A THESIS SUBMITTED FOR THE
Master of Applied Arts & Humanities
of the University of Canberra

VISUAL LISTENING:
Designing an interface for active music listening using visual content

BY LIAM COTCHETT

February 2019

Dr Lisa Sharoun
Dr Sam Hinton

UNIVERSITY OF CANBERRA

ABSTRACT

Digital distribution and access-based streaming services have created new possibilities for music listeners. By contrast, these possibilities also give rise to new concerns. There has never been greater access to so much music. However, music applications that interface these libraries reduce the user's ability to actively listen.

This thesis discusses the important role that visual design plays when listening to music. This dialogue highlights the functional attributes that album artwork gave to physical music. Particularly when contrasted to the less functional attributes available to digital music. This research conducts an expert usability review of two novel music web-applications, and a music lyric database. The first two interfaces use strong visual components to maintain focus and engagement of listeners. By contrast, the lyric database uses artwork to aid in navigating the library, rather than aid in listening to it. The reviews highlight emerging and current trends in music player design that enable active listening. This research is also guided by the development of a new creative body of work. A conceptual interface is created to explore pertinent themes from literature and theory. Finally, the body of work demonstrates that music artwork is pivotal to an engaging music listening experience and can better enable one's ability to actively listen.

THE PRACTICE-LED COMPONENT CAN BE FOUND AT:
www.liamcotchett.com.au/

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

Mindful listening is a skill that should not be taken for granted. Before the advent of writing, people transferred knowledge through a mixture of show and tell (Goding, Attias, Wrench and Johnson, 2011). Elders recited tribal histories to attentive audiences and enthusiastic listeners received messages with focus. "Myths, legends, folktales, and stories for entertainment survived only because audiences were eager to listen" (Goding, et al., 2011, p 76).

Today, if an individual becomes distracted while they listen, or their attention wanders, media players can be quite forgiving of them. Media players allow listeners to pause, stop, start and replay a recording at any point and as many times as is necessary. As useful as this technology can be, mass media experiences are considered to foster passive listening engagements "which can lead to poor listening habits" (Winn, 1988, p 144). The advent of recorded media neither involves the individual to respond or react to what they are hearing (Winn, 1988). Furthermore, there is evidence to suggest that listening skills must be taught and practiced if they are to be acquired (Caspersz and Stasinska, 2015) and media players do not currently afford this opportunity.

Before the arrival of recorded music, listening to music was an ephemeral experience—only to be enjoyed there and then, or in the now. It was either heard or it wasn't; never to be repeated in the same way twice. Since the advent of recorded music in the early 19th century, the accessibility of music has rapidly evolved. As one no longer needed to physically see the musicians while they listened, recorded music came with many visual components to help the listener study, interpret and understand what they were hearing (Inglis, 2001). With each new shape and format that recorded music took over the past century, artists and designers collaborated to create new and interesting ways to engage their listeners. However,

many scholars have suggested that less attention or emphasis has been given to the visual information of a digital music album, compared to its physical counterparts (Jones and Sorger 1999; Straw, 2009; Tsarouhis, 2006). The shrinking, or even complete removal of cover art and other visual information from the music album's assemblage gives considerable weight to this argument (Jones and Sorger 1999). Furthermore, it has also been argued that music without consideration for the presentation of the narratives that they contain, is diminishing the way music listeners engage with music and musical content alike (Wikstrom, 2015).

Gone are the days when listening to new music meant rummaging through a music store. It no longer means purchasing 'the' album, or trading it with a friend. Owning a music album was once viewed as a membership to fandom (Berger, 2001). The seductive and tangible pieces of art that were stored upon shelves acted like trophies or an expression of identity (Berger, 2001). Likewise, vinyl and compact disc music albums were once collected and exchanged like memorabilia. The oversized cover art was not viewed as superfluous and ignored during the act of listening (Jones and Sorger, 1999). Instead, it was an integral piece of the act itself. Album artwork once extended the listening experience. Furthermore, it encouraged active listening by visualising the meaning of the music (Jones and Sorger 1999; Inglis, 2001; Shephard and Leonard, 2014).

Almost three decades on and music has become a digital commodity. A rise in Internet-based services have seen new technologies sweep the music industry. The listener's choice has exploded in scale, as user interfaces, such as websites and apps, now mediate the access to music. The devices that house them are forever shrinking, and screen real-estate is at a premium. Computers, tablets, phones and now watches, are all connected and talking to each other in various ways. The internet-of-things keeps music listeners enmeshed in a network of technologies (Morris, 2010), forever moving and armed with beats. Listeners can access anything from anywhere whilst simultaneously listening to music. "Music in the cloud integrates music into so many diverse services that it becomes difficult to talk about music as a specific experience at all" (Morris, 2010, p.272). The once packaged music album is now dismantled across the internet into bite-sized snippets. Although it is accessible from the palm of one's hand, piecing it together now proves to be quite the effort.

Exploring the history of recorded music identifies a few key themes. First of all, it illustrates how the ever-changing channels of music distribution are constantly challenging the listening experience (Inglis, 2001; Straw, 2009; Wikstrom, 2014; Morris, 2015) and format of music (Jones and Sorger, 1999). This challenge highlights a rich and expansive area for investigation and further research—particularly that of a design nature. Furthermore, this research locates a significant gap in the existing literature of this space. There have been very little inquests into what effect changing the format of music has had upon the ability to listen to it or ultimately understand and appreciate it. Finally, and most importantly for the premise of this research, the timeline also highlights that some of the founding concepts that once defined physical album packaging design—protection, containment, advertisement and commoditisation (Inglis, 2001)—do not, or have not translated into the digital space with great success (Wikstrom, 2015). It is for these reasons that the research will be a creative practice based exegesis. The designing and prototyping of a range of interface screens and micro-interactions will accompany the written component, to further explore some of the concepts posed by the literature review.

In order to propose an alternative user experience for listening to music, this research must first conduct a review of the current and emerging trends of music listening interfaces. Insights will be gathered from a usability review of two novel web-applications and a collaborative lyric annotation site. The first two applications use album artwork and interactive visual elements to maintain focus and engage listeners. By contrast, the third application uses collaborative lyric annotations and a conventional media player to aid in one's ability to listen.

1.2 Scope of this research

This thesis explores the benefits that album artwork and a streamlined interface can add to one's ability to listen to music. More specifically, it is investigating the positive impacts on one's ability to actively listen to music when the presentation and format of music affords the listener to do so. Thus, the scope of this research is limited to exploring and defining the visual elements that accompany and facilitate one's ability to actively listen to music. For

example, but not limited to, the album artwork, presentation of the track listing, liner notes, lyrics and web application screens that interface the act of listening to music.

This research acknowledges that the act of hearing remains to be the primary means for understanding or appreciating music. Thus, this thesis identifies the need to also demonstrate a basic understanding of how active listening to music is performed. Particularly when intending to evaluate the impact that a visual element might have on one's ability to actively listen to music. Furthermore, the skill of active music listening is more commonly studied within the musicology field of 'music appreciation', not within the area of design. The field of music appreciation is vast and complex spanning layers of intricate taxonomies and music classifications (Percino, Klimek and Thurner, 2014). For example, an ever-increasing number of music genres, eras, periods, instruments, and concepts, to name but a few, occupy and govern this space. It is important to note this study is grounded in the area of visual communications and thus, the scope of the research does not intend to interrogate active music listening through the lens of a musicologist. This research will investigate the area of listening from a design research perspective only.

Design practice requires an understanding of many other fields in order to create relevant solutions. It does not however, expect the design researcher to become an expert in that field. Thus, this research will refer to musicology, psychology and communication literature to gain insight into what impact a visual element might have on one's ability to actively listen to music.

1.2.1 RESEARCH QUESTION

Physical music albums, such as the vinyl or compact disc (CD), once facilitated active music listening. They enabled this skill through generously sized album artwork which featured paratexts such as lyrics, liner notes and anecdotal information from the artist. The CD and vinyl also benefitted from being accessed via limiting and streamlined music player interfaces which did not allow the listener to browse through millions upon millions of songs while listening—or even a hundred for that matter. Nor could these devices connect or communicate with other technologies to enable multitasking. By contrast, music listeners today can play music from anywhere via a mobile device in the palm of their hands. They have

access to large catalogues of music via the internet and can scroll through social media feeds or shop online simultaneously. The presentation of music is no longer tangible or generous. The lyrics and liner notes are disconnected from the listening experience and require a user to search for them instead. The research question that this thesis will investigate is: 'how can the benefits of active listening that are offered to physical media music listeners via visual content, be made available to distracted digital music listeners as well?'

1.3 Outline

1.3.1 LITERATURE REVIEW

Section 2.1 notes that although this thesis is investigating the value that visual elements add to music listening, this research acknowledges that the act of listening remains to be the primary means for understanding or appreciating music. Therefore, this chapter will give a brief overview of 'listening' for contextual purposes. It will also define passive and active music listening to prepare the reader for the coming chapters.
Section 2.2 discusses the functional attributes of physical album artwork. In particular, it highlights how album artwork visually affords an understanding of the music for a music listener.
Section 2.3 argues that music listening interfaces today encourage passive listening experiences. These interfaces do not afford multi-sensory listening experiences like their physical counterparts, which has resulted in distracted and passive listeners.

↓

1.3.2 METHODOLOGY

Section 3.1 outlines and evaluates the benefits and limitations of a range of appropriate research methodologies. This chapter will also define the chosen methodology for this research.

↓

1.3.2 RESULTS, DISCUSSION AND CONCLUSION

Chapter 4.1 summarises the findings from the three heuristic evaluation and cognitive walkthrough reports. This chapter highlights to the reader the current and emerging trends of music listening interfaces. This chapter also identifies and discusses a few technologies and techniques that are being used today to encourage active music listening.
Chapter 4.2 summarises the findings and outcomes from the design and prototyping process. This chapter dissects the anatomy of the interface and micro-interactions that have been created for this research.
Chapter 5 — 6 discusses the findings from both the usability reviews and design and prototyping process against the knowledge gathered from the literature review. This chapter also identifies for the reader the value and deficiencies of using the methodology that is outlined in this research. It will also conclude the benefits and recommendations for further studies in this area.

2 LITERATURE REVIEW

2.1 Listening

Although this thesis is exploring the importance of the visual elements that accompany music listening, this research acknowledges that the act of listening remains to be the primary means for understanding or appreciating music. For this reason, this chapter will give a brief overview of 'listening'. It will then define passive and active music listening to prepare the reader for coming chapters. Finally, it will discuss the role of nonverbal cues in active music listening. It is imperative to follow this section in its entirety as it gives context to the running argument.

Listening is the most used skill in one's communication arsenal (Rankin, 1928; Wolvin and Coakley, 1996). At a reduced level, it is the process of receiving, constructing meaning from, and responding to auditory messages (DeVito, 2001; Wrench. et al., 2011). There have been countless academic enquiries into why and how one listens to auditory signals the way they do, with many scholars proposing new taxonomies that describe different styles and filters for listening (e.g Mursell, 1973; Watson, Barker, and Weaver, 1995; Tuuri and Eerola, 2012; Bodie, et al., 2013).

However, the scope of this thesis is listening to music. It is less interested in the communicative attributes of listening, and more concerned with the cognitive ones. This thesis will focus on listening at a behavioural and receptive layer. It will describe the process of listening as described by DeVito (2001) in order to later discuss the unfolding societal shift of how listening to music has changed due to the access of music changing as well.

However, to get there, one must first understand listening at a generalised level, starting with the dual-processing theory. Thought—and thus listening—manifests in one of two ways: (1): 'unconscious, automatic, contextual, and emotional'; and (2): 'deliberate, explicit, effortful and intentional' (Sloman, 1993; Evans, 2003). Listening is categorised by Sloman (1993), and more recently Evans (2003), as either a mindless, passive, and 'automatic' process or a mindful, active, and 'conscious' one.

2.1.1 ACTIVE AND PASSIVE MUSIC LISTENING

Mursell (1973), a prominent music psychologist, distinguished hearing as a passive experience, and listening as an active one. The active music listener plays music to immerse them self within the layers of a piece. For example, an active listener might take more time to find and understand the nuances. Reitan describes an active listener as "conscious, reflective and attentive to music" (Reitan 2013, p. 56). By contrast, the passive music listener might merely be exposed to music in their surroundings, or may have chosen to play music while performing some other activity in their everyday life (Reitan, 2013). For example, a passive listener might be multitasking—whether it be driving, cleaning, exercising or work. Perhaps, they just enjoy hearing the dulcet tones of the radio playing in the background, smothering the activity of noises that surround them on a daily basis. The fundamental difference between all three examples is the degree with which one is paying attention to what they are hearing. In fact, when one is not considered listening at all they are simply engaged in the act of hearing.

Hearing is a physical ability (DeVito, 2001) while listening is a skill that can be learned (Caspersz and Stasinska, 2015). Hearing is a passive task that requires one to do very little. Whereas, listening is an active task enabling one to make sense of and understand the sounds they hear. Literature draws quite a clear distinction between active and passive listening. For example, one can always hear the noises of their environment; but, what determines whether one is actively or passively listening, is whether one is tuning in to understand what they have heard. Hearing does not focus on understanding the message, as it requires no awareness at all (Evans, 2003). Hearing is automatic; it is unconscious (Evans, 2003). It's almost passing through one at all times—or as the expression goes *in one ear, and out the other*. Passive listening is the effortless, thoughtless, and habitual process of receiving the messages

that one hears. For passive listening, the process stops at being aware and choosing not to evaluate or understand the message (Treasure, 2017). An active listener, on the other hand, will perceive, process, remember and understand what they have heard (Johnson, Weaver, Watson, & Barker, 2000). Hence, why active listening requires far greater effort than the former.

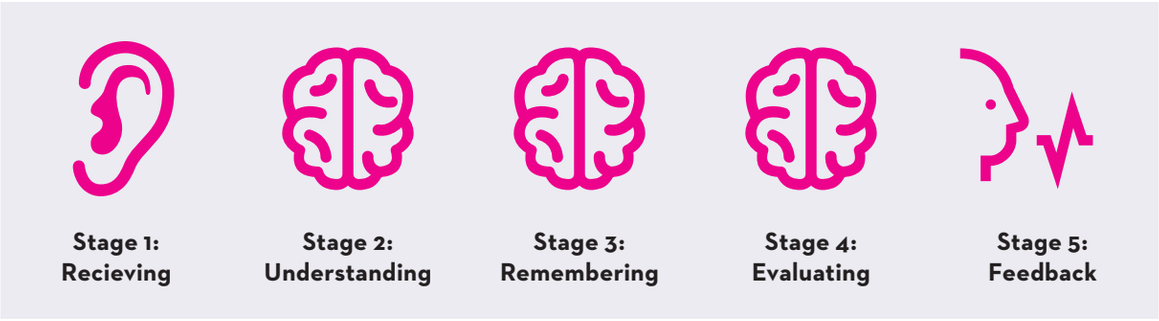
Listening to music is considered to be an "automatic part of everyday life" (Crist, 2000, p 63). Active music listening reciprocates its communication counterpart requiring even greater attention and focus. As such, I will use the term 'music' when discussing active listening, as there is a myriad of discourses that also adopt the term 'active listening'. This thesis is only concerned with the active listening of music, not all forms of listening. There is not a precise definition or a model in the musicology field for active listening to music. For example, Gotto (2007) and Varni, et al. (2011) refer to active music listening as the phenomenon of one that is actively in control of the music they are hearing. Reitan (2013) like Mursell (1973), on the other hand, describes active music listening in the same vein as applied in communication theory. She cites the Norwegian Academy of Music (NAM) curriculum to confirm the application and practice of active music listening. Moving forward, this thesis will adopt the foundational understanding of active listening according to Mursell (1973) and Reitan (2013) which aligns with communication and psychology theories and processes of listening. This research will disregard the notion that active listening might also mean to be in control of the music that one is listening to. Further to this, although a definitive framework or understanding for active music listening does not exit, musicologists such as Copland, Rich and Slatkin, (2011) have discussed the outcome of such a model if one did exist. Copland, et al., (2011) describes active music listening as having three key outcomes—but only two are relevant to this research—(1): an active music listener will gain a technical awareness of the music; and (2): an understanding of the music's meaning.

The review of musicology literature has identified a distinction between varying degrees of listening. Building upon this line of thinking, the next section will outline the process that underpins and delineates listening from hearing and active listening from passive listening.

