of many ideas that influenced the development of drawn sound (Izvolov, 1998). The "Welttonsystem" he invented incorporates all the existing music

systems in the world and had a significant influence on the development of graphical music.

In 1930, Avraamov was the first to demonstrate experimental sound pieces produced purely with drawing methods and he created over 1930-34 more than 2000 meters of sound track (Smirnov, 2013).

Germany filmmaker Oskar Fischinger is another well-known contributor of graphical sound. He conducted the famous ornament sound experiments in 1932, almost exactly at the same time as Avraamov did. In his experiment, he made different series of regular graphic patterns on the transparent sound track, which turned into the various sounds of different tone through the machine. All these results gave him new insights for music development.

"Between ornament and music persist direct connections, which means that Ornaments are Music. If you look at a strip of film from my experiments with synthetic sound, you will see along one edge a thin stripe of jagged ornamental patterns. These ornaments are drawn music - they are sound: when run through a projector, these graphic sounds broadcast tones of a hitherto unheard of purity, and thus, quite obviously, fantastic possibilities open up for the composition of music in the future" (Fischinger, 1932, p.28)

Influenced greatly by the contributions of Arseny Avraamov, Norman McLaren finished his first sound film *Pen Point Percussion* in 1951. In the film, he used a vivid and lively way to show what sound looks like with an oscilloscope and explained the procedure of how he

caught the movements of the sound, indicating that the sound on the track is the pattern of the light. From there, he reversed the idea," if a sound can make a pattern on film, then a pattern on film will make a sound. You can even create your own sound!"⁸ This movie helps Norman match up with his motion graphics and discover the skills for directors to have direct control of every step of the film production.

2.1.3 Visual Music and Synaesthesia

According to researchers, synaesthesia is a neurological phenomenon in which stimulation of one sensory or cognitive pathway leads to automatic, involuntary experiences in a second sensory or cognitive pathway (Baron-Cohen and Harrison, 1997; Cytowic, 2002 & 2003; Cytowic & Eagleman, 2009).

Sometimes, visual music is taken to be the same as synaesthesia because the most common form of synaesthesia is "colored hearing", which encompasses both music-color and word-color synaesthesia (Baron-Cohen and Harrison, 1997) Besides, there is one kind of synaesthesia named chromesthesia, which is "something like fireworks": voice, music and all the environmental sound will associate with various colors and shapes, which all fade away the

⁸ McLaren, Norman. "[Pen Point Percussion](http://www.nfb.ca/film/pen_point_percussion/)".
http://www.nfb.ca/film/pen_point_percussion/

moment the sound ends (Cytowic & Eagleman, 2009). Chromesthesia includes the meaning of association between sound and color, which is very similar to the concept of visual music.

But, sometimes synaesthesia is seen in a different perspective and far deviant from the range of visual music. As it is a “neurological phenomenon (Cytowic, 2002 & 2003)”, it shows one of the differences from visual music: visual music is artificial and made by human with a specific purpose while synaesthesia is a phenomenon or one kind of ability of human due to the structure of the brain. Researchers also mentioned that it is difficult to define synaesthesia because there are plenty of different phenomena happening within the same term (Nikolić, 2009 & Simner, 2012). Another difference with visual music can be seen here: Visual music is only in the range between sound and visuals while synaesthesia has a broader scope. It means any mutual sensations, not only sound and visuals, but also logic and colors, sound and taste and so on.

2.1.4 Computer Graphics Tool

Since the invention of the oscilloscope, “a laboratory instrument commonly used to display and analyze the waveform of electronic

signals”⁹, computer graphics has taken on a crucial role in creating visual music. Then came plenty of new inventions related to visual music based on computer technologies: such as MIDI, the abbreviation of Musical Instrument Digital Interface, referring to a technical standard that describes a protocol, digital interface and connectors and allows a wide variety of electronic musical instruments, computers and other related devices to connect and communicate with one another (Swift, 1997). The MIDI standard makes it easier to synthesize and manipulate sound (Brewster, 2002). The strong support from computer as well as wide applications allowed people create, edit and store music in a much faster and easier way, which accelerated the development of music production (Holmes, T. B., & Holmes, T., 2002).

Another typical invention is *MetaSynth*, an electronic music studio for Mac OS X where you create, compose, design and transform music and sound in a unique environment that invites exploration (Sasso, 2005). There is also a music software *autom@ted_VisualMusic* (Sergio Maltagliati, 2001), which is a generative visual music software,

⁹ <http://whatis.techtarget.com/definition/oscilloscope>

creating images and sounds in relation to precise correspondences sound-symbol-color, producing multiple variations.¹⁰

Through this *autom@ted_VisualMusiC*, the images, composed with reference to precise sound/sign/colour correspondences, follow the changes of the music. This program can be configured to create random multiple visual-music variations, starting from a simple sonorous/visual cell. It generates a new and original audio-visual composition each time the play button is clicked¹¹. In the piece made by this program and originally from John Cage's painting¹², it shows different combinations of various visual elements of different colors and shapes from the painting, which makes up different patterns corresponding to the change of the music.

2.2 Creating Visual Music

2.2.1 Mapping between Sound and Visuals

To create visual music, translating sound directly to the visuals, besides the personal understanding or perceptions, setting up the right mapping between sound and visuals is a key. "Mappings are

¹⁰ Generative Art Politecnico of Milano University. From <http://www.generativeart.com/program2001.htm>

¹¹ *autom@ted(Visual)MusiC* From <http://www.visualmusic.it/visualmusic.htm>

¹² **CA12G92E2** (from original John Cage's paintings) *autom@tedVisualMusiC 4.01* From <http://www.visualmusic.it/CA12G92E2.htm>

transformations used to convert input parameters to outputs in a different domain.” (Jones & Nevile, 2005, p56) In other words, that is to associate one element in this area with another (single or multiple) in a different field. Sound and visuals are completely different areas, to achieve the translation in between, we need to figure out what the connections are.

There are different experiments and approaches in history that tried to achieve the singular integration of sound and image. Greek philosophers Pythagoras and Aristotle speculated regarding the correlation between musical scale and the rainbow spectrum of hues (Moritz, 1997). Bauhaus artists Kandinsky and Klee have observed similarities between music and painting and Moholy-Nagy investigated the physical properties of color and light (Chipp, 1968). Combining sound and image is a permanent topic but it actually got progress especially during the age of computer science (Ciufu, 2002). In the digital era, ways of mapping have been discovered and summarized in integration of visuals and sound.

According to Jones, R., & Nevile, B (2005) in *Creating visual music in jitter: Approaches and techniques*, we can consider the fundamental frequency, amplitude and timbre, mapping them to the size, brightness and shape of a visual object to match a graphical

voice to a sound voice. They claimed, "timbre is too complex a phenomenon to be represented by a small number of changing values." Although there has been a famous experiment designed by the Gestalt psychologist Wolfgang K6hler (1929) and further refined by Werner (1934) about "Kiki and Bonba" showing amazing agreement of human perception, it was on the basis of synaesthesia and hard to be calculated and defined. Color is another complex element and there is no universality showing how to do mapping with color.

They summarized the history of mappings between sound and images, exhibiting that the basic isomorphism in those mappings may be banal but they are the crucial ground on which we can develop and derive. As a solution, they gave the approach and techniques to create visual music with the Jitter software developed by Cycling 74.

2.2.2 Linking and Mapping

Ciufo distinguished between the two similar concepts, Linking and Mapping. In his words, "Linking can be thought of as a general perceptive function and describes the intersection or interaction of sound and image. Mapping deals specifically with how these perceptual aspects connect and influence each other." (Ciufo, 2002, p2) To explain it more specifically, "linking" deals with the basic connection and synchronization between sound and image but it is not absolute.

The connection can be changed to something else, which we can take as an expression or a perception by the creator. While "mapping" will have a more scientific way, there will be different qualities in sound and vision, which are separated but directly connected. And there may be some exact mathematics to calculate the detailed number.

David Rokeby (1995) also explained similar ideas in *Challenges in the Intermodal Translation of Art* by dividing visual music into one intending to synchronize to the music rhythm and the other intending to act as an individual visual expression connected with the aesthetics of the music and sound. He further explained that visual music stands for its own but also has two fields, one following scientific and mathematical principles, and the other which forms very subjective representations of the artist's experience of the music.

However, Levin holds a different opinion, which shows the possibility of exploration for doing visual music between linking and mapping.

"One more theme which has cut across more than four centuries of color-music research, from Castel's to that of the present day, is the question as to whether there are any 'absolute' correspondences between sound and vision. It is one of the deepest issues in the field; some have felt that it is best answered through empirical studies in psychology, while others have denied the possibility of any essential mappings, and instead held that the matter is simply an aesthetic one, best

handled by design. The truth is almost certainly somewhere in between.” (Levin, 2000)

The discussion is important because it presents two different ways of doing visual music. First one is to do “linking”, which has been achieved by a lot of video artists. They create visual art based on their own understanding. The second one is “Mapping”, which is to pick up specific parameters in sound and visuals and connect them artificially with mathematics or data analysis to make a mechanism, which is the way programmers always go for. And Levin’s point provides the possibility of seeking something in between.

2.2.3 Other Experiments

Regarding the questions of whether there is a corresponding system between sound and visuals, some researchers have raised other opinions.

In *Mapping Sound to Image in Interactive Multimedia Art*, the researchers (Lee & Berger & Yeo, 2004) introduced a new concept—soxel—a representational analogous to the concept of pixel. They used a spatial approach to do the mapping for integrating synthesis and processing of digital image and sound in a new developed software—sonART. Besides, the concept of “layers” is imported in their experiment. They used the loudness and the sample rate of the sound to make the mapping and finally mixed one layered mapping in one

image. As a result, they showed some of their examples exploring with the software sonART, a couple of still images with multiple layers reflecting the different parameters they chose for mapping with sound – including volume, pitch and other properties.

Another experiment done in Japan (Nagata & Iwai & Wake & Inokuchi, 2005) used the most traditional way – testing – to verify the direct correspondence between sound and color by mappings between physical parameters such as key and timbre. They had the experiment on two groups, one was considered having the special ability of “colored hearing”, a form of synaesthesia, while the other wasn’t. The result is that they could not find any specific connection between sound and color in the normal group, which could not prove there is no connection between sound and color but at least showed that color is such a complex element that it still needs further research.

