

To Pay Or Not To Pay: How Do Free Virtual Studio Technologies Compare To Their Paid Counterparts?

MASTERS OF RESEARCH: MUSIC

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Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

(Signed)  _____

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Ethics Approval

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/e72.pdf

This research project has been approved by the Macquarie University Faculty of Arts Human Research Ethics Committee, Ethics Application Ref: (5201700853)

Abstract

Virtual Studio Technology (VST) has played a pivotal role in the recording revolution and has allowed producers to move away from analog equipment, giving them the tools to mix and master music solely inside the computer. There is significant literature describing the process of mixing, mastering and the free software movement. However, there is little to no research on free vs commercial music software.

This study tests the differences between free and commercial VST Plugins for mixing and mastering through the production of two versions of a creative work; one using free plugins and one using commercial plugins. The results are based on an ABX blind test, survey and interview with five music industry professionals. Participants describe the qualitative differences between the free and commercial plugins. An analysis of the results and interviews reveals the perceived differences and opinions of professional mixing and mastering engineers when it comes to free and commercial music software. In addition, this study identifies the different perspectives that each engineer has when it comes to mixing and mastering, and the use and place for free plugins in professional music production.

1. Introduction

Steinberg released the first Virtual Studio Technology (VST) interface in 1996. Since then VSTs has played a pivotal role in the recording revolution and has allowed producers to move away from analog equipment, giving them the tools to mix and master music independently inside of a computer. There is significant literature describing the process of mixing, mastering and the free and open software movement. However, there is not significant research comparing free to commercial studio technologies. The limited amount of academic literature on freeware audio effect plugins identifies a gap in the academic field of research. Also, there appears to be little in-depth experimentation and research comparing free and commercial plugins for use in mixing and mastering music.

A brief history of the use of the recording studio and shift to mobile and digital technologies will be given to identify the current context in which this research is situated. The democratization of freeware and commercial software will also be analyzed to identify the need for this research. An overview of mixing tools and practices throughout the course of the last half decade will show the history and development of mixing and what it has become in the present day. The same will be done for mastering tools and practices where the criticisms of the loudness wars and hyper compression will be analyzed in detail to show specific trends in the overall loudness and compression of current day music releases.

This study aims to compare and analyze the differences between free and commercial VST Plugins for mixing and mastering through the production of two versions of a creative work; one using free plugins and one using commercial plugins. In doing so it will provide an insight into whether free plugins can be used to create a commercial sounding musical recording. An overview of the methodology and creative component will be given to outline the process in

which the two audio tracks were constructed. The results will be based on an ABX blind test, where five music industry professionals will be asked to listen to both musical recordings and then required to fill out a survey and participate in an interview. The survey results will be collated and placed into a table for analysis. During the interview the participants will be asked to describe the qualitative differences between the free and commercial plugins. For example; does one mix sound more professional than the other? Is there distortion on one mix and not the other? An analysis of the interviews will be made to establish the perceived differences and opinions of the artists, producers and professional mixing and mastering engineers when it comes to free and commercial music software. In addition, this study will recognize and document the different perspectives that each participant has when it comes to mixing and mastering, and whether they have a use and place for free plugins in their own professional music workflows.

2. Literature Review

2.1 Background

History and use of the recording studio/the shift to mobile and digital technologies

A traditional recording studio can be associated with such things as; a large mixing desk, monitoring loudspeakers, tape machines and a lot of outboard hardware (Kaiser 2017). Kaiser suggests that this is due to the fact that analog recording equipment has been an integral part of music production since 1887, whereas VSTs only started gaining traction in the 1990s. Instead of plugging cables into analog hardware, the recording revolution has made it possible for music producers to load plugins into their Digital Audio Workstation (DAW).

Bennett (2012) argues that, due to this technological acceleration, these new audio technologies have divided the opinions of industry practitioners, engineers and producers, creating the debate of analog vs digital. Bennett (2012) coins the attraction towards analog hardware Technostalgia”.

Bennett (2012) also provokes the thought that vintage systems bear feelings of nostalgia or resistance to technology. Kaiser (2017) contends that analog hardware has survived the recording revolution and perhaps has gained “mythological” powers over plugins. An example of a “mythological” piece of analog hardware is the Universal Audio 1176, which Moore (2012) describes as one of the most valued and popular compressors used in music production.

It is beyond the scope of this research project to address the qualitative differences between analog and digital technologies. The point raised by discussion of this argument is that there is an enduring fascination with analog hardware that has triggered plugin companies to develop digital emulations. One of the biggest limitations that Kaiser (2017) suggests is the “credibility gap”, where the tactile feel of the buttons and knobs, process-oriented aspects of workflow, cannot be emulated. Kaiser (2017) states that there is a social dimension to analog hardware; the

use of a hardware compressor like the 1176 is a symbolic indicator of social position and prestige. The social position and prestige that Kaiser (2017) mentions also translates to the digital world. These analog emulations give the producer a sense of authenticity as they are marketed as genuine originals. Universal Audio (2017) claim to have been “winning over audio professionals for more than 15 years with their stunning analog sound.”