2.1.2 THE FIVE STAGES OF LISTENING

Whether one hears spoken words or an instrument that is striking a chord, listening

Figure 2 a: Joseph DeVito's stages of listening



is the process of understanding messages (Goding, et al., 2011). This thesis uses the term 'message' in reference to a transaction of information—in this case, usually of an auditory nature. But, it's not only the ears that are employed to receive these messages (Goding, et al., 2011, p 76).

Consider the last time you conversed with someone in the street. The background noise of traffic and fellow pedestrians around you were quite distracting. For you to speak with one another, required your focus on the sound of their voice. Visual cues given by their hands and lip movement aided in your understanding. Animated facial expressions stressed their tone, and emphasised the focal point of the conversation. As they spoke, you were able to remember each point they made, as you evaluated the meaning of their message. You confirmed your understanding when they paused by responding with an agreeing remark, which continued the conversation further. Whether this was a brief encounter or a long one, it required more than your ears to listen to the other person. This ubiquitous interaction is a orchestration of different sense-modalities. It demonstrates the intricacies of listening that are performed daily, extending past the neural function of hearing, and requiring some focus to receive the meaning. This scenario is the act of mindful or conscious listening. One receives cues, constructs meaning from them, and responds with informed feedback.

But, what if another layer was added to this scenario? One, I'm sure is quite relatable or familiar in some regard to all. Partway through the conversation, your phone beeped. This sound, designed to steal your attention, has succeeded! You received a text message which you decided to read because the curiosity has distracted you. Meanwhile, your friend has continued to express their opinion and maintain the flow of the conversation. You lost focus

on their point as you multitasked between the conversation before you, and the message on your phone. You locked your screen in time to hear the end of their story, but, you missed the animated gestures along the way. You confirmed your confusion with a depthless remark, fumbling to continue the conversation any further. This scenario demonstrates mindless or passive listening. You were aware of the context and were somewhat engaged. Tuning in and out from point to point. However, your constructed meaning was inaccurate, and response was misguided. These scenarios illustrate the importance of attention when listening. It demonstrates what information might get missed if one does not focus their senses while they are hearing; and more importantly, what accompanying visual information can do for both one's engagement and reception of meaning.

Author Joseph DeVito (2000) has divided the listening process into five key stages: receiving, understanding, remembering, evaluating, and responding. As was just described, listening requires intentional focus to hear or receive a message. Focus happens when one can filter out other sources to avoid mixed signals and isolate the appropriate information. After one receives a message, the second step of the listening process is to understand it. In the understanding stage, one attempts to learn the meaning of the message, which is not always easy. For one thing, if a speaker does not enunciate clearly, it may be difficult to tell what the meaning was.

The third stage of the listening process is remembering. Remembering begins with hearing; if one forgets something that was said, it has been suggested that they might not have been efficiently hearing in the first place (Wolvin and Coakley, 1996). Wolvin and Coakley note that the most common reason for not remembering a message after the fact is because it wasn't ever learned in the first place. (Wolvin and Coakley, 1996). However, even when one is listening attentively, some messages are more difficult than others to understand and remember. Highly complex signals filled with detail also call for highly developed listening skills. Moreover, if something distracts one's attention even for a moment, they could miss out on information that explains other new concepts they hear when recommencing their active listening again.

The fourth stage in the listening process is evaluating or judging the value of the

message. One might conclude, that "this makes sense" or, conversely, "this is confusing or wrong." This stems from the different biases and perspectives that people embody as a result of diverse life experiences. Thus, evaluations of the same message could vary from one listener to another.

Responding—sometimes referred to as feedback—is the fifth and final stage of the listening process. It is the stage at which one indicates their involvement. Almost anything one does at this stage can be identified as feedback. For example, asking for clarification on certain points that have been raised through the conversation gives positive feedback that the message has been received and remembered. Feedback is usually provided in the form of verbal input; however, one can also respond nonverbally. For example, one's body language or physical reaction to receiving a message is also considered feedback. Just as interjecting over the top of the speaker, or abruptly ending the conversation with hand gestures or walking away is too.

Even without distractions, listening is not a skill that comes naturally to all as it requires practice—and it's only becoming harder in a digital world (Winn, 1988). It is not readily taught, and difficult to practice (Caspersz and Stasinska, 2015; Treasure, 2017). Listening to music is very much the same process as listening to spoken words. It too is a multi-sensory experience. It requires you to engage with different layers of stimuli to understand what the artist is trying to express or communicate. Arguably, music can transport the imagination within seconds of hearing it (Vickhoff, 2008); but, much like a conversation, requires conscious effort and focus so the meaning can be processed and the outcomes received. Copland et al. (2011) suggests that music can even exist outside of the purely auditory nature. Besides the pleasurable sound of music and the emotional feeling that it gives off, music does exist in the notes themselves and in their manipulation. Fortunately for the listener, music notation provides a simple gateway to interpreting a piece of music. Listening with a score in hand gives you a visual focus, reduces the chance of getting distracted and generally can improve the overall listening experience.

2.2 The importance of visual aids while listening

As identified in section 2.1, listening to music, like communication, requires more than just one's ears. It can be a multi-sensory experience with a range of touchpoints. This section builds upon this narrative by discussing the functional attributes of album artwork and how it further enables active listening by visually affording the listener an understanding of the music. Furthermore, this section will highlight how album artwork has significantly changed overtime impacting the value that album artwork offers to music listening.

There is very little academic literature that decodes album artwork. Let alone what defines it as a cultural art form. Yet, academics have repeatedly expressed the need for a systematic and critical reflection of album artwork as a practice (see, e.g., Jones et al. 1999; Inglis, 2001; Tsarouhis, 2006; Pardue, 2005; Straw, 2009). Album artwork is defined as the containment and packaging of a collection of songs (Inglis, 2001). It is also worth noting that this definition has remained the same, regardless of when discussed in an physical or digital context (see, eg. Jones and Sorger 1999; Inglis, 2001; Pardue, 2005, Tsarouhis, 2006; Wikstrom, 2014; Morris, 2015). This review locates a need for the definition to be updated to better reflect digital music album artwork as it is today.

2.2.1 PHYSICAL MUSIC ALBUM ARTWORK

Research locates significant importance in the role of the artwork and graphic design production for music albums. Album artwork—also referred to as cover art—is a visual mnemonic for the music enclosed (Jones and Sorger, 1999). It also functions as the protection, advertisement, accompaniment and commoditisation for the recorded music within (Jones and Sorger 1999; Inglis, 2001). Further to this, it has been argued to render meaning and value for not only the artists producing the music, but also the listener who engages with it as well (Pardue, 2005). This argument, however, does not represent the conceding view

amongst scholars. Those that examined the digital music commodity in comparison to its physical counterparts, seem to share a more technologically-determined view of the cultural commodity. They assume that the visual discourses and meaning-making practices of time gone by—such as cover art design and the carefully packaged narratives they contain—are no longer as important to the music commodity as the 'access to' it is (Manovich, 2001; Tsarouhis, 2006; Wikstrom, 2014).

Since the arrival of recorded music in the late 19th century, music collections, and more specifically the music album, have always been 'packaged' in one sense of the word, or another (Taylor, Katz, Grajeda, 2012). Packaging the music album in its earliest form—the vinyl—manifested through wrapped narratives of seduction with sleeves, notes, and protective sheaths (Tsarouhis, 2006), or, what literary theorists would define as the album's paratexts (Inglis, 2001).

An album paratext is used as an umbrella term for all additional music content, visual information, and data pertaining to the songs that make up the album (Inglis, 2001). They are usually encased in the packaging and artwork of the physical album, or more recently sourced through online repositories dedicated to preserving these details (Inglis, 2001). Many have argued that the vinyl has had the richest paratextual exploration of any album packaging to date (see Straw, 2009; Jones and Sorger, 1999), as it conveys greater cultural identification and meaning-making. However, no scholarship has actually examined the direct relationship between the album format and the value of meaning-making it produces in relation to where or how it is being consumed.

To clarify further, the vinyl was repetitively consumed in a static location, like a lounge room. Households usually only contained a single unit that was treated in much the same way as a TV unit would be today (Taylor et al., 2012). The vinyl was usually engaged or consumed in social occasions and also in allocated periods of leisurely down time (Taylor et al., 2012). Taylor et al. (2012) suggests that this resulted in a much deeper and more contemplative engagement with the music, visual accompaniments, and overall narrative of the album design itself. By contrast, the Compact Disc (CD) was designed and packaged in a very similar way to the vinyl; however, the main point of difference was the behaviour of the consumer (Straw, 2009).

Due to the likes of the Walkman and other portable devices, consumers had come to enjoy listening to music whilst on the move. CD album designers had failed to foresee multitasking and mobility as a threat to its design and function (Jones and Sorger 1999; Straw, 2009).

The CD, for many, was the eminent beginning and end of an era in music packaging. The CD has been described as plagued by a constant decoupling of the disc from its packaging and paratextual narrative—be it visual or auditory (Straw, 2009). From an album packaging and paratextual perspective, many have concluded that the CD was less narratively successful compared to its predecessor (Jones and Sorger 1999; Inglis, 2001; Straw, 2009). However, while there have been many points of comparison throughout the course of the music album and its packaging, it is hard to definitively compare one format to another without also considering the consumer of its time, and also how or where they experienced it.

2.2.2 DIGITAL MUSIC ALBUM ARTWORK

As music evolved from shelves to screens, so too did the separation of musical content from its 'packaging'. Separating out each track from the music album initially eased the transferability of music across the internet; however, consumers also lost interest in finding the paratexts that once accompanied the music album (Morris, 2015; Wikstrom, 2014). Many have suggested that less attention or emphasis has been given to the visual information of a digital music album, compared to its physical counterparts (Jones and Sorger, 1999; Straw, 2009; Tsarouhis, 2006). The shrinking, or even complete removal of cover art and other visual information from the music album's assemblage gives considerable weight to this argument (Jones and Sorger, 1999).

Many agree that the value of album artwork today is still of significant importance for both identity formation and communication (Tsarouhis, 2006; Pardue, 2005; Wikstrom, 2014; Morris, 2015). However, it is also reasoned that it is becoming difficult to demonstrate this value, with institutions such as 'ownership' and 'collection' becoming less important in the "age of digital distribution and ubiquitous access to music" (Wikstrom, 2014, p.20). Wikstrom (2014) adds that since 'collection' and 'ownership' are of less importance, a new role for recorded music as an identity marker is needed.

Some see the album cover and paratextual artwork within as redundant in the digital

age (Tsarouhis, 2006). The functionality of the cover has even been reduced to the likeness of an icon—something that now only provides visual clues to aid a user through a large collection (Tsarouhis, 2006). Others view its lack of clarity in the digital space as an ongoing experiment that is gradually unfolding—an opportunity to explore something that is forever evolving, yet, immaterial in its raw state (Morris, 2015). While many scholars agree that music albums that are coupled with visual information are more resonant with meaning for the listener, it is safe to say that there is no unanimous view of what this visual information should look like for a digital music album.

Multiple scholars have argued that the listener's relationship with music has changed as a part of the digital transformation (Inglis, 2001; Straw, 2009; Wikstrom, 2014; Morris, 2015). However, it was Jones et al. (1999) who predicted it much earlier than most, that the ability to play with music, rather than listen to music, has become of greater importance in the digital age. It will also continue to shape the way listeners engage with music moving forward (Wikstrom, 2014; Morris, 2015). Furthermore, there has been great consideration for an ontological argument that co-exists with digitising cultural commodities, particularly in the Human Computer Interaction (HCI) field of music information retrieval (MIR). When considering the ever-evolving music economy, it has been argued that a database of music without consideration for the presentation of the narratives that they contain, is diminishing the way music listeners engage with music and musical content alike (Wikstrom, 2014).

As highlighted in this review so far, a number of scholars have compared and contrasted the changing forms that the music album has taken over its time. The consistent view of these comparisons argues that the current state or representation is far from optimal, nor ideal when considering the narratable and thematically rich nature of the music album (Jones and Sorger, 1999; Tsarouhis, 2006; and Morris, 2015). Nevertheless, the music albums shape has always been a reflection of its users changing needs at that given period in time (see Jones and Sorger ,1999; Inglis, 2001; Tsarouhis, 2006; Straw, 2009; Wikstrom, 2014; Morris, 2015).

2.3 The changing interface of a music player

Section 2.1 identified the cognitive process that unfolds when people listen to music. It also defined the difference between active and passive listening. Section 2.2 then illustrated how the visual presentation and format of music has drastically changed over the past 100 years. This section will now evaluate recent literature pertaining to the interface design of a music player. It will also identify how significant changes to music distribution and the devices that facilitate this process are constantly challenging one's ability to actively listen to music.

Music up until the last century was considered to be an active and present experience (Wikstrom, 2014). If one wanted to listen to music they either had to play an instrument or listen to someone else perform for them (Wikstrom, 2014). In the last century, there have been five significant innovations that have reshaped the music industry and how one listens to and accesses music. They are the phonograph, radio, home recording, the Walkman, and most recently, the advent of the digital music file (Jones and Sorger, 1999).

More recently, a rise in Internet-based services has seen an increasing-number of new technologies and features sweep the music industry (Wikstrom, 2014). Ratliff (2015), a music reviewer for New York Times, and author of *Every Song Ever: Twenty Ways to Listen in an Age of Musical Plenty* writes "'discovery' is very important — the idea that listeners can be guided, through stated or anticipated preferences, toward music just slightly to the side of what they like, and ideally by pressing a single button. Ratliff (2015) articulates that the applications and services that interface these large catalogues prioritise the discoverability of music over the genuine listening experience of them. "And I can see the point of listening to predictable playlists while you're doing something else; it keeps you company and isn't distracting" writes Ratliff (2015). However, this is not a new argument for some.

Since the arrival of the digital music file—more commonly known as an Mp3—a new wave of music distribution platforms known as access-based streaming services, or music

subscription services, have surfaced as a popular means of accessing music (Wikstrom, 2014). Music subscription services such as Spotify, Rdio and Pandora now allow the user to rent music rather than purchase it. These services also enable users to follow artists, friends and tastemakers alike, with the common goal of discovering new music (Wikstrom, 2014). Music discovery has evidently become an automated process (Ratliff, 2015; and Wikstrom, 2014). Similar artists, tastemakers and playlists are now suggested to subscribers in real-time, as the systems use calculated algorithms that reference the user's preferences to do so (Ratliff, 2015).

2.3.1 MULTITASKING PREVENTS ACTIVE LISTENING

"The ubiquity, pervasiveness and mobility of new technologies encourage a simultaneity of activities that go beyond anything our culture has heretofore ever known" (Hembrooke and Gay, 2003, p. 2). Indeed, the ability to engage in multiple tasks concurrently seems to be the very essence or core motivation for the development of such technologies. Hembrooke and Gay (2003) contrast this motivation by citing a large number of psychology and communication research, arguing that one's ability to engage in tasks concurrently, is at best, inadequate (Fisch, 2000; Lang, 2000), and at worst, virtually impossible (James, 1890; Woodsworth, 1921; Broadbent, 1958).

Hembrooke and Gay (2003) note that technology presents a myriad of new auditory and visual opportunities that far exceed their pre-technological forms. However, makes the point that "they also have the potential to bring distraction to new heights" (Hembrooke and Gay, 2003, p 2). Contrary to this knowledge, listeners today still choose to access their music through personal and portable devices such as a smartphone, tablet, or computer. A recent study measuring the impact that mobile phone use during lectures had on student information retention, suggest that these devices can make it difficult to stay on task and reduces information recall by 53%–70% (Kuznekoff, Munz, and Titsworth, 2015). These statistics could suggest that music players also accessed through these devices act like background task managers instead of agents of active music listening. This result is not surprising given that the fundamental function of mobile and handheld computers is designed to enable multitasking. For example, the latest release of the iPad boasts a range of features and functions that allow one to multitask better—"On your iPad with iOS 11, you can use

multitasking to work with two apps at the same time, answer emails while watching a video, switch apps using gestures, and more" (Apple, 2018). The concept of multitasking gives one the ability to split their focus amongst multiple tasks simultaneously (Hembrooke and Gay, 2003). By this definition, it is near impossible to also actively listen. As outlined in section 2.1.1 of this review, active listening requires one's full attention, or focus on doing so. Thus, in principle, an interface that is designed to accommodate multitasking or produce distractions, is never also going to facilitate active listening.