With all kinds of experiments exploring the possibilities between the borders of sound and visuals, David Rokeby (1995) argued that the heart of the work is the most significant part. In his perspective, visual music is one kind of “translation between different models”. He claimed that translation is important because for “users able to access both medias”, it can “enhance experience and understanding” but for users with restricted access translation is the “only source”. He further

advocated that sound can be translated into visual data in “any number of ways”, however, it is “not sufficient nor satisfying to think in terms of a literal presentation of sound data in a visual form” if the “heart of the work is not presented in the translation”. Rokeby emphasized that the core of translation (which can be applied to visual music as well) - expressing the heart (soul) of the work rather than trying to match all kind of properties of the music, otherwise “the effort of producing and digesting and deciphering the translation is wasted effort.”

2.2.4 Visual Music in New Formats

“21st-century art is a burgeoning” and “incredibly dynamic field of study” with the emergence of “a vast variety of materials and means.”¹³ With the development of music industry and the process of multicultural inclusion, visual music has been presenting a rich variety and multi-faced diversity during the late 20th century and early 21st century.

The Very Nervous Systems (Rokeby, 1995) is one of the most representing works. It is an improvisation tool allowing the real-time interaction between the users and the system to create sound with

¹³ <https://www.khanacademy.org/humanities/global-culture/beginners-guide-contemporary-art1/a/art-in-the-21st-century>

body language. In Rokeby's word, "it is the third generation of interactive sound installation" making of "cameras, image processors, computers, synthesizers and a sound system to create a space in which the movements of one's body create sound and/or music". Rokeby created this work because of "a simple impulse towards contrariness". Considering that computer is strongly biased, he constructed the settings of the installation responding to the contrary of computers, making the interaction process intuitive, the human body closely engaged and the experience intimate. The intense and complex interaction loop from this installation can make audience "feel directly involved". The Very Nervous Systems was a breakthrough because it differs from the past visual music with the interaction with "body language", obtaining a unique and lively responding loop between sound and body movements.

Besides the improvements in human interaction, the movie *Fantasia* (Disney, 1940) showed more possibilities in visual music with the great varieties and rich combinations in showing the abundant content in a user-friendly and inclusive way.

Fantasia is an American animated film produced by Walt Disney in 1940, which consists of live action scenes of orchestra members playing instruments, the story telling scene and the abstract animation

scene. Motivated by gaining back the popularity of the star role Mickey Mouse and inspired by the interest in producing abstract animation (Culhane, 1983), Disney started the journey of Fantasia and got great success in spite of the difficulties in the unexpected great cost and failure of creating satisfied abstract patterns (Solomon, 1990). Though Fantasia doesn't belong to the range of the visual music, it did relate and contribute a lot to this media. First of all, this movie is an experiment of Disney trying to match visuals to sound. He had the concept of matching up animation to classical music in 1982 and he would like to go beyond the usual and produce something with "sheer fantasy unfolds ... action controlled by a musical pattern has great charm in the realm of unreality" (Culhane, 1983, p13 & Barrier, 2003, p242). What's more, Fantasia achieved great success embedding visual music. According to Fantasia's official description, it is an "extravaganza of sight and sound", which will allow the audience to "See the music come to life, hear the pictures burst into song".¹⁴ The Fantasia is claimed as "masterpiece" by music critic Isabel Morse Jones because of the "enormously varied concert of pictorial ideas, of abstract music by acknowledged composers and performers".¹⁵ This movie is important in the visual music's history, because it led "to a

¹⁴ <http://movies.disney.com/fantasia>

¹⁵ <http://latimesblogs.latimes.com/thedailymirror/2011/01/fantasia-acclaimed-as-film-masterpiece.html>

new style of motion picture presentation (Pegolotti, 2003, p235)” and made “outstanding contribution to the advancement of the use of sound in motion pictures (Holden, 1993, p584)”

Entering recent decades, the “live” visual music has come into being. One of the most popular Japanese rock bands – OLDCODEX (from 2009) has a unique combination of members – vocal Tatsu and painter Yorke. They are presenting the voice with hard rock style and strong rhythm of dance from Tatsu while providing the vision of mixture art from painter Yorke. In their live show, Yorke does a live painting on a big canvas interacting with the music and lyrics, creating an aggressive and provocative performance and offering a strong and emotional duel experience for the audiences¹⁶.

2.3 Summary

Along the history of the development of visual music, it is no denying that visual music has taken a great part of the music industry. Visual music has achieved such great success from an initial experimental instrument to the variety and diversity we have right now. It is evolving, encompassing different media and adopting new elements every day.

¹⁶ <http://www.oldcodex.com/bio.php>

From the various experiments above, it can be seen that no matter how visual music changes its form or how the way it is created has been revised, the basic factors constructing visual music are always the same: sound (music), visuals (shapes, colors, actions, etc.), mapping system (how to connect the sound and visuals). These basic elements will form part of the design components for the prototype personal visual music tool *MyTool*¹⁷.

These basic factors that constitute visual music summary are updated into the conceptual framework model as shown by Figure 2.

¹⁷ As described in Section 5.

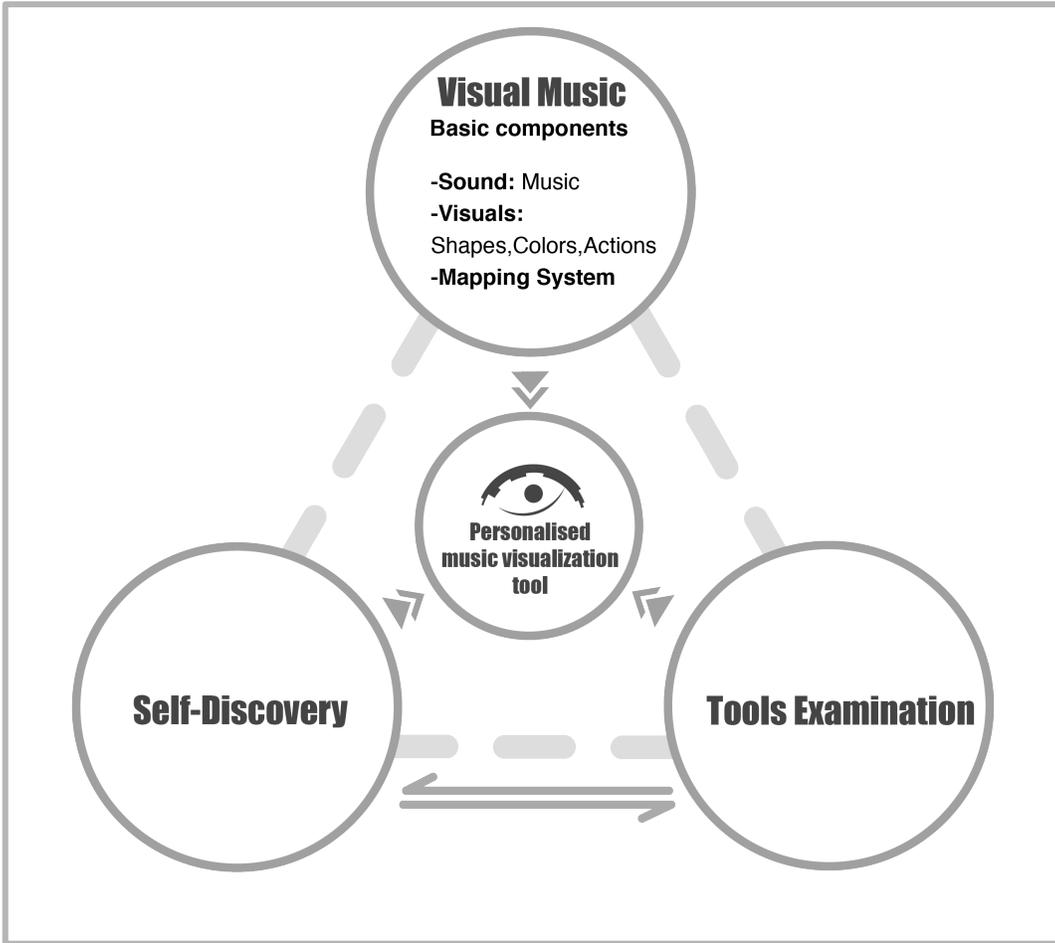


Figure 2: Conceptual framework model 2.

3 Self-Discovery of Identities

Following from the previous Section, I present a self-analysis in this section. According to Homey (1999), constructive self-analysis is important because it offers “a chance for self-realization” and opens up “a new vista “. Though the “ills of the world” cannot be cured by doing this analysis, “it can at least clarify some frictions and misunderstandings”. Furthermore, self-assessment motive can prompt people to seek information to confirm the uncertain self-concept as well as enhance the certainty of own self-knowledge (Sedikides, 1993; Sedikides & Strube, 1997). Through this self-analysis, starting with the anatomy of my self-identities, I believe that I can discover my true self-nature as well as access some important needs to build up the prototype.

Figure 3 shows the steps I will be following for self-exploration I of my two identities: an international student from China and a graphic designer with interest in visual music. Under each section my differences or uniqueness in different aspects—language, culture and technical issues—will be discussed; but also, connecting these two identities are my strengths: ability to learn independently and graphic design expertise.

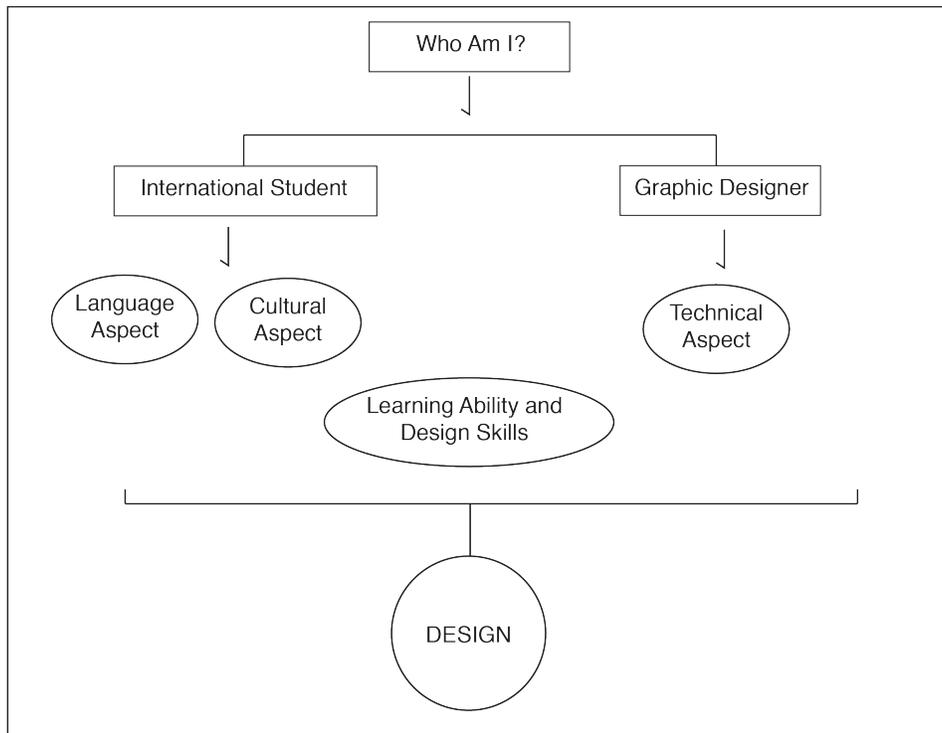


Figure 3: Self-analysis process.