One of the downsides to owning and using analog equipment is that it requires continual maintenance to sound good (Hidalgo 2010). The most sought after analog hardware is often decades old, possibly even dating as far back as the 1940s in some circumstances. There are far too many variables for any type of consistency in the analog realm; two of the same hardware 1176's can sound completely different from each other, due to factors such as age, damage or production differences. In contrast to digital software Hidalgo (2010) refers to VSTs as “robust”, as they will sound the same every time they are played back. Conversely, the reel of an analog tape can decay over time, or the machine can cause variations when the tape is played back. Other notable advantages of digital technologies that Hidalgo (2010) mentions include the ability to achieve a dynamic range of 90dB or higher and low levels of distortion, even when reaching maximum signal levels. However, if VSTs are used incorrectly, they do have the tendency to sound harsh, as digital distortion is not as pleasing to the ear as the distortion created by analog hardware.

2.2 Democratization of Software Freeware/Commercial

Definition of freeware

Freeware software is software that is distributed by the owner or creator for others to use. The creator typically retains ownership of the copyright, ensuring that users are legally not permitted to alter the software. For example, according to MeldaProduction (2017, p. 31) “you are allowed

to use the software on all your machines, but only you are allowed to operate the software. The licenses are "to-person" as defined in the license terms, therefore you can use the software on all your computers, but you are the only person allowed to operate them." Corbly (2014) goes on to add that the end users are prohibited from selling the software. Many companies will offer a free limited trial, this does not classify as freeware and these types of plugins will not be used as part of this research. Commercial software on the other hand is software that is produced for sale or licensed to the end user and serves a commercial purpose. Whilst there is free software is comparable or higher quality than some commercial software there is a stigma attached to free software as uncovered later on in this study through the interview process.

The limited amount of academic literature on freeware audio effect plugins is a noteworthy gap in academic research. There has previously not been significant in-depth experimentation and research comparing free and commercial plugins for use in mixing and mastering music. This is not true however, amongst the online community of musicians as there is heated, and continuing debates on forums with no definitive answer to the question; can you achieve the same results with free plug-ins that you can with commercial plug-ins? For example, when asked on the Home Recording (2010) forum if there is a difference between free and commercial plugins, to paraphrase, the vast amount of confusing and vague statements are made such as; "At your level of experience? No there's no substantial difference. My sense is your results with them won't be much different from one to the other. At a professional level? Different question." There is talk of Digital Signal Processing (DSP) being the same across free and commercial plugins, but without any sources or referencing in forum posts, the difference between free and commercial plugins remains unclear.

This is why the present research is timely to the field of digital music production, as there has not been significant in-depth experimentation and research on the topic of free vs commercial plugins. This thesis will not be delving into the DSP, graphical user interface or parameter controls of each audio effect plugin as part of the end result. This research will test the qualitative differences between free and commercial plugins, and aims to evaluate the extent and nature of these differences, as well as attitudes towards free and commercial plugins among music industry professionals.

The results will be evaluated via a modified ABX blind test, testing the qualitative differences perceived between free and commercial plugins for mixing and mastering. A true ABX blind test was not possible considering the circumstances of the listening tests, however the blind test has been heavily based on ABX testing methodologies. The ABX listening test is well established as a method for testing qualitative differences in audio; for instance, Benner (2016, p. 15) conducted a similar experiment testing to see if the listener had a preference between 44.1 kHz and 96 kHz on the exact same source material. The findings of this study showed that the listener was unable to detect an audible difference between the two sample rates. Similarly, in the creative component the same song will be mixed and mastered twice with commercial and free plugins. Through replication engineering the free mix will be matched as closely as possible to the commercial mix, by finding the freeware counterpart to the commercial software and matching the settings. This does not mean just setting the same levels and ratios, this will be the starting point, but if the sound or quality does not match, further tweaking may be needed for the freeware plugins to sound as close as possible to the commercial counterpart. The hypothesis for this experiment is that two musical recordings will be created that sound identical to a selection of five musicians through the use of an ABX blind test.

2.3 Mixing

Overview of mixing

Mixing is a term that refers to the final stage in the production of a single audio file (Savage 2014, p. 1). Mixing is when the engineer blends each individual track in a recording together through the process of; changing volume levels, removing unwanted frequencies, panning tracks, using compression and additional effects in order to improve the sound of the originally recorded tracks. However, Savage (2014, p. 5) makes the observation that due to advancements in technology the role of the producer, mixing engineer, mastering engineer and artist have become “blurred” distinctions. The reasoning behind this may be due to the fact that recording, editing, mixing and mastering can be executed in the same DAW program. It has become a frequent practice for some producers to start the mixing process before the song is truly ready to be mixed. Savage (2014, p. 6) contends that this approach can create problems when everything is in place for mixing, and that it is important to only make final mixing decisions once the context is complete, as all parts of the mix are related to each other. During the mixing process, the alteration of one sound affects how it will work with all the other sounds in the mix (Savage 2014, p. 6). Bouncing back and forth between being a recording engineer and mix engineer will be detrimental to certain elements or even the entire mix. While mixing it is best to stay focused on mixing, and editing when you’re editing (Savage 2014, p. 6). Toulson (2008), brings up the clichéd term “fixing it in the mix”. Whilst mixing a song enhances the quality of a recording significantly, Toulson is arguing that there is no substitute for quality audio recorded at the source. He discusses microphone selection, placement techniques and sonically pleasing analogue equipment to add character to the sound before it is recorded. Therefore, if something is poorly recorded, mixing may help enhance the sound but it will not fix the problems captured