2.3.2 TOO MUCH CHOICE

For music applications today, multitasking is not the only challenge for todays active music listener. Neil Turner, a prominent user experience (UX) designer wrote an article on the 'The paradox of choice and why I stopped using Spotify' (Turner, 2015). He identifies the paralysis of indecision that comes with an abundance of choice. Turner is referring to psychologist Barry Schwartz's popular theory 'the paradox of choice', which argues as "someone's level of choice goes up, their level of engagement and satisfaction typically goes down" (Turner, 2015, para 4). He elaborates that the more choice a user faces, a higher cognitive workload is required to evaluate and weigh up each option (Turner, 2015). Additionally, the user will have higher expectations that they will find the perfect song, which matches an increased probability of not meeting those expectations (Turner, 2015). Finally, Turner suggests that more choice also means less engagement—Sometimes people would preferably not take part than have to evaluate a multitude of options (Turner, 2015). It is no wonder that music applications today create interfaces that prioritise browsing and discovery over listening.

As highlighted by Ratliff (2015), music applications prioritise the browsing and discovery experience to counter the consequences that accompany the sheer enormity of digital music catalogues (Turner, 2015). Too much choice forces listeners to second-guess their decision. Thus, the music application interface is not there to guide one on how to listen to music, but rather help decide what music to listen to and when. Although this prioritisation is considered a benefit for music listeners, new modes of music discovery (Ratliff, 2015; Wikstrom, 2014), and revenue models such as 'freemium'—an ad-based service (Wikstrom, 2014), prohibit the

facilitation of an immersive or distraction-free listening environment. However, the field of music information retrieval (MIR) suggest a few clues as to why music player interfaces are designed this way.

2.3.3 ENDLESS BROWSING

Streaming services are differentiating themselves by offering new services such as music discovery by context (Wikstrom, 2014). Whereby, a music listener can search and easily find the song they are looking for at a particular location, time of day, or based on the weather forecast. Wikstrom (2014) notes that this is an evident shift in the service offerings for access-based streaming services today. New features are being added based on the assumption that access to music is already provided. The focus is no longer on the size of the catalogue, but rather how easy it is to browse and discover new music.

Chang and Rice (1993), notable theorists in the field of information retrieval (IR), model 'browsing' to be "a rich and fundamental human information behaviour" (as cited in, Whitelaw, 2012). The literature on browsing details an open-ended, complex, holistic human experience, instead of an input-output exchange that portrays traditional information retrieval (Whitelaw, 2012). In the tradition of information retrieval, access to collection content remains the overarching goal in creating browsable interfaces (Whitelaw, 2012). By contrast, Whitelaw analyses a range of interfaces that illustrate what he describes as 'generous interfaces'. These experiments suggest that content discovery is only part of the story. Cross-linked and hierarchical displays emphasise context—complex, multi-dimensional relationships between items—as well as macro-scale patterns and structures within collections. Whitelaw (2012) suggests that these features are contingent and generative, prompting further investigation, rather than claiming to show what is. However, generous interfaces imply no real end to their loop—forever suggesting, generating or prompting. The goal of these interfaces are to keep users moving from one artefact to the next.

Browsing entails movement through a field of resources (Rice et al. 2001, 220, as cited in Whitelaw, 2012). Browsing is an iterative process that involves scanning (Rice et al. 2001, 178, as cited in Whitelaw, 2012) or glimpsing (Bates, 2007, as cited in Whitelaw, 2012) a field of potential resources, and selecting or sampling items for further investigation and

evaluation (Whitelaw, 2012). For music applications, the entire experience revolves around this modality. The interface encourages the listener to keep iterating and sampling similar songs. These sophisticated systems are designed to do this very well, as they keep listeners endlessly sampling and discovering. However, as Turner (2015) and Ratliff (2015) dispute, the very nature of browsing a catalogue of this size with constant iteration, prompting and sampling can lead to indecision and doubt at each stage of this experience. The listener is continually evaluating whether this song is the correct one, or whether they should sample the following one, before ever deciding to listen to any song in its entirety. Paul Lamere (2014), sampled several billions of plays from millions of unique listeners around the world to learn how people discover and listen to music. The results show almost half of Spotify song plays are skipped before the songs end.

The listener is prompted to try an endless and ever-generating list of similar sounding options. Once again, this results in the listener not focusing on the listening experience as the endless loop of browsing and sampling continues to distract the listener. Ratliff (2015) notes that it is possible to successfully navigate these collections and sample new sounds with only a few finger motions, however, breaking out of the suggestive feeds entails an act of will. There is no screen at any point dedicated to just listening to a song, the loop almost never ends.

The challenge does not lie with browsing itself. It is not considered the villain in this scenario. As previously mentioned, browsing is a fundamental experience of human information behaviour (Chang and Rice, 1993, as cited in Whitelaw, 2012). Instead, music application interfaces should give significant consideration to the listening experience, as listening and browsing to music use very different modes of thinking. Grouping these tasks into the same modality is a perfectly fine experience for passive listening, but not for active listening. Browsing and active listening use two opposing modalities, and for this reason, can never be achieved in the same experience.

It must be mentioned that this thesis is not suggesting that music was once only an active listening experience, free of all indecision and doubt before digital music. Nor is it suggesting that music today is any less of an experience. Instead, this thesis identifies an opportunity in the digital music space that previously did not exist in the physical experience.

Music interfaces today have the potential to afford all listeners the opportunity to practice active listening on a regular basis, by prioritising the current interface to engage multiple senses during the listening experience, rather than distracting them with more options and doubt. This thesis locates an opportunity in the experience of listening to the music after the music has been selected. However, to improve interfaces and user experiences, one must first identify a measure to compare the findings against. This measure will be identified using a range of usability inspection methods. This method will also be used to evaluate the success of the prototype.

2.4 Summary of the literature

The review cross examined musicology, communication, psychology and interface design literature to identify the following takeaways. There are five stages to active listening: receive, remember, understand, evaluate and respond (DeVito, 2001). Furthermore, active listening requires the listener's full attention. Therefore, distractions and the ability to multitask must be prevented while listening.

Copland et al. (2011) identifies two key outcomes for active music listening: (1) the ability to identify the technical attributes of a song (e.g. tempo, rhythm, key, tone, melody, instruments); and also (2) The ability to identify and understand the meaning and context of a song (e.g. influences from the artists' background, genre influences, historical/societal influences).

The visual presentation of music has drastically changed since the advent of recorded music in the early 19th century. A number of scholars have compared and contrasted the changing forms that the music album has taken over its time. The consistent view of these comparisons argue that the current state or representation is far from optimal, nor ideal when considering the narratable and thematically rich nature of the music album (Jones and Sorger, 1999; Tsarouhis, 2006; Morris, 2015).

Multiple scholars have suggested that the listener's relationship with music has changed as a part of the digital transformation (Inglis, 2001; Straw, 2009; Wikstrom, 2014; and Morris,

2015). This argument highlights that the changing distribution channels of music are forever challenging the listening experience. Furthermore, the ability to play with music, rather than listen to music, has become of greater importance in the digital age (Jones et al., 1999); and it will continue to shape the way listeners engage with music moving forward (Wikstrom, 2014; Morris, 2015). Finally, music applications today present too many choices (Turner, 2015) while listening, leading to high-levels of song abandonment (Lamere, 2014).

3 METHODOLOGY

This thesis is investigating the benefits that visual elements and a streamlined interface can add to one's ability to actively listen to music. The aims and objectives of this research are outlined below:

1. Define a list of visual elements that accompany and facilitate one's ability to actively listen to music.
2. Identify which visual elements prevent or inhibit one's ability to actively listen to music.
3. Design a range of outputs that demonstrate how visual elements could better aid one's ability to actively listen to music.

Given the research aims and objectives outlined above, the methodology chosen for this research is a two-fold, mixed-method approach:

1. Firstly, using two inspection method techniques— (1) Heuristic evaluation and (2) Cognitive walkthrough—this research will conduct a usability review of three web applications. The web applications chosen represent both current and emerging trends in music player interfaces and will be used as a measurement of success throughout the evaluation process.
2. Secondly, the literature review identified a range of concepts for active music listening. A prototype will be created to demonstrate that a streamlined interface design and interactive visuals could better aid one's ability to actively listen to music. The prototype's successes and shortcomings will be identified using the same measures used in the usability review. Furthermore, the research will adopt a rapid prototyping and iterative design model to facilitate this process. Rapid prototyping and iterative design is an effective way to make ideas tangible and to learn through making.

3.1 Heuristic evaluation and cognitive walkthrough

3.1.1 BACKGROUND

Gilbert Cockton writes in *The Encyclopedia of Human-Computer Interaction, 2nd Ed.*, (2014) that usability is an inherent measurable property of all interactive digital technologies. There are a number of ways to measure usability of a web application, however, due to the scope and time restrictions of a Masters-level thesis, this research has chosen to review each method by effectiveness vs effort required. After reviewing several views on conducting usability inspection methods, this research opted for a hybrid approach from a range of different techniques, as recommended by Jeff Sauro (2011). Sauro suggests performing an expert review that uses a variety of inspection method techniques to cross-examine a product. With this in mind, this research uses Whitney Hess's (2009) experience heuristics, in conjunction with a streamlined Cognitive Walkthrough process as defined by Spencer (2000).

A cross-examination of emerging and current trends in music player interface design will sufficiently achieve two out of the three research objectives:

1. Define a list of visual elements that accompany and facilitate one's ability to actively listen to music.
2. Identify which visual elements prevent or inhibit one's ability to actively listen to music.

3.1.2 LIMITATIONS AND VALIDITY OF THIS METHOD

Although it is recommended to use between 3–5 usability experts for each heuristics review (Muniz, 2016; and Nielsen, 1995), this research will only be conducted by a single reviewer. This limitation is due to the scope of this research. In stating this, a single evaluator will still likely find up to 35% of usability issues (Nielsen, 1994), which will be used as a consistent measure across the three web applications. Furthermore, the review will be accompanying findings from a cognitive walkthrough which will strengthen the validity of the findings.

It is agreed within the user experience field that the best measurement for usability is to observe a sample of users who are actually using the product (Nielsen, 2012). This

method is considered the benchmark for usability data and unearths considerable insights for the design process. This research chose not to use this method due to cost. This method is considerably more expensive than a heuristic evaluation due to recruiting expenses, participant compensation and equipment rental (usability.gov, ND). It is recommended that future considerations for usability testing be carried out to complement the findings from the chosen inspection methods.

The final design will be reviewed using the same method as the first three web applications—an expert evaluation using both heuristic and cognitive walkthrough inspection techniques. The same limitations mentioned above will also apply to the final design review. However, it is important to highlight that the expert evaluation of the final design will be carried out by a single researcher who is also the designer of the prototype.

3.1.3 HEURISTIC EVALUATION PROCESS

A heuristic evaluation is a usability inspection method for computer software (Domingo, 2016). It is designed to help identify usability problems in the user interface (UI) design. Heuristic evaluations were introduced by Nielsen and Molich in 1990 in their influential paper 'Heuristic Evaluation of User Interfaces'. Nielsen later distilled and refined their research even further into the final version of 'Heuristic Evaluation' (Nielsen, 1994). Nielsen (1994) explains that a heuristic evaluation involves a usability expert to review an interface against a set of guiding principles. These heuristics provide a framework to help unearth issues a user will likely encounter when using the product (Saruro, 2011). Although Neilson is considered to be a pioneer of heuristics, this review will opt for Whitney Hess' (2009) experience design principles instead. This decision is due to the nature of the review being experience-based, instead of purely task or usability oriented like Nielsen's heuristics.

HEURISTICS

Of Hess' 20 guiding principles for Experience design, this evaluation has chosen to employ only five. It was not possible to do all 20 in the timeframe of the Masters. This was due to the number of applications to be reviewed and the considerable time it takes to complete each one. Hess's five experience heuristics are as follows: present few choices; limit distraction; provide context; use constraints appropriately; and use emotion. A brief

description of each heuristic can found in the appendix—Figure 8-a *Whitney Hess' Heuristics*.

3.1.4 COGNITIVE WALKTHROUGH PROCESS

A cognitive walkthrough is another usability inspection method, much like a heuristic evaluation (Saruro, 2011). However, the focus is on a single task instead of the usability of an entire system. The technique identifies a user's goal and how they would attempt to achieve this goal using the interface (Saruro, 2011). The second step of this technique is to carefully identify any problems a user would have as they engage with an interface (Saruro, 2011). The cognitive walkthrough was an extension of earlier work by Polson and Lewis (1990) and later reintroduced at the same conference (Lewis et al., 1990) as Neilson and Molich's Heuristic Evaluation paper.

Figure 3 a: Iterative design process diagram

SEVERITY RANKINGS

RATING	DESCRIPTION
0	Violates a heuristic but doesn't seem to be a usability problem.
1	Superficial usability problem: may be easily overcome by user or occurs extremely infrequently.
2	Minor usability problem: may occur more frequently or be more difficult to overcome.
3	Major usability problem: occurs frequently and persistently or users may be unable or unaware of how to fix the problem.
4	Usability catastrophe: Seriously impairs use of product and cannot be overcome by users.

Lewis and Polson's original approach required the evaluator to describe the user's immediate goal and answer eight questions. However, this method was not possible in the timeframe of the Masters. For this reason, this thesis will adopt Spencer's (2000) Streamlined Cognitive Walkthrough technique in which the evaluator is required only to ask two questions at each user action (Saruro, 2011):

1. Will the user know what to do with this step?
2. If the user does the right thing, will they know that they did the right thing? Will they understand that they are making progress

towards their goal?

Spencer found that by reducing the number of questions for the review team, he enabled Microsoft to use Cognitive Walkthroughs efficiently (Saruro, 2011). This inspection method will evaluate three essential tasks an active listener would undertake when using a music interface. The first task will identify whether a user can easily select a song to listen to. The second task will evaluate how efficiently a listener can engage in active listening. It will consider whether visual stimuli is used to aid focus and minimise distractions; whether the user can identify the technical musical attributes of the song (e.g. tempo, tone, instruments) and finally whether the user can understand the meaning of the song. The third and final task will evaluate whether the user can express their understanding of the song after completing the second task.

3.1.5 PRIORITISATION OF RESULTS

In order to prioritise the findings of the usability review, the results will be grouped into specific instances of heuristic violations and cognitive walkthrough failings. To further understand the impact of each issue, a severity ranking based on those defined by Jakob Nielsen (1995) will be applied. The severity is measured in terms of the frequency with which the issue occurred, the ease with which the user could overcome the issue, and the persistence of the issue—whether the issue would reoccur every time a task was attempted. Table 3a defines the severity and ease of fix rating systems applied.

3.1.6 SAMPLE SELECTION CRITERIA

Maximum variation sampling was employed to determine the sample for the usability review. The aim of this study was to review current or emerging trends in music player design that also enable active listening. Therefore, the first criterion is to demonstrate the currency and popularity of the music player. This was determined by reviewing popular online web critiquing and sharing communities such as awwwards.com, dribbble.net and experiments with google to find trending or popular music player interfaces. The second criterion of sample selection evaluates whether the chosen music players facilitate active listening in some capacity. This was measured by sampling the interface against the insights outlined in section 2.4. Finally, the last criterion expects the music player will use visual elements to aid

music listening in some capacity or another.

Literature indicates interfaces that facilitate multitasking while listening cannot also facilitate active listening. All of the major accessed-based streaming services such as Apple music, Spotify, Tidal and Pandora were excluded from the sample, as they are designed to do so. Furthermore, they are widely studied interfaces and as indicated by Lamere, 2014 have high percentages of song abandonment.

The first application selected was the Emmit Fenn website which uses album artwork and interactive visual elements to maintain focus and engage listeners. The second application chosen, Inside Music, uses interactive visuals and virtual reality technology to highlight technical attributes of a song. By contrast, the third application selected, Genius.com, uses collaborative lyric annotations and a conventional media player to aid in one's ability to listen. Furthermore, conventional album artwork is used to aid navigation of the catalogue rather than aid listening.

3.2 Rapid prototyping and iterative design

3.2.1 BACKGROUND

Rapid prototyping is a popular technique used to define system and software-level functional requirements for interactive websites and applications (Overmyer, 1991). The term "rapid prototyping" is often used implicitly and can vary in application from project to project (Overmyer, 1991; IDEO, 2011). For example, the term rapid prototyping has been used in literature to describe a variety of activities. These activities range from static screen layout and design to automated storyboarding (Andriole, 1989) and from interactive simulation (Overmyer and Campbell, 1984) to evolutionary system development.