3.1 Who Am I?

Who am I? It is a question being frequently asked by most of us. It is a complicated philosophical question and deserves discussion, because everyone has multiple identities, including me. A student, a female, a movie lover... However, here I'm going to focus on the two specific identities that relate to my needs for a personal tool.

3.1.1 An International Student From China

On August 9, 1992, a girl was born in a small village in the Canton Province of southern China. That is me. After finishing my primary school, middle school and high school, motivated by my interest towards Japanese animation, I entered a university that is also located in Canton Province and chose graphic design as my major. Along my twenty-two years of life, I never studied in a different country. I have been to Japan for several times for internship and tourism but Japan shares the same cultural root with China and the both are important parts of Asian culture. In order to experience a different life and broaden my horizon, I decided to pursue my further study in a completely different environment.

With two big suitcases, a backpack and a handbag, I finally got my passport returned from the border officer and stepped into the "land" of Canada on August 1, 2014. On that date, I formally became an international student. I would be living and studying in a totally different place, using a different language to communicate with people from all around the world.

My Journey had started.

Language aspect

Starting a new life in a new place is not easy, especially when a completely different language is needed to finish even a simple act such as shopping. Though I have been learning English for more than ten years, since Grade Four in primary school and have passed the required English qualification test, TOEFL, I realized that learning a language from the book and actually using it are so very different. According to published research, international students from countries where English is not the official language for instruction have considerable difficulty in coping with the academic and social life in Canada (Berry, 1997; Kim & Abreu, 2001; Zhang & Zhou, 2010). In the beginning of the first year, I had a hard time catching up with the course content due to the speed of speaking and different accents of students all around the world. Gradually I got used to the speed but the vocabulary problem still persists because there were plenty of new and complicated terms in the course content that I had never heard before.

I have to say that no matter how hard I tried to learn English, because it is not my mother language, the natural gap and the difference in thinking has not disappeared. I suppose it will be a long-

term battle. This language barrier for me as an international student from China is a reality.

Cultural aspect

Another difficulty I faced in Canada is the culture shock, which is the personal disorientation people feel when experiencing an unfamiliar way of life due to immigration/ travel / visit /move between social environments (Macionis & Gerber, 2010). China and Canada share such different cultures that it is hard for me to get involved completely into the surroundings. Especially because I'm such a typical Asian girl, conservative, shy to some extent, and not so active in social activities.

When I arrived in Toronto, I initially stayed with a Chinese family for two months but had to move to downtown because of the long commute to my school. At that time, I was thinking of developing better communication with different people so I moved into an apartment with "foreigners" (which, in my own perspective, means non-Chinese). However, it turned out to be an unhappy experience. It was a small apartment but several girls lived there because the landlord accommodated two people in one room, which was illegal because the landlord did not have the necessary permit for using his small apartment as a rooming house and there were not enough

facilities to protect the safety of tenants. I knew nothing about the law, tenant's rights or any other rules, so I just tolerated. I still remember that night when policemen, the fire marshall, the landlord, and another person who claimed himself to be the "original landlord" got together and had a fierce argument. Finally we were asked to move out as soon as possible. However, it was just the start of the nightmare. Some girls in the house got crazy because they thought that the landlord "cheated" us and so we could do whatever we want, which resulted in a totally chaotic situation in the apartment. They began to overlook all the rules in the house, leaving the dishes in the sink, stopping gathering garbage, bringing their boyfriends into the house without confirmation, talking loudly in the middle of the night, and so on. It was just unbearable, although I am not judging right or wrong, or talking about Canadian culture based on such a small group. The reason why I mentioned about this incident is because it pushed me to my stronger conservativeness to stay within my comfort zone. And so, three weeks after that night, I moved to another apartment shared with two Chinese girls, and am staying there until now.

Due to the unpleasant experience, I stopped exploring further. I tried to live in the same style as I did in China, keeping myself within a very narrow circle. The only people I know are classmates and co-workers from the same location. But, even then, sometimes there are

problems. I'm a person who likes quiet surroundings, and chatting with friends in a nice, quiet place while having some tea is my favourite way of spending time with friends. Some of my friends invite me to pubs or bars where there is too much noise and alcohol; I don't like the atmosphere there, so I kept reducing the time I spent on social activities and stayed at home. I felt very lonely, upset and homesick at those times.

Later on, I gradually obtained a balance of staying alone while going out for some time in my preferred way. However, the cultural gap is always there. Because of the completely different cultures, it is hard for me to get involved into the local culture. We are from different backgrounds, have different values and different attitudes towards life. For example, it is difficult for me to understand some of the local humour because I don't have the cultural "root" in my mind.

Certainly, we respect the uniqueness and diversity of every individual, but for someone who is living in a foreign environment it is important to gain a sense of "belonging". I was born and raised in China and lived there for 22 years and I can never get rid of the cultural "seed" deeply embedded inside me. For me, the cultural barrier cannot be erased completely but at least I can start from

something similar to my original background and gradually learn and adapt to it.

3.1.2 A Junior Graphic Designer

According to the Dictionary of American English, "Design is the creation of a plan or convention for the construction of an object or a system."¹⁸ And graphic design "is the art and practice of planning and projecting ideas and experiences with visual and textual content."¹⁹ Right now I define myself as a junior graphic designer but actually before I entered the university, my life had had nothing to do with art or design.

The Dark Times and My Light – Graphic Design

All along in my life as a student before entering university, I had been a traditional "good student" in many Chinese parents' eyes: go to school everyday, attend every class, finish all the homework carefully, always raise hand when the teachers ask questions, and of course get good marks in most of the subjects. Yes, I was a good student in most people's eyes who focus on studies only, which actually deprived me of the time for seeking and developing my own interest. All the time I

¹⁸ <http://dictionary.reference.com/browse/design>

¹⁹ <http://www.aiga.org/what-is-design/>

had been thinking about getting better GPA, going to a good high school and a famous university. But what about the time after graduating from the university? It seemed that I didn't think about the future at all and university was the final goal of my life, which turned out to be a ridiculous and completely wrong way of living.

A change came when I got introduced to Japanese animation during middle school. Though it was not the first time I watched Japanese animations (we had some shown on TV), I was completely taken in by one, *The Prince of Tennis*, which talks about how a tennis club in middle school fought and managed to win the national tournament²⁰. I really loved the episodes so I spent lots of time on it and even started drawing the characters in the animation, which, in my parents' eyes, was a waste of time because their belief is that students need to focus on studies and everything about the school. In that atmosphere and under pressure, I felt that I was doing something wrong and really felt guilty about that. Soon I entered high school and was busy preparing for the university-entrance examination. But at the beginning of the second year, all of a sudden I became depressed. Suddenly I lost my passion, my motivation to keep studying. I knew how important it was to my family and me because I had spent more

²⁰ <http://tenipuri.jp/>

than 10 years and my whole life would depend on this single test! But I could do nothing about it. It seemed as if there was a black hole in my heart, absorbing all my enthusiasm and energy. I was feeling frustrated, anxious and depressed everyday with lots of crying and tears. I tried many times to overcome it, talking with my parents, classmates, teachers and even counsellors. Sometimes I got better but quickly I would go back to the depressed state. The episodes came over and over again, which destroyed the peace of my family. My parents started getting frustrated and their attitude changed from encouragement and comforting to impatience and anger. In those dark times, I even thought of ending my life.

What saved me was the animation. Accidentally, I started watching *The Prince of Tennis* again. This time, with the deep depression in my heart, I was feeling the same as Inui (one of the main characters in the animation) when he was at the edge of losing the third game in the finals, which is very dangerous for the whole team (If he lost, the whole team would not be able to attend the national tournament). At the time when nothing could help, I got a common sense from the animation. I got to know that I could not stop here! Since then, every time I felt depressed again, I would watch the animation and heal my heart. With the encouragement from the virtual

characters, I managed to finish my high school and get admitted into a university in Canton Province.

Thinking about the time when I discussed my major with my parents, I feel so funny but sad. I spent more than 10 years studying to get into a good university but didn't even spend a minute thinking about what I like and want to do in the future. After quarrels and arguments, I finally chose graphic design as my major because I still remember the inspiration and courage I received from the animation and would like to do something connected with them.

My life as a graphic design student started.

Technical aspect

Though learning about graphic design is not something I had been dreaming about, I was attracted to it soon after I started. Design is great fun because there are a lot of possibilities for displaying items on the paper or the screen. As I had never learnt about anything related to art or design before, I believed that it was necessary for me to learn a little bit about drawing and painting, which can help me build up shapes and realize my ideas quicker. I also thought of learning something about coding so I can make some interaction functions possible. However, as I was never good at mathematics in

my life, it was a tough path for me to go. I mastered some basic HTML and CSS but I can only handle the simplest ones.

Even after I started making animations, and then some other interesting videos and got introduced to Adobe Flash, I remained in the position of making using the non-interaction functions. The language ActionScript (programming language in Adobe Flash) is similar to JavaScript and hard to manipulate so I decided to focus more on other aspects of doing design.

As mentioned in the motivation part, I got interested in visual music in the first year in OCAD University. Without any technical background, programming is still a big challenge for me. Especially for visual music, all I want is just to match the elements I design with the sound using a graphical user interface with a layer of programming underneath to help me do the mapping automatically.

3.1.3 The Stronger Me

There is a popular saying among Chinese international students, "International students are supermen." Though it is funny, to some extent it is true. After I came to Canada, I became more independent and began to think about myself as an individual, knowing what exactly I'm looking for rather than doing something based on other people's ideas or assessments. I'm living a totally "my" life.