in the original recording. This is on the opposite end of the spectrum to Savage's workflow as he prefers to work in the box rather than outside of the box. In the box refers to software on a computer whereas outside of the box refers to hardware. Whilst it is easy to agree that quality audio sources are a strong preference, the mix may not be able to "fix" problematic audio, however, mixing does have the capability to enhance the audio to the best of the producer's ability. Toulson (2008), states that a lot of producers are unaware of the scientific impact of over-processing audio at the waveform level, claiming that the use of digital effects should be used with caution. However, Taylor (2017), counters this argument with the notion that loudness in the form of hyper-compression has become synonymous with popular music of the 20th and 21st Century. Both Toulson and Taylor have valid arguments, over-processing is a common technique used in popular music, mixing and mastering is a subtle art and the plugins available today should be used with caution.

Toulson (2008), has a purist approach and tries to get material near to perfection before digitization takes place. He claims that if a quality singer is recorded with the appropriate microphone in an acoustically treated environment, there should be no need for processing in the mixdown. He goes on to explain how the limitations of digital sound make a bright and shiny, thin and two-dimensional recording. Tingen (2015) disagrees with Toulson in this instance. In an interview with Montagnese, a Grammy award-winning producer, he states that if you don't process a vocal using Auto-Tune it won't sound normal. Montagnese goes on to state that if the microphone captures a vocal in a way that is a little bit too bright, the use of a de-esser plug-in will be able to tame some of the sharp sibilance (Tingen 2015). Since Toulson was speaking in 2008, the VSTs available on the market may not have been as high quality and expansive as in the present day. If a vocal is not heavily processed, it will be much more difficult for it to stand

out in popular music. It has the chance of sounding un-polished or unprofessional. However, this is genre dependent and this approach is a generalization for popular music, vocal processing should be treated on a mix by mix basis, as every vocal performance and mix is different it requires different processing chains. In Tingen's (2015) article Montagnese claims that The Weeknd is a great live singer and that his performance on the musical recording *The Hills* was near perfect. Yet if we examine the vocal effect chain used on his voice we see that there are many stages of enhancement that are necessary in today's popular music environment: Chorus lead vocal: Antares Auto-Tune EFX, FabFilter Pro-DS, Pro-Q2, Volcano, Pro-MB & Timeless 2, Waves Vocal Rider, Reel ADT, H-Delay & Doubler, UAD API 560, 1176, MXR Flanger & EP34, SoundToys Little Radiator, Decapitator & MicroShift, Audio Ease Altiverb (Tingen 2015).

Mixing as a creative practice finds its roots in the idea that the recording studio can be used as an instrument of expression. Consequently, the mix engineer is the one responsible for constructing an artistic interpretation, instead of a sonic representation (Kealy 1979, p. 4). "In the studio technical decisions are aesthetic, aesthetic decisions are technical, and all such decisions are musical" (Frith & Zagorski-Thomas 2012, p. 3). Anthony (2017); surmises that a mix engineer should try to establish an emotional connection to the song, as mixing includes listening for a combination of musical and emotional elements. The notion of mixing as a creative practice transcends the definition of the content of the art form, namely; music, lyrics and performance. Instead, the aesthetics of popular art can be analyzed from the mix engineer's perspective and the effect different elements of a mix have on the listener (Kealy 1982, p. 113).

Mixing was minimalistic in the 1950's when recording was still in its early stages. Recordings were created with single-track mono tape machines. As recording technologies evolved, mixing

became a more complex task. Mixing could no longer be performed by one person, it required multiple sets of hands to control the different parameters on the console, each person was assigned an individual task to perform during the mix. Mixing was now a synchronized practice amongst the artist, producer, engineer and assistants (Anthony 2017). The advent of the DAW played a role on improving the ergonomics by simplifying the way in which music could be mixed. Mixing inside the box did not only affect producers and engineers; it also altered the dynamic of the music business. Album budgets dropped to the point where they were almost on par with the price of a full DAW setup. This forced many producers to move from a commercial studio into a home studio setup. In the current recording revolution, the power of free and cheap DAW's exceeds the resources and tools of what major recording studios were using from the 1950's to 1980's.

An equalizer is a commonly used plugin during the mixing process, it can be applied in a variety of ways when processing audio waveforms. According to Massenburg (1972, p. 2) the most common use of equalization is to correct for predictable variations in signal amplitude with respect to frequency. Berkovitz (1982, p. 226) expands upon the different types of equalization techniques that are used in audio, by describing the use of complimentary filtering as a means to correct or improve upon the audio captured by certain recording tools. The application of filters, usually a high shelf, helps to improve the intelligibility and clarity of a vocal in order for it to stand out from the instrumentation. Producers often use equalization on recordings to enhance or modify the timbre of recorded sound. Equalization is also used to solve "phase bashing".