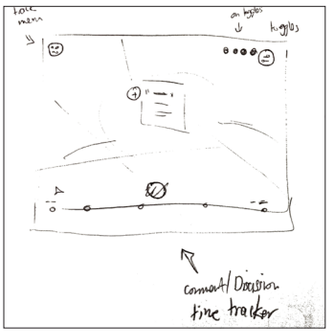
In the context of this research, rapid prototyping will consist of sketching, wireframing, static screen layout design and interactive simulation. This will be achieved following best-practices and a range of prototyping tools such as Adobe Photoshop, Sketch, Principle and Adobe XD.

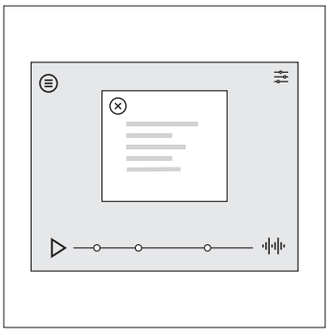
Rapid prototyping and iterative design is an effective way to make ideas tangible and to learn through making (IDEO, 2011). Creating realistic outputs allow the research to demonstrate real-world applications of some of the concepts proposed in the literature.

Furthermore, it appropriately meets the research objective: to design a range of outputs that demonstrate how visual elements could better aid one's ability to actively listen to music.

3.2.2 LIMITATIONS AND VALIDITY OF THIS METHOD

Figure 3 a: Iterative design process diagram





Although it is recommended to engage stakeholders, designers, and multiple users for feedback during the review phase (Overmyer, 1991; and IDEO, 2011), this research will instead rely on the same inspection-method techniques that were used to review the previous three web applications. This limitation is due to restricting timeframes and budgets. It must be mentioned that using this approach will reduce the validity of the findings. However, as raised previously in section 3.1.2, a single evaluator will still likely find up to 35% of usability issues (Nielsen, 1994), and will be a consistent measure against the other three web applications. It

is recommended that considerations for external feedback from designers, stakeholders and users be carried out in future studies.

3.2.3 RAPID PROTOTYPING AND ITERATIVE DESIGN PROCESS

"In an iterative approach to user interface design, rapid prototyping is the process of quickly mocking up the future state of a system" (Cerejo, 2010) or interaction. The validity of the design is measured in the review process and then refined in a cyclical process. Doing this rapidly and iteratively generates feedback early and often in the process, ultimately leading to a refined and improved final design.

With each round of review and refinement, the prototype will also build up the fidelity of the design. Starting with sketches on paper, followed by static mock-ups, this process ultimately results in a high-fidelity and interactive prototype that represents a real-word application.

3.2.4 PRESENTATION OF RESULTS

Below are two tables that demonstrate how the results will be presented throughout section 4. Rather than presenting all of the results from the report, the heuristics evaluation will be displayed as follows: A description of grouped issues found in the report in the first column; what task the user was attempting when the issue occurred in the second column; what heuristic the issue was violating in the third column; and in the last column, a rating of how severe the violation was upon the user's ability to complete the task. Similarly, the Cognitive walkthrough results table will be presented in the following way: a brief description of each task in the first column; what the correct path or actions that the user needs to do in order to complete the task in the second column; any possible issues that may arise while the user attempts to complete the task in the third column; and finally, a rating of how severe the possible issues are upon the user's ability to complete the task in the last column.

Figure 3 a: Iterative design process diagram

ISSUE	TASK NO.	HEURISTIC VIOLATION	SEVERITY RATING
Not enough context on each screen: Each screen on the web-app needs a page title, a logo and explanatory information to give context and help users orientate themselves.	1, 2, 3	3	(3) Major usability problem

Figure 3 a: Iterative design process diagram

TASK DESCRIPTION	CORRECT PATH	POSSIBLE ISSUES	SEVERITY RATING
The user wants to select a song to listen to.	Home page > hover over a track tile > click a track tile to select.	The minimalistic presentation of each track is unfortunately not very intuitive due to the lack of perceived affordance given to each tile. The User is expected to guess what is interactive and what is not, by rolling over the entire page.	(1) Superficial usability problem

4 RESULTS

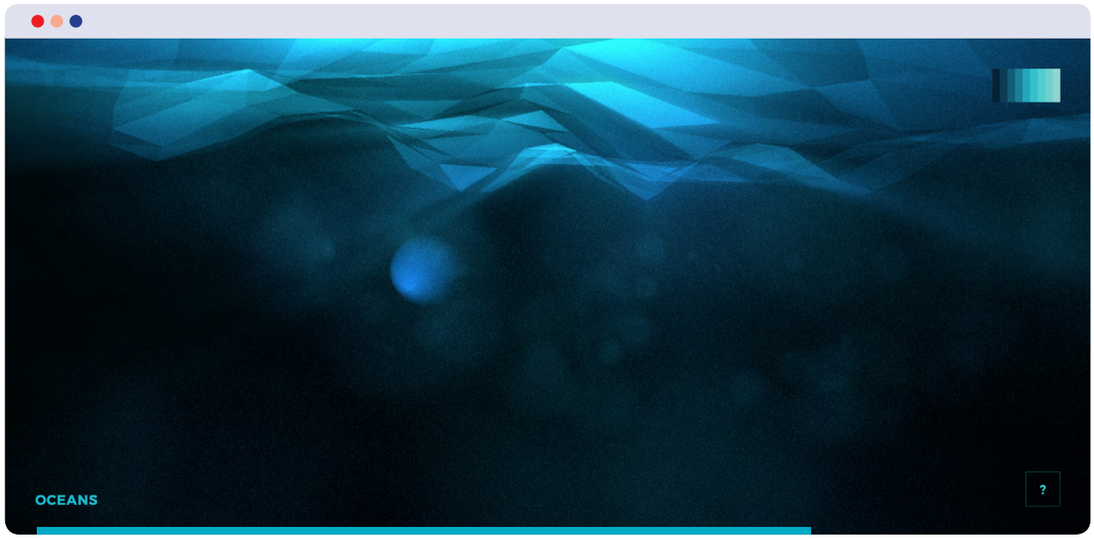
4.1 Usability reviews

Each application was reviewed independently from one another and the findings are structured as follows: a short description of each application for context; a summary of the findings; a snapshot of the data collected; and an analysis of the findings. A comparative summary of all three reviews against the research objectives can be found in section 4.1.4.

4.1.1 REVIEW 1: EMMIT FENN

www.emmitfenn.com

Figure 4 a: Screenshot of Emmit Fenn website



4.1.1.1 Application description

In partnership with Active Theory, an award-winning design agency, Emmit Fenn, an upcoming singer-songwriter turned his website into an interactive masterpiece. The website now hosts an audio-visual experience for the Prologue EP released to critical acclaim in 2017.

4.1.1.2 Summary of findings

Overall, this web application achieved four out of the possible five heuristics, illustrating the strength of this design. By contrast, the cognitive walkthrough had mixed results—one

catastrophic usability problem and one superficial usability problem. Overall the graphical components of this application make it easy for an active listener to understand and identify both the technical musical attributes of the song and also the meaning of it at the same time. However, the lack of instructional or explanatory content for the listener could be quite disorientating or confusing in some areas of the interface. Overall, this design is a successful example of how album artwork could be used to encourage and enable active listening in a music player interface.

4.1.1.3 Results

Table 4 a: Review 1 heuristics evaluation issues

TASK	ISSUE	HEURISTIC VIOLATION	SEVERITY RATING
(1) Selecting a song. (2) Actively listening. (3) Express meaning.	**Not enough context on each screen:** Each screen on the web-app needs a page title, a logo and explanatory information to give context and help users orientate themselves. (See Figure 4 b The emmit Fenn Home page).	(3) Provide context	(3) Major usability problem

Figure 4 a: Screenshot of Emmit Fenn website

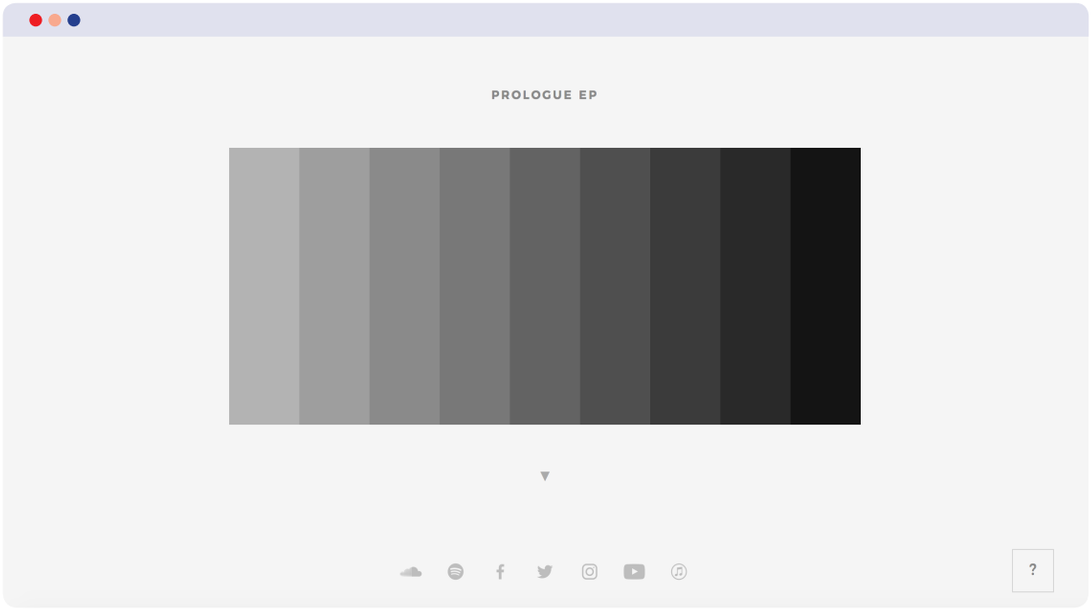


Table 4 b: Review 1 cognitive walkthrough results

TASK DESCRIPTION	CORRECT PATH	POSSIBLE ISSUES	SEVERITY RATING
1. The user wants to select a song to listen to. (see figure 4-a)	Home page > hover over a track tile > click a track tile to select.	The minimalistic presentation of each track is unfortunately not very intuitive due to the lack of perceived affordance given to each tile. The User is expected to guess what is interactive and what is not, by rolling over the entire page.	(1) Superficial usability problem
2. The user wants to actively listen to a song they have selected.	Interact with the album artwork while listening to the music.	The icon for going back to the track listing screen is unconventional and might be quite confusing for the user as there is no accompany text to explain what it means. Although, this would not prevent a user from being able to actively listen.	(0) Not a usability problem
3. The user wants to express their understanding of the song they have listened to.	The feature does not exist.	User will probably try different locations on the web application and possibly get frustrated when they can't find what they are looking for.	(5) Catastrophic usability problem

4.1.1.4 Analysis

The major flaw of this interface design is the lack of context and instructional information on each screen. The user immediately gets presented with the Prologue Ep (2017) track listing when arriving on the Emmit Fenn website. This would typically be considered a positive experience, except, the lack of content on the page is quite disorientating for the user upon arrival. It is not immediately obvious what to do on this page as there is no instructional or explanatory information describing the purpose of the website, or what one should do once they arrive there. The lack of site identity, logo or page title—which would inform a user that they are listening to Emmit Fenn's new EP—is also very unconventional. However,

the highlight of the design resides in the interfaces ability to enable a user to practice active listening adequately.

This novel interface captures the essence of immersive and distraction-free listening. Although the interaction and navigation of this website feels removed and unrelated to that of a conventional music streaming service interface, many features still feel familiar to the current music listener's schema. An example of this is the placement of the scrobble bar and track title—typically anchored to the bottom of the screen. The scrobble bar tracks the position within the current song, which is not surprising or unique. However, what makes this particular example successful is how paired back its functionality or interactivity is—to the point that it is only there as a representation of the length and duration of the song, rather than something that can be manipulated or interacted with at any point. This smart but straightforward lack of interaction forces the listener to participate in listening to the entire song. They are not able to skip past the less engaging parts of a song—that is potentially important for building up to the intensity of the refrain or carrying significant conceptual or narratable weight within the overall structure of the song.

This particular design decision permeates across the entire interface. Rather than designing new and bespoke features to enable users to achieve a task, it is the removal or disabling of some more common music UI features that make this interface successful. Active listening is all about focus and understanding. This interface removes all competing interactivity—and thus distractions—which forces the user to merely just listen. The interface disarming the ability to skip tracks while another song is playing illustrates this point quite well. This brave design decision successfully removes the paradox of choice that plagues most music interfaces (Turner, 2015). The listener is encouraged to be present within the current song by not worrying about what is next in the listening queue.

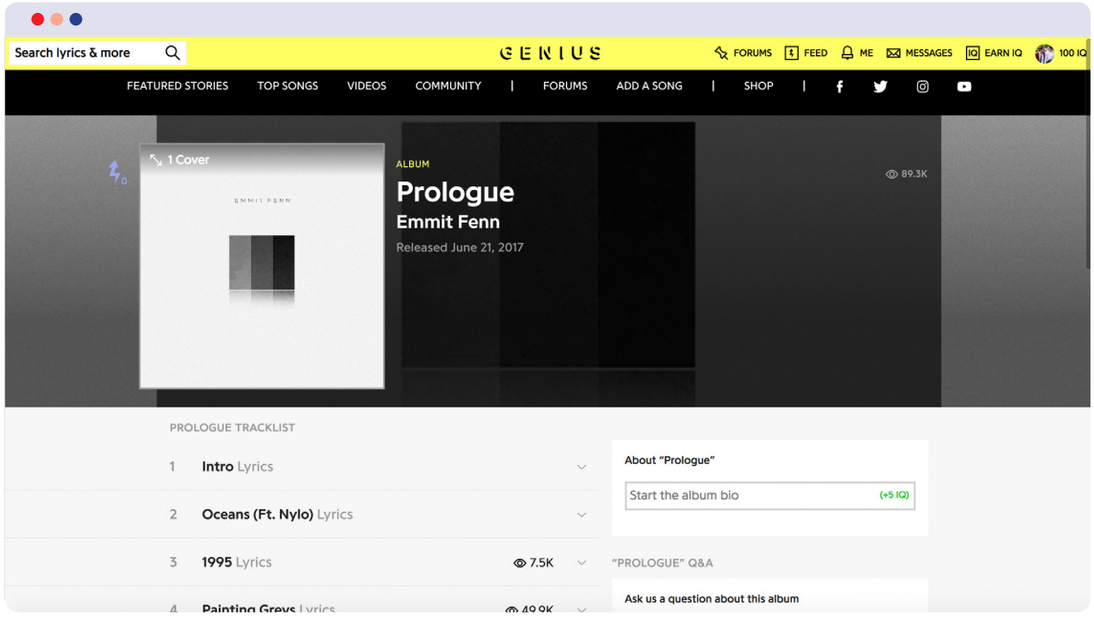
Once again, everything about this screen keeps the listener focused on the current song that is playing. For example, opening a new internet browser tab forces the music to pause. The music remains paused waiting and ready to resume once the user returns to the Emmit Fenn website. This feature encourages the listener to stay focused while listening and not engage in multitasking—synonymous with most music listening experiences today.

Finally, the graphics that accompany the music are abstract visual representations of the narrative. By not having explicit video footage, such as a music video, leaves room for the listener to interpret the music in their way. Colour, shapes, and diffused lighting congruously interplay and reacts to the melody, tempo and beat of the music. This fun interaction helps the listener stay immersed in the narrative and concept of the lyrics and melody, guiding them through the whole song. The graphical component makes it easy for an active listener to understand and identify both the technical musical attributes of the song and also the meaning of it at the same time. This design is a successful example of how album artwork could be used to encourage and enable active listening in music user interfaces.

4.1.2 REVIEW 2: GENIUS

www.genius.com

Figure 4 c: Screenshot of Genius website (album page)



4.1.2.1 Application description

Genius' premise is that "every song has a story that needs to be told" (genius.com, 2009). This website is a platform that enables a collaborative community of users to deconstruct and discuss the meaning of their favourite songs. This interface demonstrates current practices for how people interpret or understand music.