In this Section two of my strong points will be discussed: my learning ability as an international student, and my design skills as a junior graphic designer. As a student coming from a different background, I have proved that I have acquired certain knowledge base and learning ability enough to allow me to study abroad and start something on my own. Also, as a graphic designer with 4-year learning experience related to graphic design, I have the following expertise:

- -Proficiency in Adobe Photoshop, Illustrator, InDesign
- -Experience in making illustrations and animations
- -Moderate skills in motion graphics and video editing in After Effects, Premiere and other video related software

My proficiency and expertise are important parts in figuring out the right design components in constructing the basic framework of the personal tool.

3.2 Summary

The chart below summarized the results of my self-analysis, which will be used in the review of some visual music software in the next Section.

Table 1: Summary of self-analysis.

NO.	Aspects	Details
1	Language	Non-native English speaker
2	Cultural	From different cultural background
3	Technical	Not strong in programming
4	Strong Points	Independent learning ability and graphic design expertise

The summary above is updated into the conceptual framework model, as shown in Figure 4.

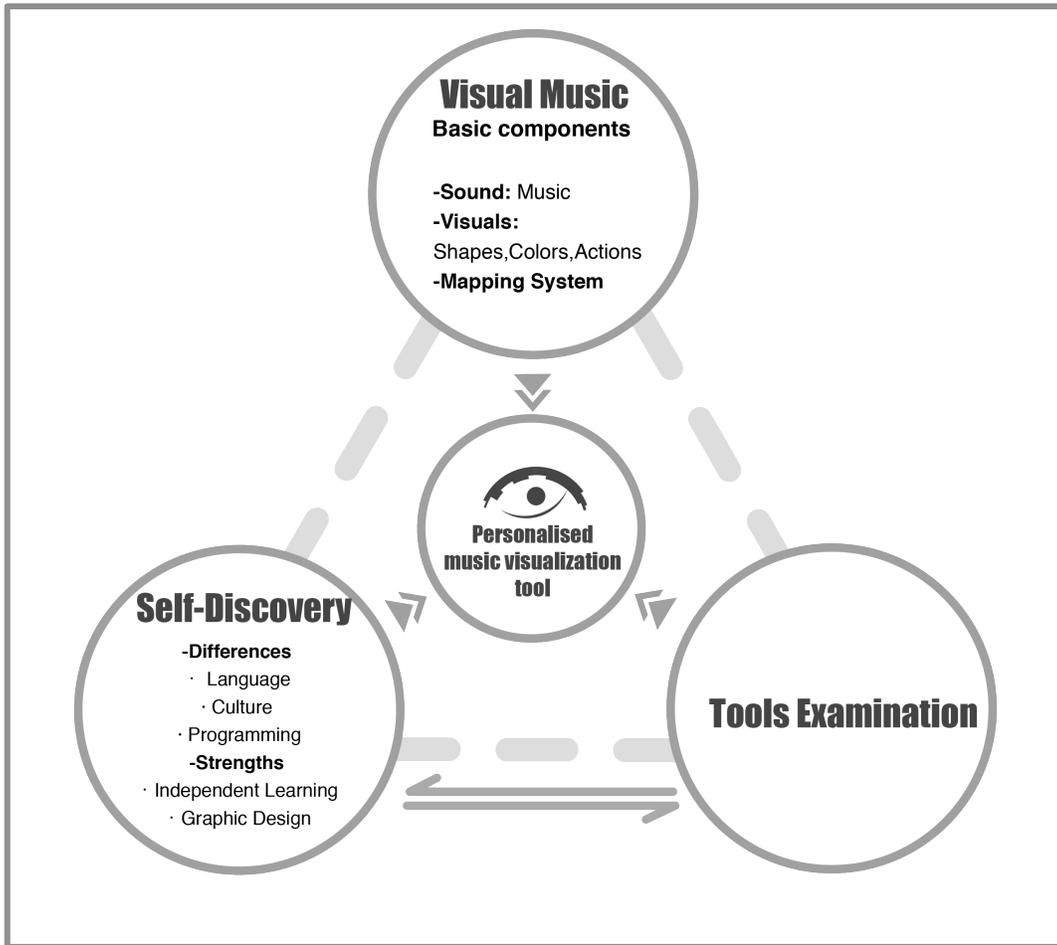


Figure 4: Conceptual framework model 3.

4 Tools Examination

4.1 Data-collection Template

In the research method of auto-ethnography the researcher is the subject and the researcher's experiences are the data (Ellis and Bochner, 2000). In my MRP, data collecting happens when doing the examinations of current visual music tools. I am the primary source of data. Figure 5 shows the data-collecting template I designed.

Name of the tool	
Date	
My needs from self-analysis	Features that match the needs Features that don't match the needs
Special notes and others	

Figure 5: Data collection template.

During this process, I focus on my experience using the existing tools for making visual music. Based on the self-analysis in the last chapter, my own needs are summarized and will become the criteria to assess whether the features are matching. There are plenty of tools for making visual music in the market and some of the popular ones are widely used among visual music designers. In this Section, I am reviewing three tools: Adobe After Effect, Resolume and Max7. These tools provide multiple functions and I summarize the features that I would consider for adopting in my design as well as the features that I would like to adapt before considering inclusion in my design.

4.2 Current Tools for Creating Visual Music

4.2.1 Adobe After Effects CC 2015

Create incredible motion graphics and visual effects. The industry-standard animation and creative compositing app lets you design and deliver professional motion graphics and visual effects for film, TV, video and web. (Adobe, 2015)

Figure 3 shows part of the features in a screen shot of the software.

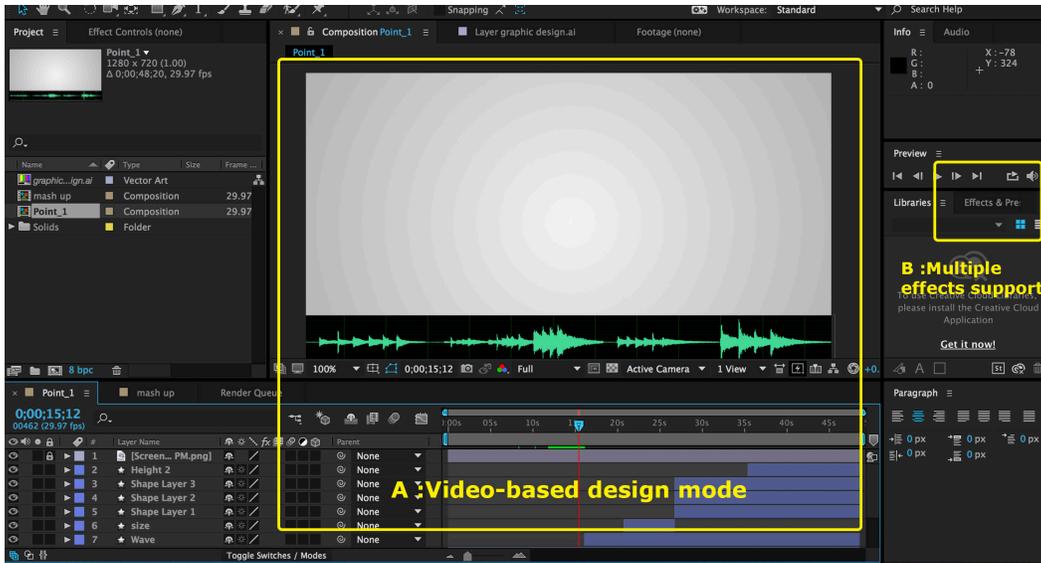


Figure 6: Screen shot of After Effects.

Good features worth adopting:

1. Compatibility with Adobe series

As a graphic designer, I use Adobe Photoshop and Illustrator more often. After Effects allow the direct copy and paste as well as drag function between adobe software, which is helpful for people who are used to creating shapes in PS and AI.

2. Video-based design mode (Figure 6 – A)

After Effects focus on motion graphics and visual effects and it has a large panel dealing with timeline, which is useful when matching sound with visuals.

3. Strong support for multiple effects (Figure 6 – B)

I can choose lots of pre-set visual effects with various properties to be adjusted.

Barriers:

1. English as the primary language

As mainstream design software in western, After Effects use English as the main language. Though Chinese version is available, most of the help files or other resources are in English only.

2. No mapping systems offered

All the mappings need to be done and controlled by the designer without automatic detection.

Table 2: Summary of review of After Effects

Name	Adobe After Effects CC 2015	
Date	2015 Jan. -2015 Feb.; 2015 Dec.	
Needs/Capabilities	Functions that match (Good Features)	
My expertise as a graphic designer	1. Video-based design mode 2. Compatibility with Adobe Creative Collection	
Technical aspect	3. Existing effects support	
Needs/Capabilities	Functions that don't match (Barriers)	
Language and cultural aspects	1. English as the primary language	
Technical aspect	2. No mapping systems offered	

4.2.2 Resolume Arena

Resolume focus on Live HD Video Mixing and offers Live Composite & Effects with Real Time Rendering and Audio & Visual Plugins. Resolume has both audio effects and video effects and audio analysis is easy to be achieved. (Resolume, 2015)

Figure 4 shows some of the features in a screen shot of the software.

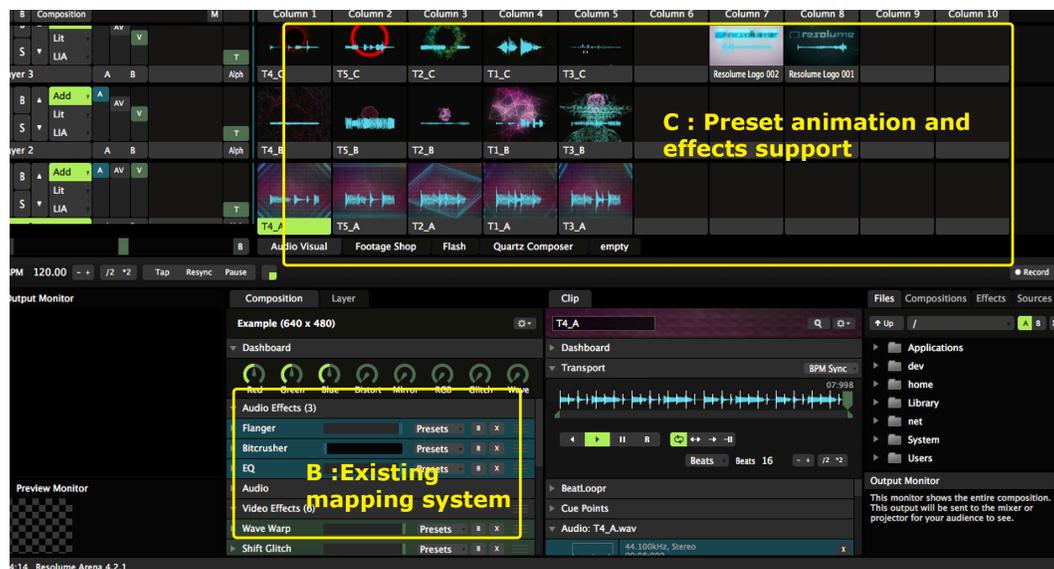


Figure 7: Screen shot of Resolume Arena.