Puckette (2007, p. 290) explains that the problem of phase bashing arises when waveforms are taken from different frequencies of a sample or an entirely different sample, as there is no guarantee that the phases of each sample will align correctly. If the frequencies are not in line

with each other this will result in audible frequency deviations between the samples. This is caused by a type of frequency modulation or as Puckette suggests “phase slippage” (2007, p.290). These types of phasing issues can be remedied through careful sample selection, and by examining each sample through the use of a spectrum analyzer to ensure compatible frequencies. If the frequencies do not line up then proper equalization of frequencies in specific areas will allow for correct blending of certain waveforms.

Another commonly used plugin during the mixing process is compression. There are three common uses that Moore (2012) defines as the compressors ability to enhance an audio waveforms articulation and intelligibility, to balance out the level of the waveform and to increase its overall loudness. Compression is not only limited to these base functions, compression can also be used creatively by the producer. The use of fast release compression can be used to increase the tail end of a sound and raise the volume to match the initial peak volume. Conversely, Vickers (2001, p. 4) states that compression reduces the dynamic range of an audio waveform. Dynamic range in this case is defined as the difference between the minimum and peak signal levels.

Spatial imaging is another technique used to create sonic sound staging in order to provide a sense of width and depth studio recordings. Hill (2012, pp. 349-350) states that isolated sound sources, on individual tracks, are recorded during the tracking stage and, during the mixing stage, individual tracks are altered to have a balanced volume and spatial relationship with each other. Hill claims that, in almost every pop song, the lead vocal, bass, snare and kick are imaged to the direct center in the soundstage. The idea of “spatial staging, phonographic staging, the sound box, and virtual space” (Vad 2017), is a technique that requires no digital alteration of the original sound source. This notion of “sound-space” (Kraugerud 2017), is not a new

development. Panning techniques and the creation of virtual spaces dates back to the pre-digital recording era. However, even though a recording can resemble that of the initial spatial environment in which it was recorded, it will never be a direct copy of such an environment (Kraugerud 2017). An example of a virtual space is a drum kit. The spatial scenario can be based upon the drummer's perspective, with the snare situated slightly to the left of the kick drum. Conversely, the drum placement can be inverted to emulate what the audience would hear. The horizontal method of spatial design is a simple yet effective way to emulate a real world listening environment. Additionally, Kraugerud (2017), describes a method for vertical spatial design. In order to create more separation between the bass and the kick drum equalization, mic placement and tuning of the kick drum can be utilized to accomplish an emulated vertical space where the bass sounds as if it had been layered on top of the kick drum, whilst the kick remains the driving force of the mix. Through adjusting volume levels and the pan of individual tracks, a sense of depth and space on the overall sound of the final mix will have been created. This stage should be the first point of action before any effect plug-ins are placed on a track (Kraugerud 2017).

2.4 Mastering

Overview of mastering

Savage (2014, p. 2) and Ojanen (2015) define mastering as the final step in the music production process, before a musical recording is replicated and distributed as a finalized musical product to the consumer. Ojanen (2015) states that there is an "Aesthetic-Technical continuum," and on the aesthetic end of the spectrum, there is an obvious use of music technology, and on the technical end, the technology is used transparently as a correctional tool. This can be linked back to the analog vs digital debate, as analogue hardware is said to introduce a certain sound or character.

McIntyre & Payton (2008) state that the most important goal in mastering is to ensure that the final product is clear across all playback systems.

Fleck (2013, pp. 19-22), outlines the common signal path of a mastering chain as follows; EQ is applied for timbral balance and to control any anomalies in the low and high frequencies of the recording. If there is an abundance or lack of frequencies in a specific area of the frequency spectrum, a boost or cut can be made with the EQ to correct the frequency balance. Lastly, placing an EQ on an entire mix allows the mastering engineer to optimize the loudness by highlighting the frequencies where human hearing is the most sensitive. Fleck (2013, p. 23) states that mastering engineers use a compressor on the entire mix, and that subtle amounts of compression can have dramatic results. Mastering compressors are best set to have relatively low ratio settings. Fleck (2013, pp. 27-29) goes on to say that limiting is the final creative step in the mastering process. The mastering engineer will set the threshold of the limiter, this threshold is where the limiter stops the signal from going any further in amplitude. The makeup gain is commonly correlated to the limiter threshold. The mastering engineer will also set the final output level, usually to -0.3dB FS, in order to leave plenty of headroom for inter-sample peaks and to allow for the best lossy-format encoding.