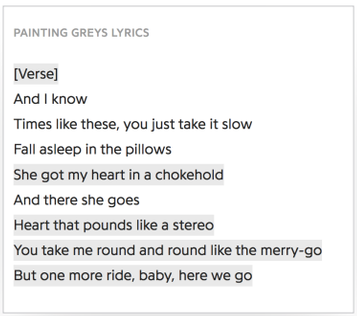
4.1.2.2 Summary of findings

Overall, the Genius interface failed the heuristic evaluation and cognitive walkthrough. The site violated four out of the five Heuristics and has usability issues for all three tasks. Although this design enabled a user to achieve all three tasks in the cognitive walkthrough, it was not considered easy to do so. Interestingly, Genius was the only website in this review that allowed users to complete the third task—express an understanding of the song. In summary, the interface presents too many options for performing the same task and is very distracting. The number of options available at each step ultimately compete for the user's attention and cognitive load, thus causing the user to work harder to achieve their goal.

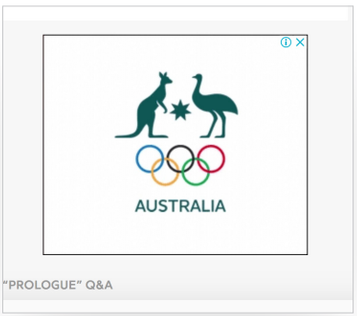
4.1.2.3 Results

Table 4 c: Review 2 heuristics evaluation issues

TASK	ISSUE	HEURISTIC VIOLATION	SEVERITY RATING
(1) Selecting a song. (2) Actively listening.	**The interface present multiple options to achieve a task.** The number of options for each task are ultimately all competing for the user's attention and cognitive load, thus making them have to work harder for the information.	(1) Present few choices	(1) superficial usability problem
(1) Selecting a song. (2) Actively listening. (3) Express meaning.	**The interface is very distracting.** Each screen features a number of distracting features that divert the user's attention to less critical tasks. (See figure 4 f)	(2) Limit distractions	(5) Catastrophic usability problem
(1) Selecting a song. (2) Actively listening. (3) Express meaning.	**Interactive elements are not clear.** There is a lack of perceived affordances for interactive elements on this site. It is difficult to determine what is clickable and what is not in some cases. (See figure 4 d)	(4) Use constraints appropriately	(5) Catastrophic usability problem



‹ Figure 4 d: Interactive lyrics lack perceived affordances



› Figure 4 e: Non-related content and advertisements are present while listening

Figure 4 f: The listening interface for Genius.com

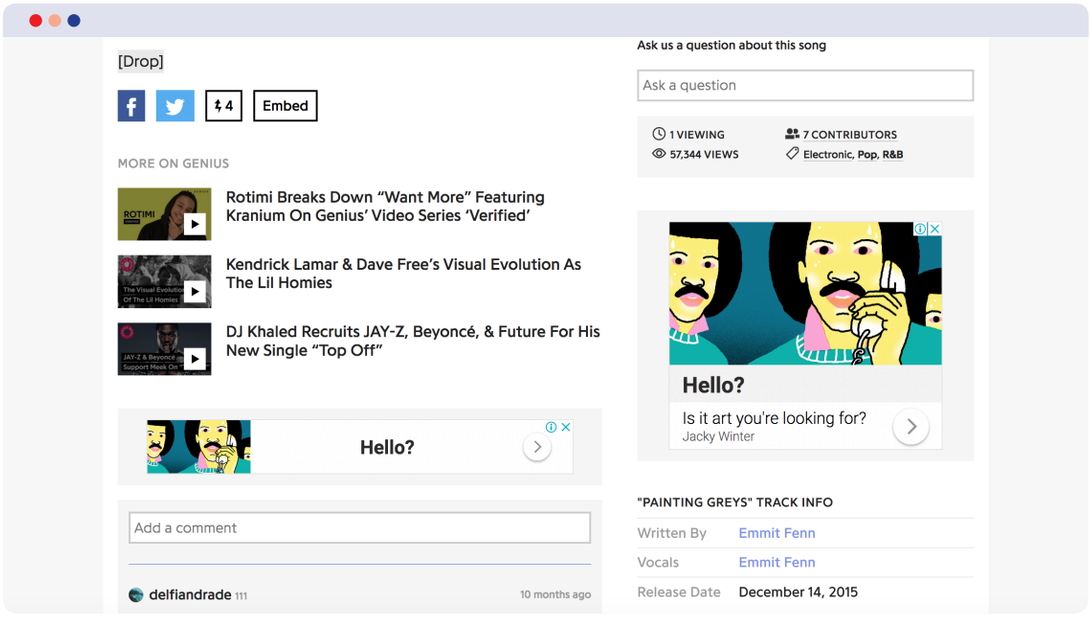


Table 4 d: Review 1 cognitive walkthrough results

TASK DESCRIPTION	CORRECT PATH	POSSIBLE ISSUES	SEVERITY RATING
1. The user wants to select a song to listen to.	Home page > Search for an artist > select the artist's name > on the artist's page, select an album > on the album page click the name of a song > on the song page click the play button.	It is not immediately obvious what is interactive and what is not on each screen. The user is expected to guess by rolling over the entire page in some cases. For example, it is not really clear that a user can click on the name of a song on the album page to access the song page where they can listen to the track.	(1) Superficial usability problem
2. The user wants to actively listen to a song they have selected.	There are 5 clicks and 3 screens that a user must engage before they can listen to a song. Each screen presents a myriad of options that could easily distract or entice the user away from completing the task.	The user is bombarded with a range of different stimuli which are all competing for their attention. It is difficult to actively listen to the song when the interface is enticing you to browse, read, scan and watch the video material all the same time.	(2) Minor usability problem

3. The user wants to express their understanding of the song they have listened to.	After logging in or creating an account, on the song page highlight some lyrics to add an annotation.	It is not immediately obvious for a new user that they can highlight lyrics to add their own annotation. it is not an intuitive or familiar experience for a user to perform and there is no instructional content that informs the user of this functionality.	(2) Minor usability problem

4.1.2.4 Analysis

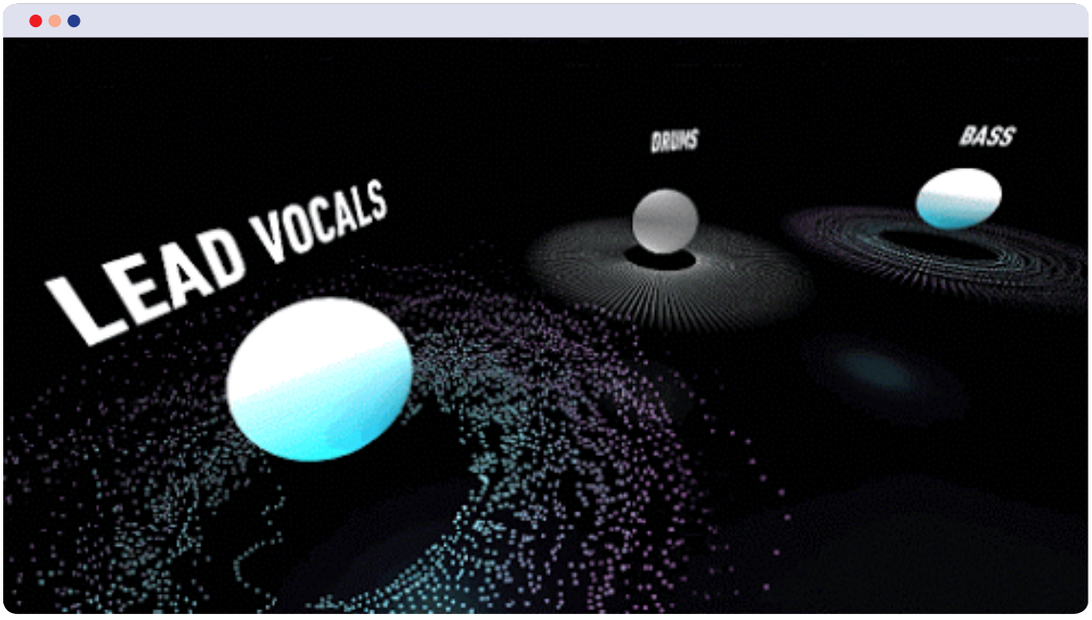
The interface design is very distracting and does not allow the listener to engage in active listening very easily. The listener would almost have to close their eyes in order to do so. Features like displaying the number of other users who have listened to this song, and the ability to vote the song up or down, are irrelevant for an active listener. Same goes for social sharing and recommended content which is unrelated to the selected song. These features only entice the user to change modalities and distract the listener from actively listening.

The site could use a more streamlined layout that reduces the number of modalities a user would need to engage at any one time to achieve their goal. For example, the user is expected to cross-reference each piece of data simultaneously to achieve their goal of understanding the music. This design encourages multitasking instead of an immersive and distraction-free listening environment. The user is expected to read the lyric annotations while also watching the music video at the same time. This expectation makes it difficult to identify the musical attributes of the song, such as, which instruments are playing what, and why, as the listener is too busy trying to browse, read, scan and watch the video material all at the same time.

4.1.3 REVIEW 3: INSIDE MUSIC

www.experiments.withgoogle.com/webvr/inside-music

Figure 4 g: Screenshot of Inside music application



4.1.3.1 Application description

Inside Music by Song exploder and Google Creative Lab, enables the user to walk around and interact with the individual layers of a song in a 3D space. The design uses cutting edge technology, such as WebVR and spatial audio, to produce a unique and immersive virtual reality experience. WebVR is an experimental JavaScript API that provides support for virtual reality devices, such as the HTC Vive, Oculus Rift, Google Cardboard or OSVR in a web browser (https://webvr.info/). Spatial audio, on the other hand, allows applications to convincingly place sounds in a 3-dimensional virtual space, surrounding the user and giving the auditory illusion of spaciousness.

4.1.3.2 Summary of findings

Inside music was the most successful of all three applications that were reviewed. Inside Music received the lowest severity rating for the cognitive walkthrough, with no usability issues for both the first and second task. The application, unfortunately, failed the third task as it did not offer the user the ability to express their understanding of the music. Despite this shortcoming, the Inside Music application achieved 100% of the heuristics, also noting

that it was the most exciting and pleasurable interface of all three to use for active listening.

4.1.3.3 Results

Table 4 e: Review 3 heuristics evaluation issues

TASK	ISSUE	HEURISTIC VIOLATION	SEVERITY RATING
-	**No heuristic violations found.**	-	(0) Not a usability problem

Table 4 f: Review 3 cognitive walkthrough results

TASK DESCRIPTION	CORRECT PATH	POSSIBLE ISSUES	SEVERITY RATING
1. The user wants to select a song to listen to.	Click the 'enter 360' button on the introduction screen > click a track tile to listen to a song.	There is no way to repeat the voice over instruction. The user might not understand the initial voice over's instructions and need to hear them again.	(0) Not a usability problem
2. The user wants to actively listen to a song they have selected.	Click and drag the screen to explore the virtual environment. The user can interact with the orbs to toggle on and off the layers of the song.	There is no way to repeat the voice over instruction. The user might not understand the initial voice over's instructions and need to hear them again.	(0) Not a usability problem
3. The user wants to express their understanding of the song they have listened to.	The feature does not exist.	User will probably experiment with the web application and possibly get frustrated when they can't find what they are looking for.	(5) Catastrophic usability problem

4.1.3.4 Analysis

This interface is very intuitive and a fascinating experiment for interacting with music, particularly for how unconventional and unique the design is for this field. Although its primary goal is not active listening, it manages to facilitate this function very well. The sounds of each layer wander from one ear to the next, from behind you, to in front of you. The visual stimuli not only aids focus but also guides the users hearing as they roam around the space. As you look away from the interface, the sound dampens—no different to if you were to do so

at a live concert hall. This smart feature also allows the user to listen to and quickly identify individual sounds, instruments, rhythms and melodies within a song. Every aspect of this interface aids the users' focus and promotes the act of listening to the music, instead of just hearing it. Further to this, the interface is so engaging and a pleasure to interact with, that it minimises distractions simultaneously.

Interestingly, although the user can change the song at any point, which is considered a hindrance for active listeners, the tangibility and dynamism of each music layer almost beckons the user to first experiment with the current song before doing so. The design is captivating and enticing for even the most unenthused listener of the current songs genre. This interface makes it a breeze to listen for technical details of the music. There are songs from all genres of music in this experiment, classical to pop music, even electronic. Each is equally captivating as the last to watch. Particularly the classical pieces that light up and visualise the sounds of each layer as if it were emulating the instrument playing the note itself.

The visual elements of the interface feature 3D orbs or spheres that surround the user. These spheres act as toggles for the different layers of sounds a user hears at any one time. They explode with rays of light that dance to the tone and decibel of noise that each layer expresses. For example, a struck snare drum shoots sharp and intense beads of light. By contrast, the bass emits a more consistent and subtle rippling of light. Given that each layer or instrument is represented by a sphere within the space, this interface makes it very easy to isolate and individualise particular sounds. The user can easily study not only the sounds that a particular layer transmits but also the tone and structure illustrated by the visualisation that accompanies it.

Unfortunately, the only way for a user to identify the meaning of the song is by deconstructing the tone and expression of each layer in comparison to the lead vocals lyrics. A user would find this interface no more useful than an analogue radio for understanding the meaning of the music.

The user can pause and play the song at any time, however, they cannot track the song back and forth, or replay any particular part of it over and over again. This feature is important for active listeners who want to compare and contrast the structure of a song or particular sections that are repeated throughout.

4.1.4 COMPARATIVE SUMMARY OF FINDINGS

The usability review cross-examined three web-applications that demonstrate current and emerging trends of music player interface design. All three applications demonstrated different uses of visual elements to select a song and enable active listening. Only one of the interfaces enabled a user to respond or give feedback to what they had heard.

The Emmit Fenn website featured really strong use of interactive visual aids to portray the meaning of the song to the user. The artwork also highlighted some technical attributes of the music, but not all—such as rhythm and tone. Inside music on the other hand used strong interactive visual aids to highlight all of the technical attributes of the song, but did not visually portray the meaning of the song at all. Both applications also synced the visual elements to the music which created an immersive experience. By contrast, Genius used static visual elements, such as a thumbnail of the album artwork, or a profile picture of the artist to aid in browsing and navigating the website. Genius was the only interface to show the lyrics of the song while listening, which enabled the user to interpret the meaning of the song. However, Genius did not sync the music video, lyrics and visual elements together which created a distracting, multi-modal listening environment for the user. Genius resulted in a catastrophic usability issue in contrast to Inside Music and the Emmit Fenn website which received no usability issues when attempting to actively listen. These results could suggest that a music player interface does not require both technical attributes and the meaning of the music to be visually portrayed at the same time for the user to actively listen to music; however, the visual elements must be in sync with the auditory elements in order to add value, otherwise they compete with each other and become distracting for the user.

The Emmit Fenn website separated the browsing and listening experience which featured no distractions. Inside Music did not allow a user to browse at all and used visual elements such as colour, light, shape and location to maintain the user's focus on listening. Both of these approaches resulted in no usability issues while selecting a song or actively listening to it. Genius, on the other hand, did not separate the browsing and listening experience and did not use visual elements to maintain the user's attention. Instead, the visual elements used for navigation and orientation (such as album artwork, background images,

artist profile image, lyrics, ads and related artist feeds which featured a range of other visual elements) created a number of distractions for the user while completing both tasks. This approach resulted in minor and catastrophic usability issues for both browsing and listening. This finding was consistent with the literature, suggesting that an interface that enables or expects multitasking or browsing while listening will never allow a user to also actively listen.

Finally, Genius was the only interface to enable a user to interpret the meaning of the song by highlighting the lyrics and adding an annotation. Given that only one out of three interfaces enabled a user to attempt this task could suggest that it is not a common or conventional feature for music player interfaces to have. Genius received a minor usability issue for this task due to its lack of instructional content. The user is not immediately aware of this functionality and would have to guess how it works once they become aware of it. This finding was consistent with all of the unconventional design elements and features across all three interfaces. For example, the Emmit Fenn website lacked instructional information for its unconventional presentation of the list of tracks, which resulted in a superficial usability issue. By contrast, Inside Music was the most progressive and original interface of all three, but, did not receive a single usability issue as it featured auditory instructions that guided the user throughout the entire experience. However, it was noted that the user could not repeat the instructions later which could potentially cause an issue for the user.