Good features:

1. Existing effects of expert level for use (Figure 7 – C)

Especially for live and DJ, Arena offers professional visual and audio features allowing users to create and adjust effects lively.

2. Existing mapping system (Figure 7 – D) able to be revised. Arena provides easy mapping for users to change and use in their own works.

Barriers:

1. English as the primary language

As a mainstream western design software, After Effects use English as the main language. Though Chinese version is available, most of the help files or other resources are in English only.

Table 3: Summary of review of Resolume Arena

Name	Resolume Arena	
Date	2015. Nov.	
Needs/Capabilities	Functions that match (Good Features)	
Technical aspect	<ol style="list-style-type: none"> Existing effects support Existing mapping system 	
Needs/Capabilities	Functions that don't match (Barriers)	
Language and cultural aspects	<ol style="list-style-type: none"> English as the primary language 	

4.2.3 Max 7

Visual programming language for media that works on Mac (OS 10.7+) and Windows (7+), and supports a wide variety of hardware. Full support for MIDI devices and modern audio hardware; Limitless audio options including basic DSP building blocks, VST, Audio Units, and Max for Live devices; Flexible support for multi-channel audio;

*Real-time input from webcams, digitizers, and built-in hardware;
Interactive OpenGL graphics and GLSL shaders, including real-time shadows;
Support for multiple displays and tools for live projection;
Transcoding and interaction between audio, video, graphics, and control data. (Cycling 74, 2015)*

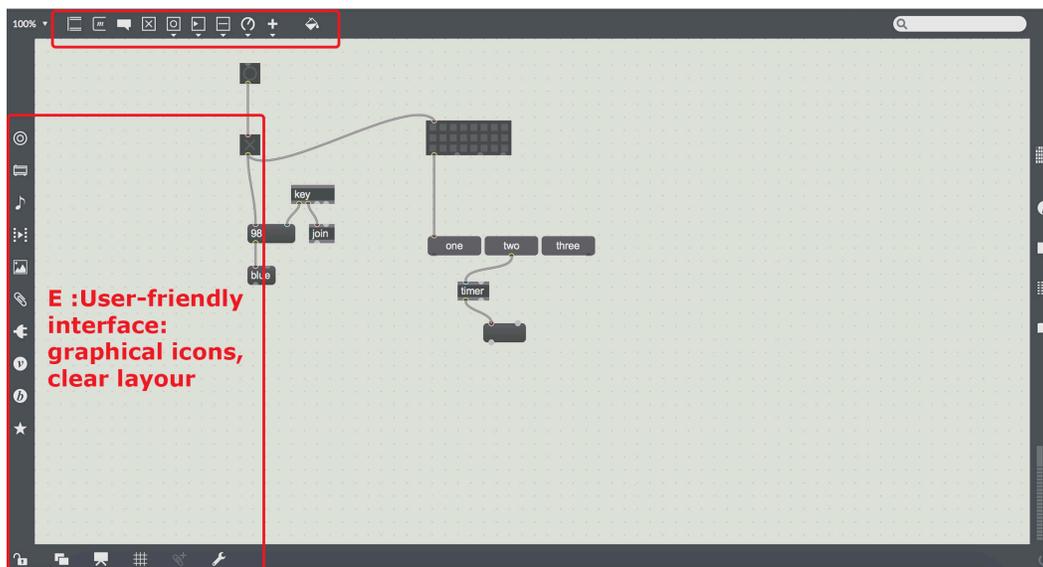


Figure 8: Screen shot of Max 7.

Good features:

1. User-friendly interface (Figure 8 – E)

The interface of Max is simply and easy to understand. Graphical icons are displayed with explanation. The working panel is unlimitedly extendable, which allows user to put the working elements in order in the way they want.

Barriers:

1. Too technical for visual music designers without programming background.

Max is a programming language, although it is in a visual way, all the functions, even a small play command needs to be done in programming.

2. English as the primary language

As mainstream design software in western, After Effects use English as the main language. Though Chinese version is available, most of the help files or other resources are in English only.

Table 4: Summary of review of Max 7

Name	Max 7	
Date	2015. Oct. – Nov.	
Needs/Capabilities	Functions that match (Good Features)	
My expertise as a graphic designer	1. User-friendly, clear and simple user interface	
Technical aspect	2. Accurate control of mapping	
Needs/Capabilities	Functions that don't match (Barriers)	
Language and cultural aspects	1. English as the primary language	
Technical aspect	2. High technical requirements for visual programming as the main function	

4.3 Exclusion: Lack of Flexibility

In reviewing the results of examination of three popular visual music tools presented in Section 4.2, a key element that emerges as the cause for exclusion is the lack of flexibility. These three tools are deeply rooted in western culture, and they focus most of their attention on target users who are expert programmers, proficient in the use of the English language and do not adapt to the needs of users outside of their design scope.

In my experience with using the tools, although I found that some of the functions fitted me perfectly, I was unable to engage in free self-expression with any one single tool. This lack of flexibility motivated me to create my own tool.

4.4 Summary

Table 5: Summary of environmental scan

Name of Software	Functions that match and adopted	Details
After Effects	Video-based design mode (the working panel)	Like the combination of working through multiple layers, timeline and video-playing

After Effects&Arena	Preset effects	Multiple existing effects ready to use
Resolume Arena	Preset animations	Provides rich resources for motion animations, quick way to create music video with rhythm
Resolume Arena	Existing mapping system to be revised	No need to do mapping with programming
Max 7	Simple interface structure; Graphical icons and clear layout	Friendly and clear working interface; easy to work on and manage
Name of Software	Features that don't match	Details
After Effects Arena Max 7	English as the primary language	Not only in the interface itself, but also in most of the help files or other resources
After Effects & Max 7	Programming languages are important	Especially in Max 7, which is a visual programming software primarily

The summary above has been updated into conceptual framework model, as shown in Figure 9. With this, the framework has

been completed, providing the required components for creating the prototype design of the personal tool.

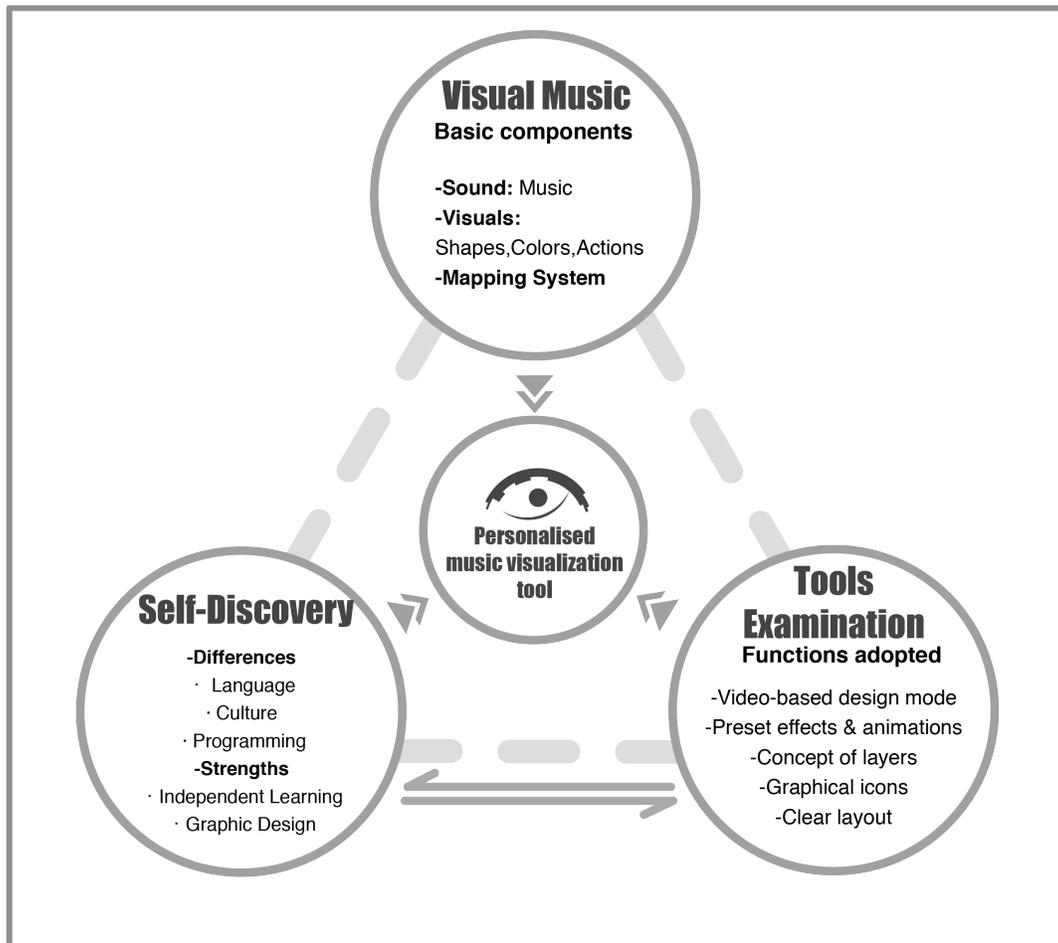


Figure 9: Conceptual framework model 4.

5 Design of *MyTool*

This chapter displays the visualization of my personal tool for making visual music, beginning with the design requirements (Section 5.1) as well as the flowchart and the wire-frame (Section 5.2) introducing the basic structure, and following by the screen mock-ups (Section 5.3) as well as a description (Section 5.4), which provides the detailed information about how the components shown in the mock-ups work.

5.1 Design Components

Based on Sections 2, 3, and 4 above, on literature review of visual music, self-analysis of my identities and environmental scanning of existing tools, the design components needed for creating the personal tool have been summarized to the Table 6.