It is common for a mastering chain to contain multiple EQs, compressors and limiters. For example, an analog compressor could be used to add warmth to the overall musical recording, in addition to a digital transparent compressor that is being used to tame the kick drum. Fleck (2013, p. 16) also mentions the use of a mid-side insert on the mastering chain, providing the mastering engineer with the ability to EQ and compress specific sections of the stereo image. However, as discussed in the previous section, panning techniques are crucial for creating a rich and full mix. The term pan is derived from panorama, it is when the audio signal is distributed on

the stereo field. The audio signal can either be shifted completely to the left/right side, or spread evenly to each side of the stereo field. A four-band stereo imaging plugin is crucial to ensure that each frequency band is imaged correctly. As a general guide, the lower/bass frequencies should be pulled into mono, as this is where the kick drum lives. The kick is the heart of the beat and needs to be placed directly in the center of the mix. From this mono position, as the frequencies increase in number the stereo image should be fanned out accordingly. Snowman (2009, p. 400) supports this claim by including stereo imaging in the usual mastering chain. Snowman also includes harmonic excitement (2009, p. 416) claiming that when an enhancer is used, dull or missing frequencies can be restored or replaced making the mix seem “clearer, brighter and crisper.” This is important to note as it will be used during the creative component of this research project to enhance the overall musical recording for final playback.

For a recording to sound clear, punchy, defined and polished, Fenton et al. (2011) suggest that it comes down to the skill of the engineer in the production stages. If a recording has been poorly mixed and mastered it is more likely to sound unbalanced, distorted or dark. Nielsen & Lund (1999) identify one of the most important mistakes that engineers make when mastering a recording is to compare the processed effects chain against the non-processed at the same volume level. If the engineer fails to do this the louder musical recording has the possibility to trick the engineer into preferring the louder, processed signal.

Loudness Wars

Savage (2014, p. 399), highlights that the most important part of the final master is “loudness”. This is most commonly referred to as “the loudness wars”, where it implies that “louder is better” (Taylor 2017). Taylor (2017) states that there is a great amount of evidence that supports the

notion that the loudness is better paradigm is responsible for the loudness wars. This quest for loudness has emanated from the fact that audiences often choose loudness over fidelity (Devine 2013, pp. 160-161). The loudness war is thought to have been conceived around 1989 and reached its peak around 2004, being held accountable for a Root-Mean-Square (RMS) level increase of 5.0 dB and a loudness increase of 4.0 LU (Deruty & Tardieu 2014, p. 52). According to Nielsen & Lund (2000) the best sound in pop music was created between 1982 and 1995. Fletcher & Munson (1933, p. 82) provide a definition that loudness is a psychological term used to measure the scale of the aural sensation when listening to music. Malachy et al. (2014) discuss the 'louder is better' phenomenon where when two matching musical recordings are played back at different levels, the louder of the two will be perceived as superior over the quieter musical recording. This is due to the "nonlinear response of the ear" (Malachy et al. 2014), where an increase in loudness will allow for more frequencies to become audible at the high and low end of the frequency spectrum. Wendl & Lee (2014) believe that the Fletcher-Munson curve demonstrates how the difference in loudness levels can change the perception of different frequencies. As a result, a musical recording that has a flatter frequency response will be perceived as having more detail the louder it gets. Fletcher & Munson (1936, p. 238) support this claim by stating that there is a "functional relationship between the loudness of a sound and the degree to which it masks single frequency tones, that is, the masking audiogram of the sound, is developed." This has led to the belief that music with a louder overall signal will sell better than quieter music. Whilst the theory of 'louder is better' holds some merit, Vickers (2001) argues that listeners, when selecting music to purchase, are more influenced by the way in which the music is constructed through lyrics, instrumentation, harmony, melody, emotion and texture instead of pure loudness. Loudness may help a musical recording to stand out over a quieter

musical recording, however if a piece of music lacks in musicality, Vickers (2001) suggests that loudness is not enough for our brains to prefer a less musical, louder musical recording over a more musical quieter musical recording.

The loudness war has raised concern that the quality of music is deteriorating as a result of modern mixing and mastering techniques, such as applying compression and limiting in an attempt to achieve a louder musical recording than the competition (Vickers 2010). Nielson & Lund (2003) support this claim by stating that music is mastered at such elevated levels that it is not unusual for tracks to be clipping inside of a DAW.

Due to the advancements in music technology, it is surprising that some theorists suggest that industry practices are in decline. To quote Vickers (2010, p. 1) “we’re making popular music recordings that have no more dynamic range than a 1909 Edison Cylinder.” Early recording technology could achieve a dynamic range of up to 20 dB, this range is higher than the range of most current recordings. In the short term, louder is perceived to sound better. Consequently, in order to achieve this loudness hyper-compression is one of the techniques used to achieve such volumes. Hyper-compression is a term used to describe over-compressing a recording in order to increase its loudness. Hyper-compression is enabled through the use of multiband compressor VSTs. One of the downsides of hyper-compression is that it is said to have the possibility to degrade the quality of audio by removing dynamics, and as a result reducing the emotion and excitement of the music. As stated previously, hyper-compression is a short-term solution as it might sound superior in the initial stages of listening. However, it is believed that hyper-compressed music can cause listening fatigue over an extended period of time, thus having the ability to discourage listeners from replaying or listening to an entire song. Some people claim to have the ability to hear subtle amounts of compression, while other listeners are completely

unaware of any hyper compression. The overall quality cannot be ascribed to a single measurement when it comes to analyzing the overall music quality. Commonly the input signal is compared to the output signal in order to measure aspects such as total harmonic distortion (Fenton et al. 2011).