4.1.5 SEVEN GUIDING PRINCIPLES FOR DESIGNING A MUSIC PLAYER FOR ACTIVE LISTENING

As per two of the objectives for this research, below is a range of visual elements and techniques that enable and prohibit active listening. Please note that this list is not exhaustive, but rather a starting point for future research to build upon. This list is based upon the findings of the usability reviews:

1. Album artwork allows the user to more easily understand the meaning of the song.
2. Visual elements such as lighting, shape and colour when synced with music allows the user to more easily identify technical attributes of a song.
3. Location of visual elements that represent sound allows the user

to more easily locate technical attributes of a song such as the direction of sound.

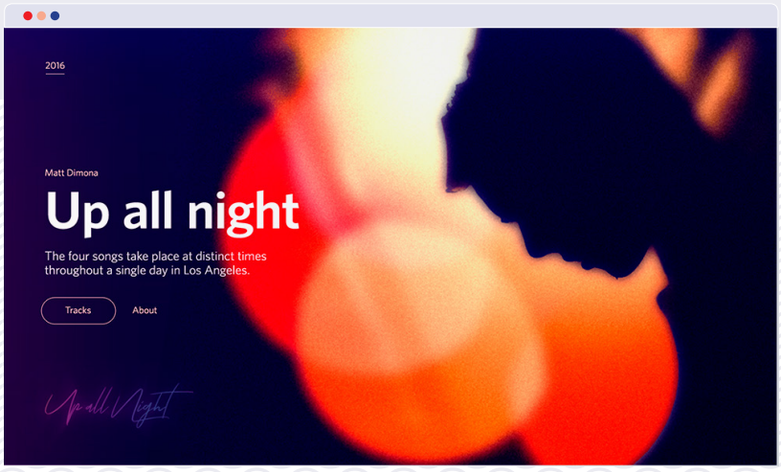
4. It is imperative that visual and auditory elements are in sync to enable active listening and decrease usability issues.
5. It is crucial to limit the use of visual elements while listening to minimise distractions.
6. It is important to separate browsing from listening to reduce distractions for the listener.
7. The use of novel or unconventional features such as annotating lyrics or responding to music require instructional material to reduce usability issues.

4.2 Designing a music player interface that uses visual elements to facilitate active listening

The literature review of this thesis identified a range of considerations for active music listening. Section 4.1.4 identified a list of visual elements and techniques that better enables one's ability to actively listen. A prototype was created to demonstrate that a streamlined interface design and interactive album artwork could better aid one's ability to actively listen to music. This section is structured as follows: it will first outline the list of considerations that have been identified in the literature; the list of considerations will then be used as the structure for this section by grouping the various design outputs under each consideration; finally, a brief description and annotation of each design will be given. A comparative summary will analyse the prototype against the same measures used in section 4.1.

The PROTOTYPE

THE FULL PROTOTYPE CAN BE VIEWED HERE: *liamcotchett.com.au*



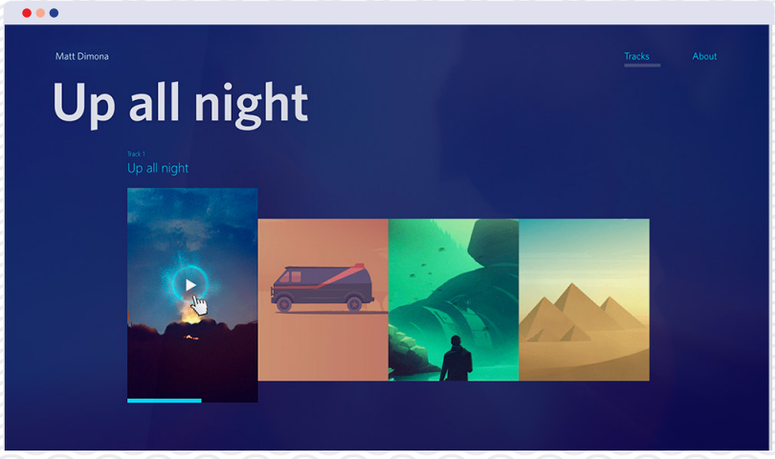


Figure 4 h: The prototype screens

Physical music albums—such as the vinyl or compact disc (CD)—once facilitated active music listening. They enable this skill through generously sized album artwork and the benefit of being listened to via streamlined music players that did not distract while being played—such as the phonograph and CD player. By contrast, music listeners today can access and play music from anywhere via the internet in the palm of their hands. The active music listening prototype (see Figure 4-h) was created to demonstrate that a streamlined interface design and album artwork could still aid one's ability to actively listen to music. The literature review (section 2.3.4) identified three key concepts that a listener must achieve to actively listen to music. Furthermore, the usability review (section 4.1.5) identified seven guiding principles for designing an interface that will better aid one's ability to actively listen.

Starting with the conventional components of a web-based music player, the intention was not to start with a blank canvas for this design process. Instead, the process refined or removed features and screens that were familiar to most listeners of today. The guiding principle of this process was to enable a user to effectively receive, remember, understand, evaluate and respond to the music that they had chosen to listen to. These five principles are the five stages of active listening identified in the literature. In order to measure the success of this process, a listener must be able to identify the technical attributes of a song and also understand the meaning and context of the song as well. Investigating the possibilities of both current and emerging technologies, such as spatial audio, webVR and Javascript frameworks such as Tone.JS and Three.JS, a series of new features were also created for the prototype to further enable these two outcomes for the listener. Finally, auditory instructions are spoken while screens are being loaded or before the music begins to play. This is designed to alleviate confusion surrounding some novel or unconventional features within the interface. The instructions are designed to guide the listener to performing correct actions, as well as highlighting the ability to customise the listening interface to their needs.

4.2.1 PREVENT THE LISTENER FROM BECOMING DISTRACTED

4.2.1.1 Immersive and distraction-free listening

Active listening requires one's full and undivided attention. A key problem for music players today is that they allow listeners to multitask at every stage of the experience.

Multitasking by definition is the ability to split one's focus amongst multiple tasks (Hembrooke and Gay, 2003). Therefore, a music player that allows a listener to get distracted will never enable active listening. Thus, the aim of this experiment was to create an immersive and distraction-free listening environment.

The first place that multitasking is encouraged in conventional music players, is when the listener browses for music. However, the challenge does not lie with the concept of browsing itself, it is not considered the issue in this scenario. Literature indicates that browsing is a fundamental experience of human information behaviour (Chang and Rice, 1993). Instead, the issue lies in the lack of an ending to the browsing loop. For example, music players expect the listener to select a song to sample it, meaning there is no dedicated space to just simply listen—the user is forever browsing.

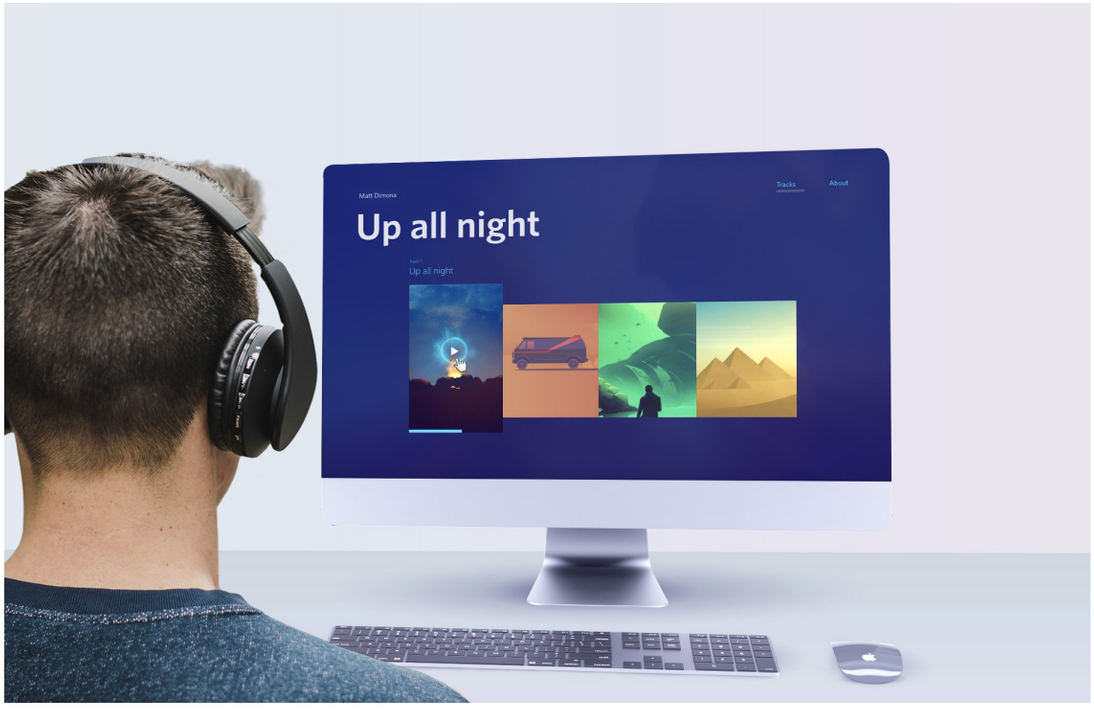
The second place that multitasking is encouraged is while listening to music. Feeds of related content and similar songs are suggested to the listener. Furthermore, the interface enables users to navigate through the collection by skipping or changing the current song. They are able to add songs to a play queue or create a playlist for future listening. Users are even able to leave the media player they are using entirely to browse other apps or respond to emails and messages.

Many studies have proven that giving somebody multiple tasks to complete at the same time is ineffective compared to completing the same tasks separately (Hembrooke and Gay, 2003). Given that this prototype is focusing on enabling active listening, this design gives significant consideration to the act of listening as a separate and unique experience from browsing—not one that is intertwined within an endless loop of song choices. Listening to music and browsing through a catalogue of songs use very different modes of thinking. Grouping these tasks into the same modality is a perfectly fine experience for passive listening or for sampling music while browsing, but not for active listening. Browsing and active listening use two different modalities, and for this reason, can never be achieved in the same experience. This prototype has given both tasks their own screens, and the conventional skip button has been removed from the listening interface.

Further to this, the second iteration of this design recognised the need for a user to

be able to sample a song before they commit to selecting one. Therefore, this prototype demonstrates the ability to sample a track while browsing. This is achieved by hovering over a track tile, to preview a sample of the audio. This is not to be confused with the listening experience, as it is limited to previewing a 30 second sample of the song and accompanying visual (as illustrated in the image below). The blue bar at the bottom of the tile indicates the timeline of the 30 second preview and will continue to loop through the sample while the user remains hovering over the tile, or clicks the play button.

Figure 4 i: Sampling a song while browsing

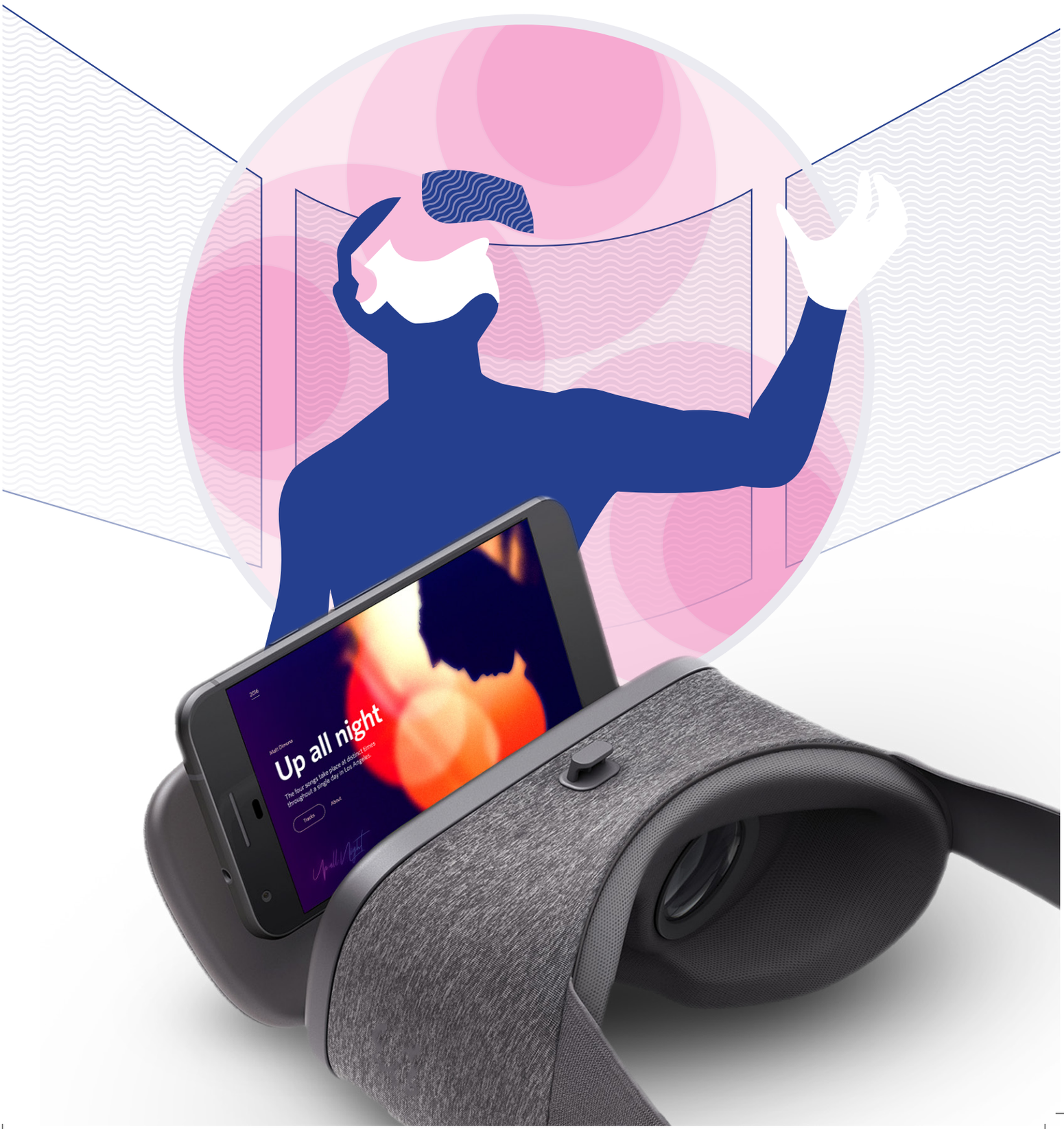


4.2.1.2 Spatial audio

Spatial audio allows a listener to interact with the music around them. For example, a listener can turn their head to the left to dampen sounds to their right; or, turn their head to the right to dampen sounds to their left. Furthermore, the music will dampen completely if they look away or interact with other features within the interface. Spatial audio makes the music sound ambient and dynamic. It is like having a series of speakers surrounding you

at all times, emulating the acoustics, reverberation and environment of live music. As the listener moves away from one virtual speaker and closer to another—either by turning their head or moving within a space—the volume, dynamics and acoustic mix of the audio will change as well.

Figure 4 j: Illustration of spatial audio and mockup of Virtual reality headset



Spatial audio can be toggled on and off by the user to be able to compare and contrast the different listening environments. The spatial audio button is located in the bottom right-hand corner of the screen next to the song timeline for quick access. The use of spatial audio in this prototype helps the listener to remain focused on listening to the music at all times. This is achieved by notifying one that they have lost focus with subtle auditory cues such as, dynamic, sound direction, or tempo changes. When things become expectant, repetitive, or too familiar, one begins to tune out from what they are hearing (Pérez González, Malmierca and Covey, 2005). However, a clear change in the dynamics and direction of the music will instantly guide the listener back into focus and active listening again.

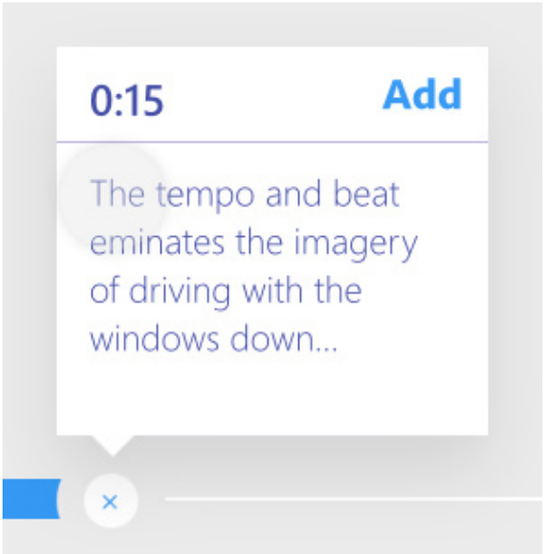
4.2.2 ENABLE THE LISTENER TO ACHIEVE ALL FIVE STAGES OF THE LISTENING PROCESS

Conventional music player functionality enables a listener to achieve receiving, understanding, and remembering in some capacity or another. Evaluation and feedback are typically the two stages that get overlooked whilst using a media player. These two stages are crucial for developing good listening habits (Winn, 1988). Winn (1988) argues that media players neither involve the individual to respond or react to what they are hearing. Thus, this experiment concentrated on evaluation and feedback first.