Table 6: Design components of MyTool

Features from Sections 2,3,4	Design components of MyTool	Why they suit me
Literature review	Basic components Visuals (Shape, Color, Animation); Mapping System	Basic component for creating visual music
Video-based design mode	Video-based design mode	Helps me match visuals and sound easily
Preset effects	Preset effects	Helps me create effects quickly
Preset animations	Preset animations	Helps me create animations quickly
Simple interface structure	The concept of layers	I am familiar with this in Adobe series as a graphic designer
Graphical icons	Graphical icons	Gives me easy access to design tools
Clear layout	Collapsible function panel	Gives me a clear working space
Don't use expert level English	Use simple language (short English words or Chinese)	English is second language
Don't use programming languages for mapping	GUI for Mapping System	No programming background; need support for mapping

5.2 Flowchart and Initial Wire-Frame

As the first experiment I had for making personal tool, I simply named this tool "MyTool". I'm a very visual person as a graphic designer, so I use an eye as the symbol with my favourite chartreuse color. Figure 10 is the logo design I made for *MyTool*.



Figure 10: Logo design of MyTool.

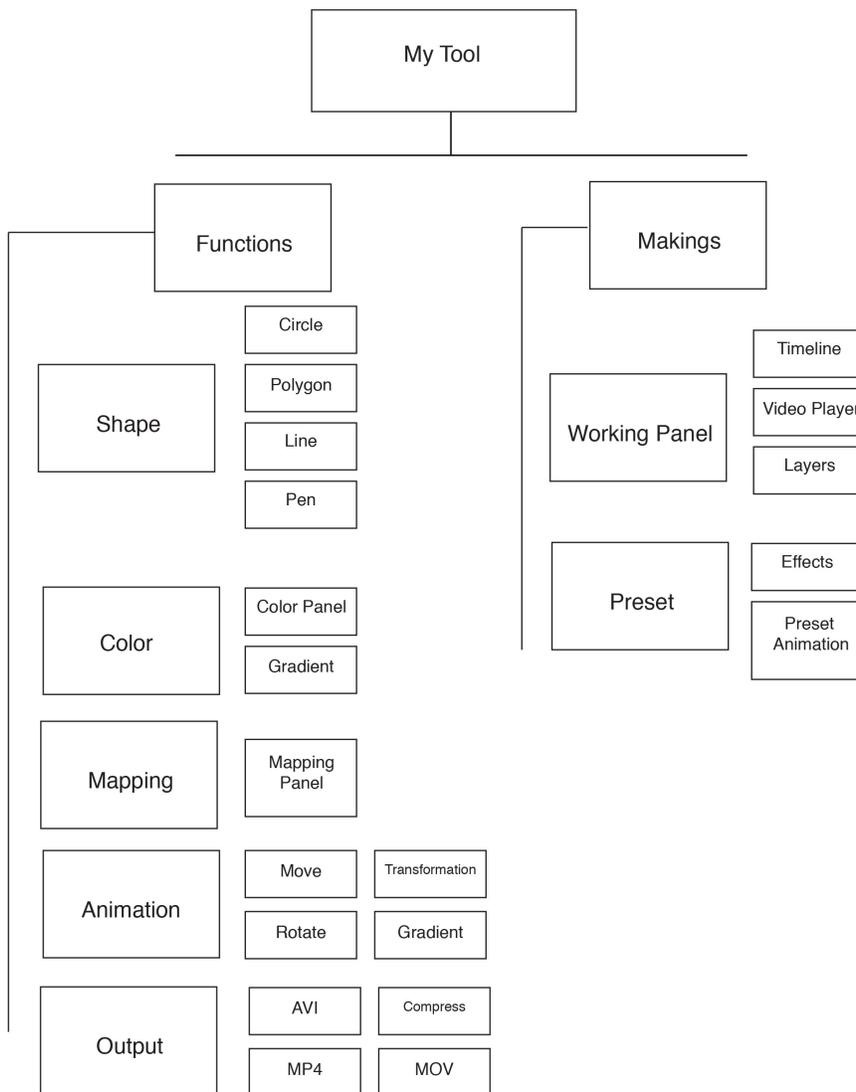


Figure 11: Flowchart of MyTool.

Figure 11 is the flow of *MyTool*, including the basic components, and Figure 12 is the wire-frame of the first layer of the tool.

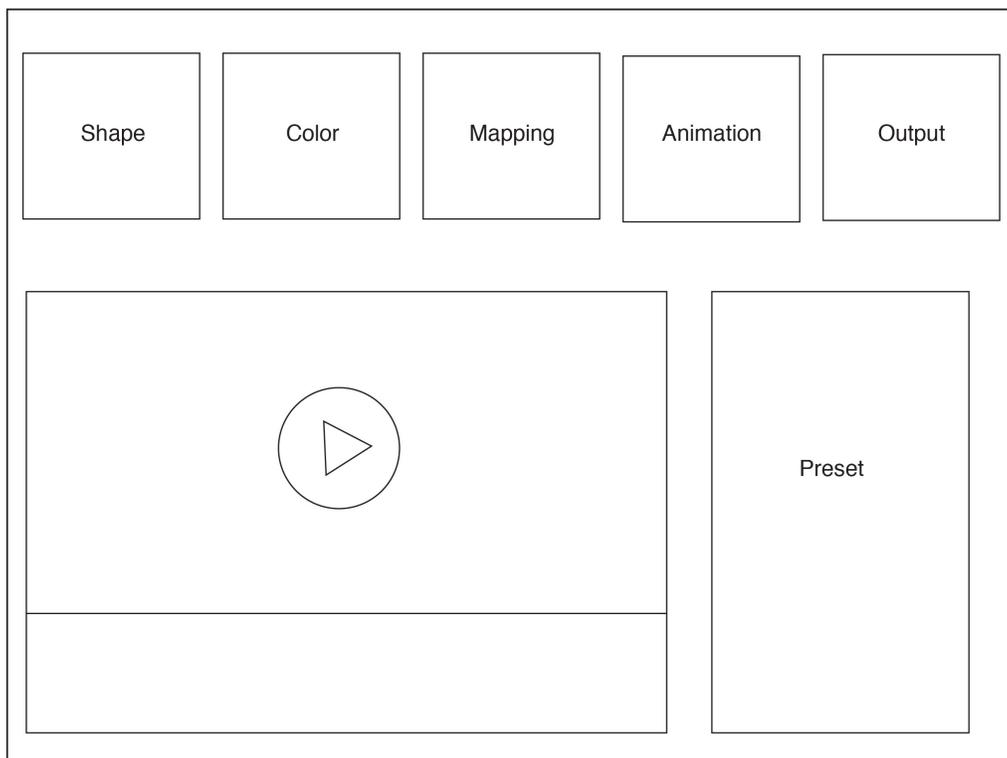


Figure 12: Wire-frame of MyTool.

5.3 Description of *MyTool*

As shown in the previous section, there are 2 major components of the tool: Functions and Makings. Functions includes the primary features for building up the basic elements for visual music video while Makings deals with the working process, which imply contains the Video-working panel and the Pre-set panel. There are 5 sections under

the Functions and those sections also have subordinate menus, which will be explained below.

1. Functions:

1.1 Shape: Shape function is a tool for creating shapes. There are 4 sub-menus under shape functions: Circle, Polygon, Line and Pen. Polygon includes triangle, rectangle and the others. Because I use rectangle the most often, the default menu for Polygon is rectangle. With Pen, I can draw the irregular shapes I want.

1.2 Color: Color function is a tool for picking color for the shapes created in the tool. It consists of a color-picking window and a gradient window, where I can have variations of opacity and gradients.

1.3 Mapping: I designed an automatic mapping panel for doing mappings between visuals and sound, which is the most significant part in a visual music video. There are two separate parts, one for the mappings between Color (Tone, Saturation, Brightness) and Sound (Pitch, Loudness, Timbre), the other one between Shape (Scale, Distance, Rotation) and sound. I chose Color and Shape as the parameters for mappings because I used them the most in my previous works. In the mapping panel, I can map one or multiple properties to the other one or multiple properties just by linking the buttons representing the right properties.

1.4 Animation: Animation function is for generating simple actions of the objects. There are 4 sections: Move, Rotate, Transform, Gradient. Move can allow objects to move in any directions and routes and Rotate is for creating rotations. Transform can make shapes generated in the tool change the shapes, for example, from a circle to a triangle. And I can use Gradient to creating animations showing the gradually changes of colors or opacity of the objects.

1.5 Output: Output function allows me to generate a video in any of the 3 formats I always use: AVI, MOV and MP4. I also designed a Compress button for making videos in lower quality to save time and preview.

2. Makings:

2.1 Video-based working panel: This is the most important part of the whole tool because it is the place for generating contents. I adopted the concept of layer from Adobe series for better user experience in doing overlay effects. Also, I can play video and the audio at the same time to make sure the mappings are working fine with the timeline. I can magnify or shrink the timeline by drag the slider at the right corner at the bottom. What is more, I can drag the audio files or other design files directly into the working panel.

2.2 Pre-set panel: The panel is divided into two parts: Pre-set Effects and Pre-set Animations. Pre-set Effects provide some existing effects, for example, change the tone of the whole video, add a light spot or create a soft pink atmosphere. Pre-set Animations offer some simple action templates for generating a beautiful video, such as a ball moving round over and over, a rotating triangle, etc. The panel can be closed to gain more space for the working panel and reopened when needed.

3. Other details:

1. Collapsible function panel: The function panel at the top can be collapsed to get more space and reopened by clicking the small bright triangle. Also, by clicking each button in the panel, the corresponding sub-menu will appear and I can choose the needed one. If I move my mouse off the sub-menu or click one section, it will disappear.

2. Extension: As the first iteration of my personal tool, future revisions are expected. At the top-left corner, the updates can be found in the Extension menu.

5.4 Screen Mock-ups

The following images are the visualization of the interfaces designed for *MyTool*. Given the same structure (there are Functions and Makings in the tool, and the Makings – Video working panel and Pre-set window are fixed) of every screen, only the different function parts are made and displayed.