Listening habits of the consumer are also important to note in conjunction with the loudness wars. The levels at which the listeners playback their music could show a preference towards a louder listening experience. However, Epstein et al. (2010, p. 1476) have shown through their research that the listening environment is the leading cause for the choice of playback level. The maximum level at which audio can be output on current portable listening devices such as; smart phones, computer and MP3 players all have the ability to surpass the Occupational Safety and Health Administration (OSHA 1998) and National Institute for Occupational Safety and Health (NIOSH 1998) standards for long-duration exposure. However, according to Epstein et al. (2010, p. 1476) listeners commonly output their music levels well below the OSHA guidelines for maximum noise exposure. Taylor (2017) states that louder is supposedly better, yet according to Epstein et al. (2010, p. 1476) listeners aren't pushing the limits of their playback devices to achieve maximum loudness. This indicates that listeners are not inclined to consume music at louder volumes, yet the initial loudness of one song over another seems to play an influential role on the listener when selecting music to purchase. A full discussion of the loudness wars is outside the scope of this study, please refer to Fletcher & Munson's work for a full explanation of loudness.

3. Background To Freeware

Different variations of freeware include, open source, nagware or a base version of a commercial plugin which are all admissible in the creative component. Lessig (2004, p. 46) defines open-source software as software in which the source code is shared to the public. Everyone with an internet connection can download the programs that are used to experiment with the code for open source software. Blair (1972, p. 95) adds that technology can move in the opposite direction to what has been used in the past and what was expected for the future. Free and open source technologies lower the barriers to entry, consequently creating an incentive for the competition. Alexander (1994, p. 122) suggests that free and open source software could erode current market structures by enabling new entry. In hindsight, this should encourage higher product diversity and increase the variety that the recording industry has to offer. Advancements in open source tools and internet availability have enabled many producers and musicians to relinquish the services of industry professionals in favor of the do-it-yourself (DIY) movement. What was once considered a fad has led to a paradigm shift in the music industry (Petersen 2009).

Lessig's (2004) notion of free culture can be applied to the open source software movement. All cultures are free to some extent however, this is dependent on how much of the culture and technology is free for people to receive and build upon. Open source software allows significant scope for others to build upon existing works, whereas unfree or permission-based technologies leave much less. Through open source software people now have the ability to experiment in the abstract. It is no longer an isolated activity taking place in the garage; open source allows experimentation and innovation on a communal platform, exploring someone else's creation.

The more you experiment the more you improve, and the more you improve the more you learn (Lessig 2004, p. 46).

Out of the box mixing and mastering is done through the use of analog consoles and, many professionals in the industry use a combination of both digital and analog. The debate concerning which sounds better is outside the scope of this research, however it is important to document here as some still feel that analog is irreplaceable. Hracs (2012) covers the rise of digitally driven independent music production and suggests that we are in an “MP3” crisis. Hracs states that “musicians can make and sell music from anywhere.” Thus, altering the music industries way of producing and distributing music. However, the counter argument is that analog equipment is superior to digital. Hidalgo (2010) states that one of the common problems with digital recording is a supposed “harshness” that it adds to a recording.

Hidalgo (2010) states that analog equipment in the signal chain will smooth out a recording.

However, there is a vast selection of digital plugins that are emulations of analog hardware.

Throughout the creative component the mixing and mastering will be done digitally with the use of no analog hardware.

The participatory nature of open source software is not always as focused as commercial plugins when it comes to achieving its goals. Development of open source software takes place on various fronts at the same time, often only minor changes to the aspects of the project are made in conjunction with other users, which slowly improves the quality of the software over time.

Once these changes are added to a new build or version of the product (Bruns 2008, pp. 4-5)

states that this is only a temporary snapshot as development of the software continues

indefinitely. This is in contrast to commercial plugins, where a polished product must be created to deliver to the end user.

Profit becomes a motivator for developers as consumers are less likely to purchase a work-in-progress piece of software. Commercial generally means that a product is as close to finished as possible and software developers distributing their products under a commercial business model must focus on providing high quality user interfaces and functionality. Updates may be released to address bugs or compatibility issues.

The definition of freeware that will be used for the creative component of this research project is that the free plugins provided by the developer will work open-endedly at no cost to the end user. Some of these plugins contain 'nagware' which displays a nag screen somewhere on the software whilst the plugin is in use, however, this has no impact upon the functionality or sound of the plugin; the developer is requesting a donation to help support future builds of their operation.

Another example of free software is a limited edition, for example an equalizer that only has four bands available, whereas the professional edition gives the user access to eight bands. To counter an issue such as this, the producer can place an additional equalizer in the chain and have access to four more bands. In these types of cases the end user may purchase the upgrade for convenience rather than functionality purposes.

Free and open source technologies have lowered the barriers to entry, enabling consumers to become producers Bruns (2008, p.3). Whilst the participatory nature of open source software is not always as focused as commercial plugins, they have the ability to inspire product diversity and to increase the variety of VSTs available.