4.2.2.1 Timely discussions

The experiment explored the idea of enabling a listener to respond to what they hear. The timeline at the bottom of the screen acts as a discussion board for like-minded users to append their responses. The user simply taps the timeline to add a response. The music will pause and a pop up will appear prompting the user to write their response on what they have heard (as seen in the image below). The response will be pinned to the timeline at the location that the user is currently paused upon. After the user has saved their response

Figure 4 j: Illustration of spatial audio and mockup of Virtual reality headset



to the timeline, other users may now also view and respond to it—resulting in a timeline of discussion points that enriches everyone's understanding of the music.

4.2.3 ENABLE THE LISTENER TO IDENTIFY THE TECHNICAL ATTRIBUTES OF A SONG

Copland et al. (2011) identifies that all music has an expressive power. He believes that all music creators place intent behind each note or lyric that expresses what the piece is saying, or what the music is trying to communicate. The expression is not bound solely to the individual notes or lyrics in a song, but rather a feeling impressed on the listener by the manifested theme that each note and lyric illustrates. Enabling a listener to easily identify these details will aid in their comprehension of the meaning that they convey.

4.2.3.1 Isolating sounds

As well as preventing a listener from becoming distracted, spatial audio can also be used to identify the technical attributes of a song. As previously mentioned above, a listener can move around the virtual space to heighten or lower the volume, dynamics and acoustic mix of the audio around them. However, a listener that is untrained in isolating sounds on their own may find this quite limiting or difficult to do so with any great degree of accuracy. Spatial audio does not give the listener the ability to isolate sounds, instruments or various layers of a piece, it simply allows the user to identify the direction that the sound is located within a mix. Thus, this experiment identified another framework or technology that could be used in conjunction with spatial audio to do so. Tone.js is a javascript framework for creating interactive music within the browser. "It provides advanced scheduling capabilities, synths and effects, and intuitive musical abstractions built on top of the Web Audio API" (tonejs.github.io, ND). The prototype draws upon this framework in a number of ways. The first is to allow a listener to manipulate their listening environment to isolate individual sounds. The second is to synchronise both the audio and visual elements of the music. A user can click the toggle button to open the toggle menu (the button sits above the song timeline in the bottom right of the screen for quick access, as seen in the image above on the right). The menu allows a user to toggle on and off the different instruments to isolate their sounds. A user can select a single instrument or multiple instruments to isolate at any one time (as illustrated in the image above on the left—the drum button has been selected, and the user

is now hovering over the guitar button). After closing the menu, the user is made aware of their selection through the use of consistent iconography that sits next to the toggle button (as seen in the image above on the right). To turn off the isolated instruments, the user simply opens the toggle menu again and deselects the instruments.

Figure 4 k: A virtual reality headset being used to control the sound menu

4.2.3.2 Synchronising audio and visual

The usability review highlighted that audio and visual elements must be in sync to avoid distractions and decrease usability issues. This prototype was designed with Tone.JS in mind to achieve this principle. Visual elements such as lighting, shape and colour embedded within the album artwork are synced with the rhythm, tempo, dynamics and instruments of a song. This allows the user to more easily identify the different technical attributes of a song as well as creating an immersive listening environment for the user. Furthermore, the location of these visual elements represent the direction in which the sound is coming from.

Figure 4 l: The embers within the artwork are synchronised with the guitar and the glow off the fire with each kick of the bass drum

4.2.4 Enable the listener to identify and understand the meaning of a song

Vinyl and CD album packaging included what literary theorists refer to as 'paratexts'. A paratext is described as a literary device that enables an author to include useful additional information that builds upon the point of the main text. CD and vinyl album packaging contained a number of paratexts throughout the album artwork including the song lyrics, liner notes, and anecdotal information from the artist. Media players do not currently afford the digital listener the same opportunity as they expect a listener to find this information elsewhere. The objective of this experiment was to incorporate as many paratexts into the listening experience, without creating distractions for the listener. This was ultimately overcome by giving the listener the choice to toggle these elements on and off in the same way that they can isolate instruments. Using the toggle menu, users can customise the interface

to suit their informational needs to understand the meaning of the song.

4.2.4.1 Interactive album artwork

A key difference between physical and digital album artwork is the opportunity to add movement and interactivity. Wikstrom (2014) believes that music interaction will play an increasingly important role in music listening moving forward. It is important that interaction is used to increase engagement and focus, rather than distract the user from listening with gimmicks. The prototype experiments with a simple 2.5D (or parallax effect) on a 360-degree illustration. The combination of these visual techniques meet three of the seven guiding principles from section 4.1.5:

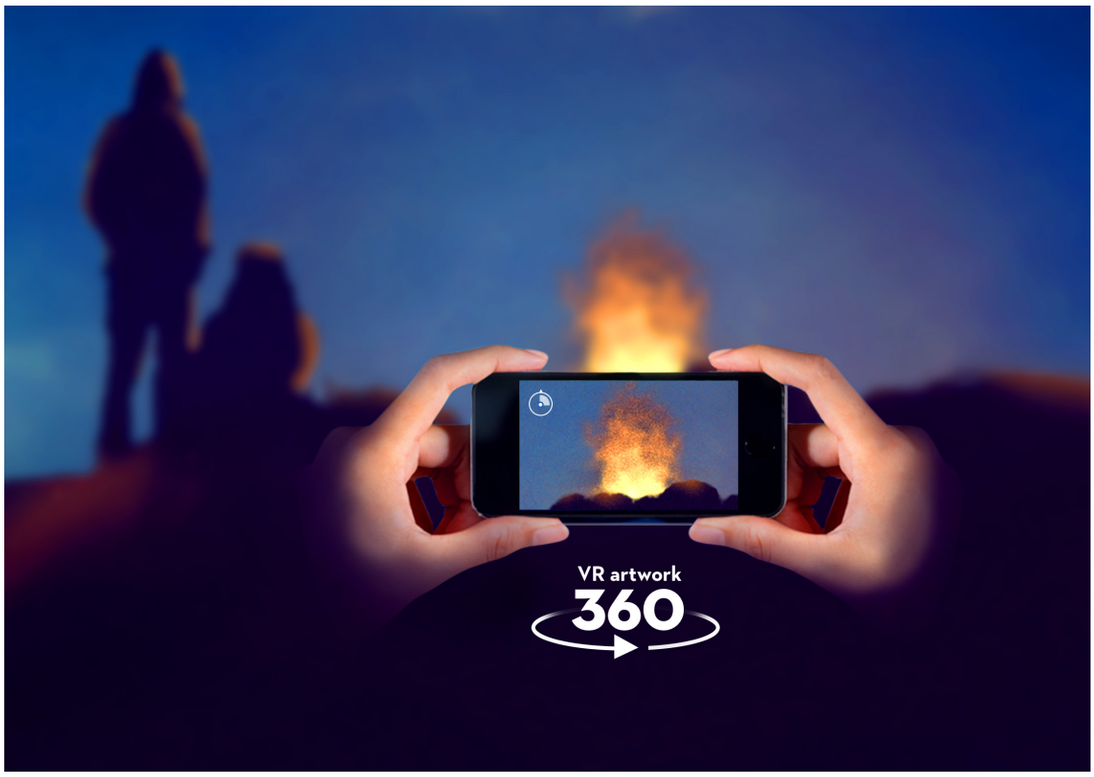
1. Album artwork allows the user to more easily understand the meaning of the song.
2. Visual elements such as lighting, shape and colour when synced with music allows the user to more easily identify technical attributes of a song.
3. Location of visual elements that represent sound allows the user to more easily locate technical attributes of a song such as the direction of sound.

360-degree photos are interactive panoramic images that surround the original point from which the shot was taken. This technique simulates being in the shoes of a photographer and looking around to the left, right, up and down as desired. Given that this prototype used an illustration instead of a panoramic photo, I had to map the static illustration to an equirectangular image to create the same effect. I chose to use a 360-degree image as it can be experienced in both a virtual reality headset and a web browser. The second technique in this prototype is a parallax effect. The term parallax first came from the visual effect of 2D side scrolling videogame (w3schools.com, ND). The technique varies the speed and movement of background images compared to foreground images to create the illusion of depth during gameplay (w3schools.com, ND).

The combination of these techniques adds a subtle layering of depth, movement and interaction to the artwork resulting in an immersive listening environment. The subtlety

of this visual technique heightens the auditory experience for the listener. Whereas, if more movement and interaction were used it would distract the listener from listening. For example, a user can move their head or click and drag the artwork to interact with the space. Furthermore, as mentioned previously, syncing the lighting, shapes and colours within the artwork, to the sounds and rhythm of a song, created a rich and dynamic evolution for album artwork. Interactive album artwork affords the listener the opportunity to identify meaning through a multi-sensory audio-visual experience. Digital artwork has a greater aptitude for expressing the narrative of the music, if given the opportunity. Finally, this prototype provides a proof of concept demonstrating that interactive album artwork can better enable one's ability to actively listen. This is achieved by visualising both the meaning and technical attributes of the song.

Figure 4 j: 360-degree artwork simulates being in the shoes of a photographer. The user can look around to the left, right, up and down as desired.



4.2.4.2 Artist notes

Throughout the song, various artist notes will appear on the screen (illustrated in 'figure 4 j'). An artist note is designed to draw the listener's attention to significant details of a song

or its meaning. A user can choose to ignore the button and continue to listen, or click on it to open up a note from the artist (illustrated in the image on the right). Rather than pausing the song completely, opening up an artist note will dampen the music and repeatedly loop the same part of the song until the user closes the artist note to resume listening. This is intended to reduce the disconnection and distraction caused by opening the artist note. The content of an artist note can range from a simple comment about a lyric or highlighting an interesting detail about the song, through to a deep analysis of what the song is trying to convey and why they wrote it. The notes are synced with the timeline of the song giving the artist the ability to draw the listeners attention to different elements at specific points within a song.

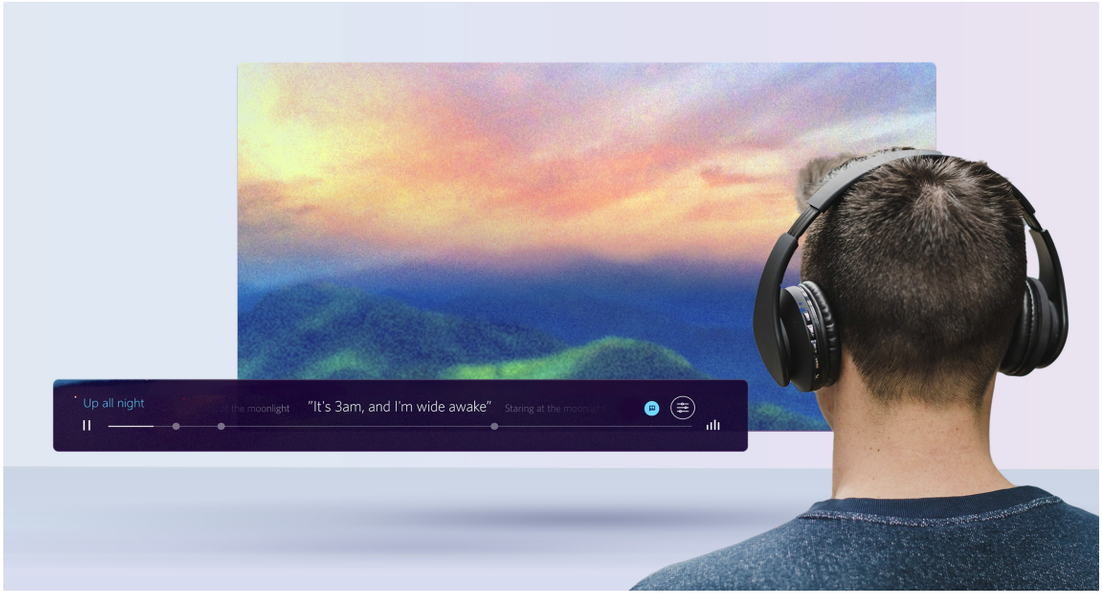
Figure 4 k: Clicking on an artist note and reading the anecdotal information

4.2.4.3 Synced lyrics

The usability review found that incorporating lyrics to the listening experience enabled a listener to more easily identify and interpret the meaning of the song. However, the interface that was reviewed did not sync the lyrics and audio together, making it difficult for a user to remain focused on listening. This experiment mitigates the impact of expecting a listener to

read and listen simultaneously by only showing lyrics from the current stanza. Furthermore, only the sentence that is currently being sung is highlighted to the user. As mentioned previously, the user is able to turn on or off this functionality as they please if it becomes distracting or is not required while they listen.

Figure 4 l: Synced lyrics and audio



4.2.5 SUMMARY OF FINDINGS

The interactive prototype had mixed results across both inspection methods. The prototype received lower severity ratings for the cognitive walkthrough than Inside Music did, however, each task had a number of issues, which Inside Music did not. The interactive prototype was a success in that it did not fail either of the inspection methods. However, it could use further refinement across the board to address some of the minor and superficial usability issues. The main shortcoming of the design is its lack of labeling of interactive elements and no text alternative instructions on each screen.

Table 4 f: Review 4 heuristics evaluation issues

ISSUE	TASK NO.	HEURISTIC VIOLATION	SEVERITY RATING
Too many features can be distracting. The possibility that a user can perform a range of different tasks of active listening at the same time, could be quite distracting (e.g. while listening, the user can read an artist note, write a response on the time lime, or read the lyrics). However, it is worth noting that all of these features except for the timeline response are turned off until the user decides to turn them on.	2	2	(0) Not a usability problem
Missing labels that describe the function. Although there are auditory instructions before a user begins each task, if the user misses the instruction or does not quite understand the instruction, the interface does not provide the user with a text alternative to also describe the functions of the interface. (E.g. selecting a song, the user has to hover over the track tile to find out the name of the song. Secondly, the toggle button or spatial audio button on the listening interface do not have labels at all).	1, 2 and 3	5	(2) Minor usability problem

Table 4 g: Review 4 cognitive walkthrough results

TASK DESCRIPTION	CORRECT PATH	POSSIBLE ISSUES	SEVERITY RATING
The user wants to select a song to listen to.	On the title screen, click 'tracks'. On the track listing screen, hover over a track tile to sample a preview of a song, or click the play button to listen to it.	There is no way to repeat the auditory instructions. The user might not understand the voice over's instructions and need to hear them again.	(0) Not a usability problem
The user wants to actively listen to a song they have selected.	On the listening screen, the user can click and drag the screen to explore the virtual environment and interactive album artwork. The user can customise the interface to suit their visual and auditory informational needs by opening the toggle menu. Click the toggle menu button to open the toggle menu. The user can turn on/off any of the following features: lyrics, artist notes and the ability to isolate instruments.	There is no way to repeat the voice over instruction. The user might not understand the initial voice over's instructions and need to hear them again.	(0) Not a usability problem
The user wants to express their understanding of the song they have listened to.	On the listening screen, click the timeline to add a response > A pop-up will appear to write a comment > Type your response > click 'save'.	If the user misses the auditory instructions before the music begins, it might be difficult for the user to work out how to add their response.	(1) superficial usability problem

5 DISCUSSION

This section will discuss the results (from section 4), in comparison to the research objectives (outlined in section 1), the research question (stated in section 1.2.1) and the literature review (from section 2).

The question that this research and methodology investigated was: 'how can the benefits of active listening that are offered to physical media music listeners via visual content, be made available to distracted, digital music listeners as well?' The objective was to first define a list of visual elements and features that enable and prohibit active listening; and secondly, to test whether it is possible to better one's ability to actively listen using visual content and a streamlined interface. In general, the results found in the usability review and interactive prototype were expected. They demonstrate that it is possible to enable active listening through strong use of visual elements and a streamlined interface design. However, they are relatively inconclusive as to what impact these changes might have on other aspects of the music listening experience. For example, the investigation was not concerned with the browsability and music discoverability of a music player, but rather what impact being able to browse or discover music while listening to a song might have on one's ability to listen actively. Therefore, the results only show one side of the story. They don't show what impact strong use of visual elements and a streamlined interface design would have on one's ability to discover music or browse through a large collection of songs. Thus, this research finds that a more holistic review of the entire music listening experience is required.