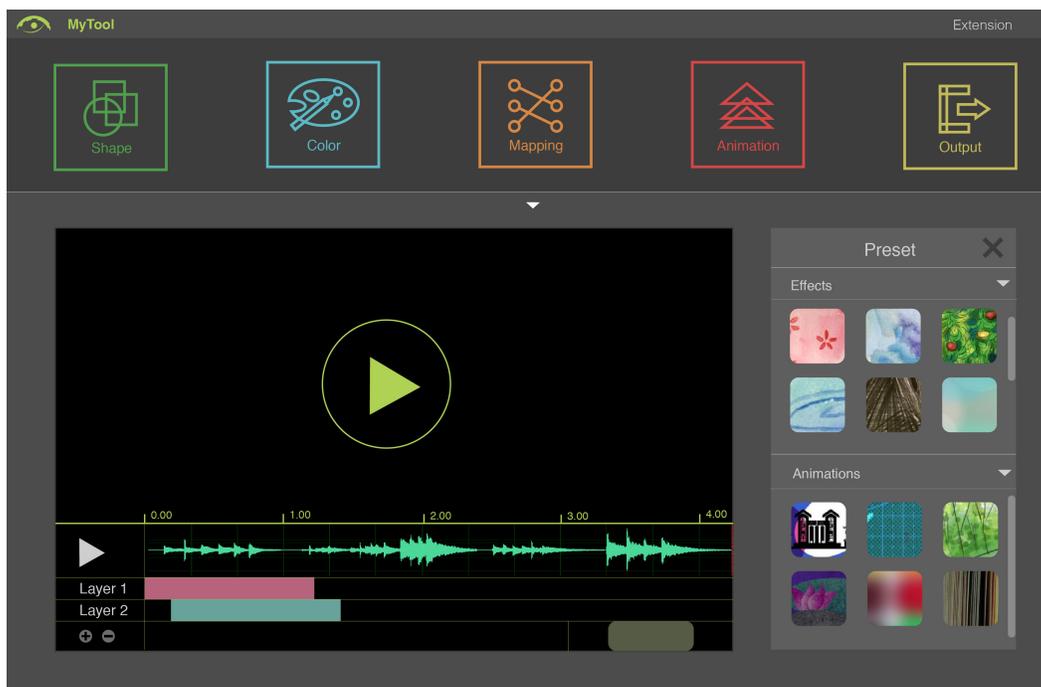


Figure 13: Screen shot of MyTool

The above image shows how *MyTool* looks like. A dark color has been used for protecting the eyes and reducing tiredness. A simple design and layout have been applied with clear graphical icons in different

colors representing every of the functions. The bright triangle can be used to open or close the tab for functions.



Figure 14: Shape function

This image shows what will be displayed when the Shape function is clicked. I can choose from Circle, Polygon, Line and Pen. Triangle and other polygons can be accessed through the rectangle icon and curve can be accessed via the straight-line icon, while the pen can be used for creating custom shapes.



Figure 15: Color function

Figure 15 shows what will be displayed when the Color function is chosen. Color can be picked either through the color-picking panel or inputting the code in the text box at the right top of the first panel.

In the second panel, gradient effect can be achieved by adjusting the color of the two sliders.

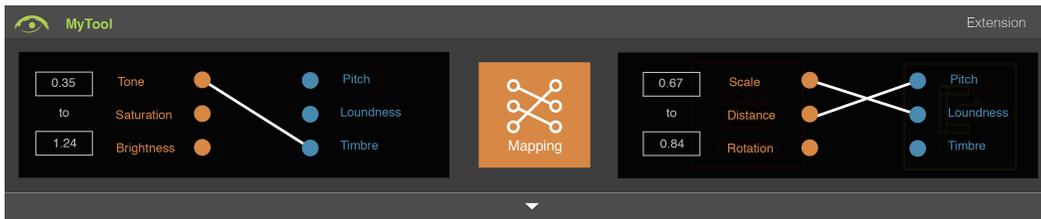


Figure 16: GUI for mapping function

Figure 16 shows what will be displayed when the Mapping function is chosen. This function is based on a graphical interface with programming at the back stage to support the interactions happening when the mapping system is working. The left panel is for the mapping between color and sound while the right one is for between shape and sound. Mapping can easily be achieved by filling in the time boxes and connecting among properties.

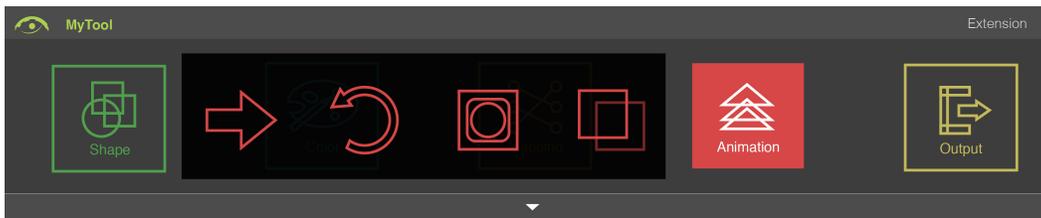


Figure 17: Animation function

Figure 17 shows what will be displayed when the Animation function is chosen. The graphical icons represent Move, Rotate, Transform and Gradient. The animations can be applied to the shapes

generated in the tool by dragging and putting into them, after that a window will pop out showing the parameters to be adjusted in detail.

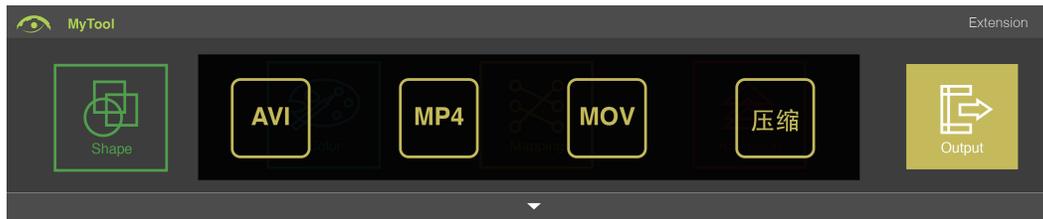


Figure 18: Output function

Figure 18 shows what will be displayed when the Output function is clicked. Video can be outputted into AVI, MP4 or MOV format. Via the last button the files can be compressed to the qualities I want.

6 Reflection

This chapter is a self-reflection on the process of this project as well as how this project can benefit myself and other users, and what kind of impact it has brought to the field of inclusive design.

6.1 The Self-Dialogue

After finishing the design part, I started to think back about this journey of self-thinking and self-learning: discovering the self-nature and coming back to the origin.

Dating back to the end of the first year of my master program, I had the idea of doing something about visual music but had difficulty figuring out what exactly I wanted and would be able to finish, as well as would fit into the scope of a master thesis. After multiple rounds of revisions and refinements of the proposal, finally I was inspired by the “one-size-fits-one” design approach of inclusive design and decided to design a personal visual music tool for myself.

The next challenge after choosing the theme was the methodology. Auto-ethnography is the most suitable method for doing a self-study. However, it is not a popular method compared to user-centered design, the mainstream one that most my classmates are selecting. During our class presentation of MRP proposals, I was asked

plenty of questions about the value and the objectives of the project. I still remember one of the most difficult questions as, "What do you want to achieve by doing this?" So, what do I want to achieve? I spent lots of time considering this repeatedly and discovered the answer: *to learn about myself, to come back to the origin where I made up my mind to become a designer, so I can start again, as a designer or someone else.*

Amidst all these intricacies, I started the research last October. The first step was to do the literature review on visual music and I came back to the time when the word "visual music" was firstly coined and used. It was great fun to learn things I thought I knew but discovered that I actually did not. I gradually learnt about the development and history of how visual music has evolved. At the same time I began to do a self-analysis through the self-conversations. To tell the truth, it was not an easy thing to think back to the childhood and bring all those memories back to life. My childhood, my elementary school, middle school ... and university, Japan, Canada... inclusive design, all those pieces clicked together and became the me I am right now. Learning about the component during my growth that would be important for the review of tools, the tools examination commenced. I tried the tools separately at different times and

summarized the functions that match the needs and those don't. Finally, time to get ready for prototype design!

Pulling together all the elements from the study, I had all the design requirements in hand, on the basis of which I figured out the design components and drew the flowchart and wire-frame of the tool. I felt interested and excited to actually make something for myself. During my life as a graphic designer, I spent most of my time designing for finishing assignments, making something for someone or earning money. This was the first time that I spent such a long time to design a tool for myself. I cannot say what exactly I got through completing this self-study, but I can certainly say that it is far more than finishing a master's thesis.

As I discussed before, here was a journey in which I not only cares about the end, but also how I reached the end. The most beautiful scenery is along the road. I know more about myself now, and I know where I am headed.

6.2 An End User's Confession

Putting all the elements together, I noticed that in this project, I am in fact an edge case user far away from the range of the target users for whom the popular visual music tools were designed. The tools I examined are mainstream software in the western market with

a target user focus on those who live in western countries. Therefore, as a student from a land far away from the western world with a completely different living style and cultural background, I got to using the tools only because of my interest, but am actually much out of the service range of those tools in their design scope.

6.2.1 Myself as an Edge Case User

To express my position as an edge case user in the above context, I draw upon the Use Model²¹ described in the Fluid project, which uses a “user states and context” framing to identify the concrete representation of end users from main stakeholders to help developers and evaluators better understand the scope, uses and success criteria of their deliverables. Figure 19 presents the user-context diagram based on the four criteria relevant to me when interacting with visual music tools: language proficiency, graphic design skills, cultural background and programming skills. It is interesting to see from the figure that my “ability shape” is not balanced, with three of the four criteria being far away from the target user zone.