4. Methodology

4.1 Overview

The purpose of this thesis is to test the differences in quality between free digital effects plugins against commercial digital effects plugins. This project investigates differences between free and commercial mixing and mastering plugins, which perform distinct and well-defined DSP functions, and are more directly comparable. The creative component consists of one musical recording that has been mixed and mastered twice; once with free plug-ins and once with commercial plug-ins. During the recording process the audio signals have been kept dry with absolutely no processing of any kind. Through the use of an ABX blind test these two variations of the same song allow free mixing and mastering plug-ins to be compared to their commercial counterparts.

The way in which the results will be judged are similar to that of Benner's (2016) method, in which the participants switched between two versions labelled A and B. One of them was 44.1 kHz and the other 96 kHz, and for each excerpt the participant was asked to choose which one he or she preferred. In the case of this research the participants will be able to switch between the Commercial Mix and the Free Mix. "It is common with ABX listening tests in other fields within audio engineering. These typically utilize a computer interface which lets the listener switch back and forth between A, B and X and also repeat a loop of the stimulus a number of times" (Benner 2016). Benner (2016) found that the listeners showed no significant preference for any of the sample rates. A combination of five industry professionals and musicians will be selected to analyze the two different versions of the same song.

4.2 List Of Plugins Used

Type	Free	Commercial
Pitch Correction	MAutoPitch by MeldaProduction	Nectar by iZotope
EQ	Nova by Tokyo Dawn Records	Pro-Q 2 by FabFilter
Compression	MCompressor by MeldaProduction	Compressor by Ableton The Glue by Cytomic
Transient Designer	Transient by Audio Assault	Transient Designer by SPL
Limiter	MLimiter by MeldaProduction	Pro-L by FabFilter
Reverb	Tal-Reverb by Togu Audio Line Protoverb by u-he	Pro-R by FabFilter VintageVerb by Valhalla
De-esser	Lisp by Sleepy-Time DSP	Pro-DS by FabFilter
Multi-Band Compression	OTT by XferRecords	Multiband Dynamics by Ableton
Distortion	Krush by Tritik	Sausage Fattener by Dada Life Trash 2 by iZotope
Delay	Tal-Dub by Togu Audio Line	Simple Delay by Ableton
Mastering	N/A (instead, a combination of free plugins listed above were used to create a mastering effect chain)	Ozone 7 by iZotope

The reason why the paid plug-ins were chosen over the more expensive Waves and UAD plugins was due to the mixing criteria. These plug-ins were chosen due to their high-quality algorithms and surgical nature. Waves and UAD plugins tend to emulate analog hardware and by doing they can color the audio signal. The aim of this creative component was to create a clean, clear, well balanced and loud mix.

5. Creative Component

Please access the creative component using the following link:

https://drive.google.com/drive/folders/0B--IFW_8UVQVdVhsWWpfZ1dRcDg?usp=sharing

5.1 Processes Of Creation

The DAW that was chosen for the creative component was Ableton Live 9. The creative component started with three MIDI skeleton tracks, melody, bass and drums. Starting with a basic skeleton provides the overall structure, length, key and chord progressions of the song. It was crucial to create and record the cleanest raw sounds possible. Whilst recording the vocalist, multiple takes of the same phrases were captured so that a composite vocal track could be made from the best parts of each recording. One of the main advantages to producing electronic music is that apart from recording vocals, the rest of the sound engineering can be done solely inside the computer through software, including synthesizers, samples and virtual instruments. All the chords and melodies were created in MIDI, providing the option to change sounds instantly without having to re-record or recreate content. Watson (2014, p. 19) suggests that the use of MIDI allows for the combination of instruments to achieve a fuller sound and to create combinations of different sounds. Watson (2014, p. 14), states that “the enormous control over sound provided by MIDI enabled a flexibility to work with sound that had previously not been possible.” Pre-processing was not a concern for this investigation as all of the digital sounds were designed without any pre-processing to ensure a valid comparison of the free and commercial plugins used. Most electronic music is pre-processed, this is why an original musical recording was chosen for this study. The goal was to produce a great sounding mix with the commercial plugins and then try to replicate the same mix using free plugins

The commercial effects chain on the lead vocal is as follows;

- FabFilter Pro-Q2
 - EQ
 - Low-cut filter at 155Hz
 - Bell at 800Hz with a 1.36dB boost
 - High shelf at 3296Hz with a 2.8dB boost.
- iZotope Nectar 2
 - Applied for pitch correction
 - Range set to low with a speed of 64ms.
- Ableton Multiband Compression
 - Used with a 6dB boost across the high, mid and low frequencies.
 - The attack and release settings were set slightly differently for each band to place a subtle emphasis on the mid-range of the vocal.
- Ableton Compressor
 - Used to ensure the vocals were uniform in volume and clarity in order for them to stand out from the mix.
 - Ratio set 2:1
 - Attack 2ms,
 - Release 50ms,
 - Threshold -28.1dB,
 - Knee 6.0 dB and
 - Output 2.31dB.
- ValhallaVintageVerb
 - Reverb

- Chamber mode
- 1.59s decay
- 0ms pre delay
- 34% mix.