The most interesting finding was unearthed when comparing the results of the interactive prototype to the usability review. The usability review found that the more interactive, immersive and streamlined the music player was, the less usability issues it had. However, not a single interface in the usability review facilitated the active listening process in its entirety. The interactive prototype on the other hand, explored the concept of an interface that could facilitate all facets of active listening. Yet, in doing so, potentially highlighted a

self-defeating objective in and of itself. The sheer number of functions and interactions that the user is now able to achieve could be viewed as distracting for the listener—which is one of the key objectives of active listening defined in the literature. The finding highlights a need for further research and exploration in this space to progress the concept further and reveal a simpler design or approach for achieving the same goal.

Furthermore, the prototype explored Jones et al. (1999) and Wikstrom's (2014) suggestions that the ability to play with music, rather than just listen to music, has become of greater importance in the digital age. This research, like Wikstrom (2014) and Morris (2015), also believes that interactive listening will continue to shape the way listeners engage with music moving forward. However, this research appends the need to also compare and measure the changing interactions and access to music—specifically, the effect they have on one's ability to listen to music.

The usability review tested three tasks that are involved in active listening: selecting a song, the ability to identify technical attributes and understand the meaning of a song, and the ability to respond to what was heard. Consistent with the theory and literature of active listening, the review found that interfaces that enabled distractions or multitasking were not able to facilitate active listening. This was particularly evident in the Genius website that was also the only interface to use visual elements to aid navigation rather than to aid listening. The interface also enabled the user to multitask while listening and featured related content and advertising across each screen. Needless to say all of these elements had a negative impact on one's ability to actively listen or complete each task. Interestingly, the Genius website was the only application that interfaced a large catalogue of music to choose from, which could suggest why the browsing experience was of equal importance to listening, if not more so.

The process of designing and prototyping an interface that enables active music listening, illustrates the important role that visual elements like album artwork and paratexts still play in active music listening today. This result along with the results from the usability reviews were consistent with the findings from the literature. Furthermore, the review showed that two of the three applications used a streamlined interface design and strong use of visual elements to represent the music and engage listeners. Like the many scholars who agreed

that music albums coupled with visual information are more resonant with meaning for the listener (Jones and Sorger 1999; Inglis, 2001; Shephard and Leonard, 2014), the usability review also found this to be true when comparing the first two interfaces which used visual elements to aid listening, to the third which did not. It is still safe to say that there is no unanimous view of what the visual information should look like for a digital music album; however, as suggested by Morris (2015), the lack of clarity surrounding the presentation of music in the digital space, suggests an ongoing experiment that is gradually unfolding.

Due to the low validity of the chosen methodology, the results of this study cannot be considered conclusive. Due to the consistent application of the chosen method, it is believed that the results will not vary too much. However, a more reliable method for testing should be conducted with further analysis to validate these results. It is recommended that future considerations for usability testing be carried out.

Finally, it is evident from both the usability review and interactive prototype that it is possible to better enables one's ability to actively listen to music with visual content and a streamlined interface design. However, further consideration must also be given to using constraints appropriately, where possible. The interactive prototype demonstrates that trying to facilitate the entire active listening process may not be beneficial or necessary to better enable one's ability to actively listen. Although, giving the user the ability to customise and choose which features they find useful, and which ones they do not, is a good place to start. However, this research recommends that a further reduction to the number of features facilitating the listening process is necessary. This research also recommends conducting usability testing on a sample of active listeners to determine the benefits and value of each feature. This will also identify which features are not necessary.

6 CONCLUSION

6.1 Summary

Active music listening is a complex and multi-sensory experience that is not commonly studied and relatively undefined. The primary objectives of this study was to outline a list of visual elements and features that enable or prohibit active listening. Furthermore, this research tested whether it is possible to better one's ability to actively listen using visual content and a streamlined interface.

This research builds upon a small line of scholarship that has investigated the value of music album artwork. Furthermore, it is the first of its kind to measure the impact that visual elements (such as album artwork and paratexts) have on one's ability to actively listen. The study looked at the history of recorded music and identifies a few key themes. First of all, this research illustrates how the ever-changing channels of music distribution are constantly challenging the listening experience and format of music. This challenge highlights a rich and expansive area for investigation and further research—particularly that of a design nature. Furthermore, this research locates a significant gap in the existing literature of this field. There have been few studies into what effect changing the format of music has had upon the ability to listen to it, or ultimately understand and appreciate it.

The methodology found a number of visual elements that enabled and prohibited active listening, resulting in seven guiding principles for designing an active listening music player interface. In summary, album artwork that applies considered visual design concepts—such as lighting, colour, shape and location—support listeners to understand meaning and identify technical attributes while listening. It is important that the visual elements are used with restraint and are in sync with the music.

Finally, the results of this study suggest that it is possible to better enables one's ability to actively listen to music with visual content and a streamlined interface design. However, the results also indicate that trying to facilitate the entire active listening process may not

be beneficial or necessary to enabling one to actively listen. The research concludes that although it is not perfect, the proposed interface design gives the user the ability to tailor the music player interface to meet their listening needs. It is a positive first step for this field of research, indicating that digital music players can better enable active listening through visual content and streamlined interface design. However, further reduction and streamlining of the interface is required to amend some of the usability issues discovered in the final review.

6.2 Recommendations

Conducting this research at a Masters level created some limitations of scope due to allocation of time and resources. Therefore, this research could benefit from further investigation at a PhD level. Due to these limitations, the research did not develop a fully functioning prototype. Design mock-ups were produced for this research purely for demonstration purposes. Thus, further research in this field should include the development of a working prototype to measure the implications and feasibility of the designs. It is also recommended to conduct usability testing with a sample of active listeners to determine the benefits and value of each feature outlined in this research. Additionally, further rounds of the iterative design process in conjunction with the usability testing and working prototype, will lead to a more conclusive understanding of how visual content can better aid one's ability to actively listen to music.

7 REFERENCES

Alluri, V., Toiviainen, P., Jääskeläinen, I., Glerean, E., Sams, M., & Brattico, E. (2012). Large-scale brain networks emerge from dynamic processing of musical timbre, key and rhythm. NeuroImage, 59(4), 3677–3689. doi:10.1016/j.neuroimage.2011.11.019

Apple. (2018). Use Multitasking on your iPad. [online] Available at: https://support.apple.com/en-au/HT207582 [Accessed 2 Feb. 2018].

Berger, H. (2001). Tramps Like Us: Music and Meaning Among Springsteen Fans.(Review). Ethnomusicology. University of Illinois Press. doi:10.2307/852681

Bodie, G., Worthington, D., & Gearhart, C. (2013). The Listening Styles Profile-Revised (LSP-R): A Scale Revision and Evidence for Validity. Communication Quarterly, 61(1), 72–90. doi:10.1080/01463373.2012.720343

Caspersz, D., & Stasinska, A. (2015). Can We Teach Effective Listening? An Exploratory Study. Journal of University Teaching and Learning Practice, 12(4), 15.

Copland, A., Rich, A. and Slatkin, L. (2011). What to listen for in music. New York, N.Y: Signet Classic.

Crist, M. (2000). The Effect of Tempo and Dynamic Changes on Listeners' Ability to Identify Expressive Performances. Contributions to Music Education, 27(1), 63-77. Retrieved from http://www.jstor.org/stable/24127019

DeVito, J. (2001). The interpersonal communication book (9th ed). Longman, New York

Cockton, G. (2014). Usability Evaluation. The Interaction Design Foundation. Retrieved 4 September 2017, from https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/usability-evaluation

Goding, A., Attias, B., Wrench, J., & Johnson, D. (2011). Stand up, Speak out (1st ed., p. 75-76). [S.l.]: [s.n.]

Goto, M. (2007). Active music listening interfaces based on signal processing. ICASSP, IEEE International Conference on Acoustics, Speech and Signal Processing - Proceedings (Vol. 4, pp. IV1441–IV1444). doi:10.1109/ICASSP.2007.367351

Hembrooke, H., & Gay, G. (2003). The Laptop and the Lecture: The Effects of Multitasking in Learning Environments. Journal of Computing in Higher Education, 15(1), 46–64. doi:10.1007/BF02940852

Inglis, I. (2001). Nothing You Can See That Isn't Shown: The Album Covers of the Beatles. Popular Music, 20(1), 83–97.

Johnson, M., Weaver, J., Watson, K., & Barker, L. (2000). Listening Styles: Biological or Psychological Differences? International Journal of Listening, 14, 32–46.

Jones, S., & Sorger, M. (1999). Covering music: A brief history and snalysis of slbum cover design. Journal of Popular Music Studies, 1112(1), 68–102. doi:10.1111/j.1533-1598.1999.tb00004.x

Kuznekoff, J., Munz, S., & Titsworth, S. (2015). Mobile Phones in the Classroom: Examining the Effects of Texting, Twitter, and Message Content on Student Learning. Communication Education, 64(3), 344–365. doi:10.1080/03634523.2015.1038727

Lamere, P. (2014). The Skip. [online] Music Machinery. Available at: https://musicmachinery.com/2014/05/02/the-skip/ [Accessed 9 Mar. 2017].

Manovich, L. (2001). The language of new media (1st MIT Press pbk. ed.). Cambridge, Mass.: MIT Press.

Morris, J. (2010). Understanding the Digital Music Commodity. ProQuest Dissertations Publishing. Retrieved from http://search.proquest.com/docview/869322196/

Morris, J. (2015). Selling digital music, formatting culture.

Mursell, J. (1973). The psychology of music. St. Clair Shores, Mich.: Scholarly Press.

Nielsen, J. (1994). Usability inspection methods. Conference Companion on human factors in computing systems (Vol. 1994-, pp. 413–414). ACM. doi:10.1145/259963.260531

Nielsen, J. (1995). Severity Ratings for Usability Problems: Article by Jakob Nielsen. [online] Nielsen Norman Group. Available at: https://www.nngroup.com/articles/how-to-rate-the-severity-of-usability-problems/ [Accessed 18 Mar. 2018].

Pardue, D. (2005). CD cover art as cultural literacy and hip-hop design in Brazil. Education, Communication & Information, 5(1), 61-81. http://dx.doi.org/10.1080/14636310500061334

Percino, G., Klimek, P. and Thurner, S. (2014). Instrumentational Complexity of Music Genres and Why Simplicity Sells. PLoS ONE, [online] 9(12). Available at: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0115255 [Accessed 8 Apr. 2017].

Pérez-González, D., Malmierca, M., & Covey, E. (2005). Novelty detector neurons in the mammalian auditory midbrain. European Journal of Neuroscience, 22(11), 2879–2885. doi:10.1111/j.1460-9568.2005.04472.x

Rankin, P. (1928). The Importance of Listening Ability. The English Journal, 17(8), 623-630. doi:10.2307/803100

Ratliff, B. (2015). Seeking Genuine Discovery on Music Streaming Services. [online] Nytimes.com. Available at: https://www.nytimes.com/2015/06/29/arts/music/seeking-genuine-discovery-on-music-streaming-services.html [Accessed 12 Mar. 2017].

Reitan, I. (2013). Listening to music – with professional ears. A study of orchestral musicians' ways of listening. Norges musikkhøgskole.

Shephard, T. and Leonard, A. (2014). The Routledge companion to music and visual culture. New York, NY: Routledge.

Straw, W. (2015) The Music CD and Its Ends, Design and Culture, 1:1, 79-91, DOI: 10.2752/175470709787375751

Taylor, T., Katz, M., & Grajeda, T. (2012). Music, sound, and technology in America. Durham, NC: Duke University Press.

Tonejs.github.io. (2018). Tone.js. [online] Available at: https://tonejs.github.io/ [Accessed 18 Mar. 2018].

Tsarouhis, P. (Mar. 2006) "Mapping the Narrative in a Digital Album Cover," M/C Journal, 9(1). Retrieved from <http://journal.media-culture.org.au/0603/08-tsarouhis.php>.

Turner, N. (2015). The paradox of choice and why I stopped using Spotify. UX for the masses. Retrieved from http://www.uxforthemasses.com/paradox-of-choice/ [Accessed 07 Oct. 2017]

Tuuri, K., & Eerola, T. (2012). Formulating a Revised Taxonomy for Modes of Listening. Journal of New Music Research, 41(2), 137–152. doi:10.1080/09298215.2011.614951

Varni, G., Mancini, M., Volpe, G., & Camurri, A. (2011). A System for Mobile Active Music Listening Based on Social Interaction and Embodiment. Mobile Networks and Applications, 16(3), 375–384. doi:10.1007/s11036-010-0256-4

Vickhoff, B. (2008). A Perspective Theory of Music Perception and Emotion (Ph.D). University of Gotheberg

W3schools.com. (2018). How To Create a Parallax Scrolling Effect. [online] Available at: https://www.w3schools.com/howto/howto_css_parallax.asp [Accessed 18 Mar. 2018].

Whitelaw, M. (2012). Towards generous interfaces for archival collections. Comma, 2012(2), 123-132. http://dx.doi.org/10.3828/comma.2012.2.13

Winn, D. (1988). Develop Listening Skills as a Part of the Curriculum. The Reading Teacher, 42(2), 144-146. Retrieved from http://www.jstor.org/stable/20200040

Wolvin, A. & Coakley, C. (1996). Listening. (5th ed.). Madison: Brown & Benchmark.

Wikstrom, P. (2014) The music industry in an age of digital distribution. In Castells, Manuel, Gelemter, David, Vazquez, Juan, & Morozov, Evgeni (Eds.) Change : 19 Key Essays on How the Internet is Changing Our Lives. Turner Madrid, Madrid, pp. 1-24.

Wikstrom, P. (2014). The music industry (2nd ed.). Cambridge: Polity Press.

8 APPENDICES

Table 8 a: Five of Whitney Hess's 20 heuristics

HEURISTICS	DESCRIPTION
Present few choices	The more options a person receives, the more difficult the decision becomes for that person to make (Turner, 2015). As previously mentioned in chapter 4, Hess (2009) also refers to Schwartz 'Paradox of Choice', and recommends removing all of the "nice to have" alternatives, as these will only cause indecision and doubt. The interface should focus on the necessary options a person needs to weigh up, that will significantly impact the outcome.
Limit distractions	There is a long tradition of psychological and media communication research that indicates that our ability to engage in simultaneous tasks is, at best, limited (as cited in Hembrooke & Gay, 2003: Fisch, 2000; Lang, 2000), and at worst, virtually impossible (as cited in Hembrooke & Gay, 2003: James, 1890; Woodsworth, 1921; Broadbent, 1958). Hess (2009) states: "Short of chewing gum while walking, people cannot do two things simultaneously. They end up giving less attention to both tasks and the quality of the interaction suffers" (Hess, 2009). Limiting distractions requires an interface to enable people to focus on the goal at hand. Their attention should not get diverted to less critical tasks while trying to do so. Hess (2009) recommends designing for tasks to be carried out consecutively instead of concurrently. An interface that affords focus will guide the user to completion by keeping them in the moment.
Provide context	Providing the user with sufficient information guides a user to a successful outcome. An interface that communicates how everything interrelates—i.e. why they are doing what they are doing, where they are in the process and how they got to this point—a user is more likely to understand the importance of the task at hand (Hess, 2009). For an interface to successfully provide sufficient context, Hess (2009) recommends ensuring that the design is self-contained and does not break the user out of the experience—unless of course, it is necessary to communicate purpose.
Use constraints appropriately	An interface that prevents an error from occurring is far stronger than one that enables a user only to recover from a mistake. If one knows in advance that there are restrictions or gaps in the process ahead, one will not make the wrong decision or end up in the wrong section of the site accidentally. Indicating what is not possible with the interface or system, enables the user to establish what is possible—ultimately guiding users to make successful interactions. Hess (2009) stipulates to make sure the constraints are worthwhile. In other words, don't be too limiting or cautious when it is only to benefit the system. The design must consider the experience of the user first and foremost.
Use emotion	Ease of use is not the only measure of a positive user experience; pleasurability is just as important (Norman, 2002). Something can be straightforward to use and understand, but if it is uninspiring, dull or impersonal, it can feel harder to work through (Hess, 2009; and Norman, 2002). The interface should permeate flourishes of excitement, seduction and delight. Hess (2009) believes that the design should incites passion, which will ultimately make the person feel engaged and focused.