²¹ https://wiki.gpii.net/w/Use_model

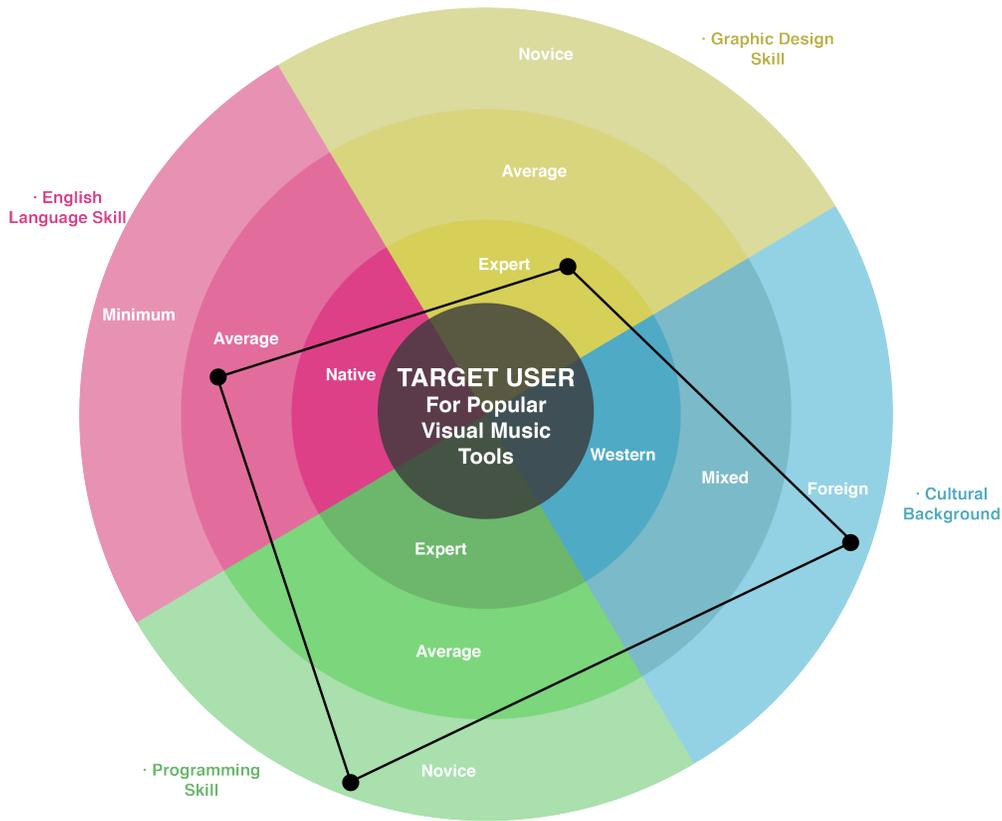


Figure 19: Myself as an edge case user.

6.2.2 Myself as the Target User

As explained in Section 6.2.1, Figure 19 shows how far away I am from the center of the target users. This can be expressed from another perspective: how far away the tools are from my personal requirements. This perspective, representing me as the target user, is illustrated in Figure 20 on page 92.

Table 7 and Table 8, derived from the tables presented in Sections 3.2, 4.2 and 4.4, provide the data for this depiction. Table 7

starts with my characteristics, articulates my needs and capabilities from those characteristics, and derives the design dimensions through which the tools could be assessed vis-à-vis myself as the target user. “My Position” indicates the position where I will be in the diagram according to my own needs and capabilities.

Table 7: Deriving design dimensions

My Characteristics	My Needs/ Capabilities	Dimensions	My Position
Medium English proficiency	Need simple interface with less English	Interface complexity	Low
Minimal programming skills	Need GUI mapping system	Programming expertise requirement	Low
Expertise in Graphic design	Can create good visuals	Visual design skills requirement	High
Used to Adobe suite	Can use Adobe suite well	Compatibility with Adobe suite	High

Table 8 presents an evaluation of what the examined tools can offer along the four dimensions derived in Table 7. It is easy to see that going by those design dimensions, all three tools have mismatches with my position, which strengthens the rationale for the

creation of *MyTool*. On the other hand, *MyTool* is designed to fully match my position.

Table 8: Design scope of the examined tools and *MyTool*

Dimensions	After Effects	Resolume Arena	Max 7	My Tool
Interface complexity	Medium	High	Low	Low
Programming expertise requirement	Medium	Low	High	Low
Visual design skills requirement	High	High	High	High
Compatibility with Adobe suite	High	Low	Low	High

Tables 7 and 8 are reflected in the diagram below positioning myself in the centre as the target user. The four shapes, formed by marking the examined tools and *MyTool* using the matrix in Table 8, present in a vivid way the matches and mismatches with my own needs. It is apparent that *MyTool's* shape matches perfectly with my needs and capabilities and occurs closest to the centre where I sit as the target user.

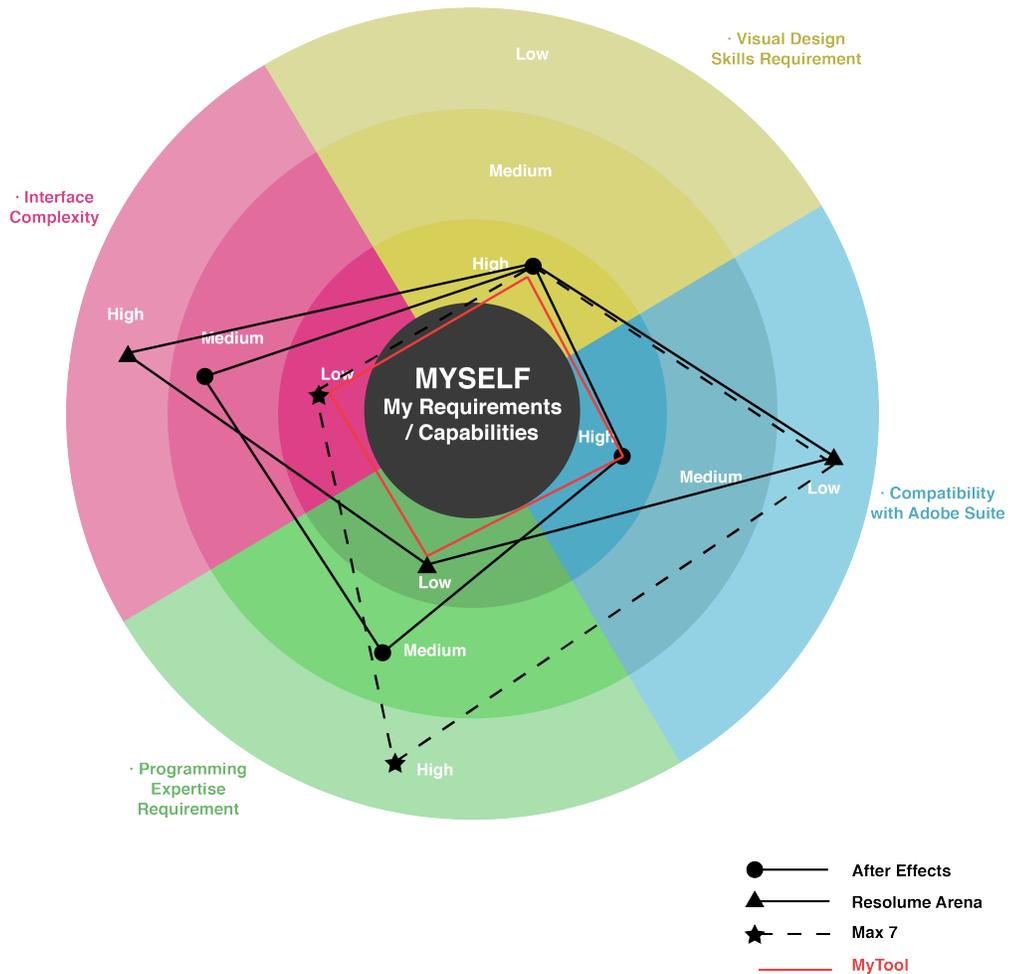


Figure 20: Myself as the target user

The design of *MyTool* provides an example for stretching the design scope of the mainstream tools to meet diverse needs and different perspectives, which is greatly significant and meaningful in constructing a more inclusive digital environment for people who are out of the mainstream and present at the edges.

6.3 Be More Inclusive

Pointing out myself as an edge case user in the design scope of popular music tools in the last section, it is apparent to see that how much beneficial influence it could bring to the society.

MyTool is a personalized tool satisfying specific requirements for myself, which unveiled the importance of flexibility and customizability in tools in order to be more inclusive. This MRP can also be taken as an edge user case study of visual music tools for the designers/programmers/manufacturers behind those tools, indicating the need to have their design scope broadened and expanded, as well as the beneficial effects it will bring not only to their own products but to the whole society. The domain of visual music will be stretched if more users can participate in the process of making visual music and express themselves by overcoming the limitations they experience in current tools. As a result, a virtuous cycle of inclusion can be triggered: 1) the design scope of visual music tools is broadened; 2) more people can participate; 3) companies get bigger market and more profit through noticing those who are at the edge; 4) the scope is expanded again... This will leverage a virtuous cycle and continue the upward spiral, making the whole society more and more inclusive in the context of visual music design.

7 Conclusion

7.1 On the Way to Customization

The first dimension of inclusive design is to recognize the diversity and uniqueness of those we are designing for (IDRC, n.d.). This emphasizes that everyone is unique and has different needs; therefore one size does not fit all, and we need to design for diversity.

This project built up a conceptual framework based on Visual Music, Self-Discovery, and Tools Examination, which form three important aspects of the outcome of the project—MyTool, a personalized music visualization tool. Design requirements for the tool were derived through a framework synthesizing (1) the basic components for visual music from a review of literature, (2) my specific needs as an international student and a junior graphic designer through self-analysis, and (3) the tool functions for adoption/adaptation via an examination of some visual music tools through environmental scanning. Based on those requirements, design components were derived and *MyTool* was conceived and designed as a prototype version of my personalized tool for making visual.

Although *MyTool* is a digital personalized tool built through self-study, it is not an exercise of a segregated and exclusive tool design for only myself. Rather, the process is presented in this report as an

experiment for software customization. IDRC (n.d.) argues that “a mass solution does not work well”. Moreover, one of the biggest differences between inclusive design and universal design is that “we do not need to design one-size-fits-all, the flexibility of the digital gives us the luxury and freedom to take a one-size-fits-one personalized design approach to inclusion.”²²

The design and popularization of personal tools like *MyTool* would also stretch and broaden the design scope for the designers of popular visual music tools, leading to the marketing of more flexible tools, which help more users participate and express themselves through visual music with a sense of belonging and inclusion, which could, in turn, create a bigger market for the tools, thus triggering a virtuous cycle of inclusion. As an inclusive designer, I am glad that *MyTool* can respond to the three dimensions of inclusive design and has its unique contribution in building up a more diverse and inclusive environment.

7.2 Looking Forward

MyTool is a new experiment using auto-ethnography methodology, which overlays the roles of researcher and participant. I

²² <http://idrc.ocadu.ca/index.php/resources/idrc-online/library-of-papers/443-whatisinclusivedesign>

designed the tool based on my own self as the user and the only way for me to assess this tool would be through long-term use and continuous self-reflection.

Owing to my lack of experience and the short duration of the MRP, *MyTool* is far from perfect in completion. The next step will be sustained testing and continuous refinements based on my self-input. Inquiries with experts regarding technical issues and professional knowledge are also on the cards. Ultimately, I hope, some day, I will be able to develop *MyTool* into a working tool allowing me to visualize music to reflect my unique ideas, using my creativity, imagination and talent. Then, perhaps, I would experience what the ABBA meant when they sang,

"I'm hearing images, I'm seeing songs no poet has ever painted ..."

(ABBA, I Let the Music Speak, The Visitors, 1981)

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