The free effects chain for the vocals was fairly similar;

TRD's EQ Nova was set to replicate FabFilter Pro-Q2 exactly. MeldaProduction's pitch correction tool MAutoPitch was set to the same key as Nectar 2, the only parameter that needed adjusting was the speed which was left on 30%. Xfer Records multiband compressor OTT had an almost identical graphical user interface to the stock Ableton Multiband Compression, however this was the one instance where a free plugin had a greater ability to enhance the audio than its commercial counterpart. The difference noted from the OTT in comparison to Ableton Multiband Compression was its ability to drastically manipulate the frequencies in each band allowing a much crisper and clearer vocal that was not possible to achieve simply with the stock Ableton plugin. The lack of clarity from the Ableton Multiband Compression was countered with the further use of Ableton Compression plugin, the same cannot be said for the free alternative MCompressor by MeldaProduction. Since Xfer Records OTT did such a good job of compressing and clarifying the voice the MCompressor was applied to ensure the vocals were uniform in volume. I relied heavily on my own qualitative judgement in order to achieve similar sounding results instead of trying to match the same settings due to the different processing algorithms. Tal-Reverb was the free reverb of choice and the settings were; room size 0.7, pre-delay 0ms, stereo width 1 and the wet mix set to -13.2dB.

The biggest obstacle was the difference between the quality of mastering plugins between free and commercial. Commercial software developers offer complete mastering suites, such as

iZotope Ozone. Ozone was selected for the creative component, as iZotope's plugins are continually being updated with new versions being released periodically. As of October 2017 iZotope has released Ozone version 8, which only became available after the creative component had been finalized. This allows the mastering engineer to achieve a more balanced, compressed and louder musical recording, as electronic and pop music is increasing in loudness; Deruty & Tardieu (2014, p. 52), state that music has been incrementally getting louder since 1989. Inside Ozone 7's maximizer section IRC III mode was selected with a ceiling of -0.3 as it allows the overall volume to be raised to higher than normal levels for a regular limiter, unlike the MLimitier by MeldaProduction which could not raise the volume to the same levels as Ozone 7 without digital distortion. The typical signal flow used inside Ozone 7 is as follows:

- EQ:
 - Brickwall Highpass at 30Hz
 - Brickwall Lowpass at 18000Hz
- Imager:
 - Band 1: -100%
 - Band 2: -40%
 - Band 3: 30%
 - Band 4: 55%
- Maximizer
 - IRC III (Clipping)
 - Ceiling: -0.3dB
 - Threshold: -7dB

When it comes to mixing the only plugin that proved to have limitations was the small number, and low-quality options of free reverb plugins that were available for download. With that being said, it was difficult to find a commercial reverb that fitted well into the track as reverb is an acquired taste and can be treated as an instrument or sound design tool. With the free reverbs their effect is what you hear is what you get, without any ability to alter the sound drastically. With more advanced reverbs there are options to sculpt and choose different convolutions that are suited to specific tracks. In future research it would be interesting to expand upon purely free vs commercial and experiment with a free mix with a commercial master vs a commercial mix with a commercial master and see if in fact mastering is the defining factor of a musical recording. On the contrary another experiment could be a test to see whether the effects in the mixing process are what defines a musical recording. These are just a few examples of the different combinations that can be used to delve deeper into the intricacies of mixing and master to try and grasp the defining principle of what makes a musical recording sound more professional. This approach will stray away from purely free vs commercial and focus on a hybridized method for mixing and mastering to uncover the essential tools that separate the amateur sound from commercial releases.

5.2 Administration Of ABX Blind Test

Frindle (1997, p. 44) states that an ABX blind test is necessary to avoid bias. Bech & Zacharov (2006), support this notion stating “that formal listening tests are regarded as being the most reliable method for audio quality assessment.”

The ABX was administered at the participant’s venue of choice. As this experiment was administered through the use of a DJ mixing desk, a laptop and a pair of open back headphones,

it was quite easy to transport to various locations whilst still maintaining the same listening environment for each participant.

Headphone playback has many advantages over studio monitors as they provide controlled and highly consistent listening conditions regardless of the location. “The direct coupling of sound transducer and ear entrance provides ideal preconditions for high-fidelity, defined playback, particularly in terms of imaging precision and tone color” (Theile 2016). A pair of Beyerdynamic DT 990 (250ohms) open back headphones were chosen for situations where the participant was unable to listen to the musical recording on hi-fidelity speakers in an acoustically treated room. Each participant had access to a pair of DT 990 (250ohms) open back headphones which made testing in different locations possible without the external environment having an impact on the blind test.

The two songs were loaded into Pioneer Rekordbox DJ software, synced and beat matched to each other. The songs were then played in unison with one another so that they were playing the same part of the song at the same time. The participants were then able to move the slider from Deck A to Deck B and isolate each musical recording whilst they continued to play in unison. One of the biggest obstacles that had to be overcome was the song mastered with free plugins, as it was not able to achieve the same perceived loudness as the commercial version. This was the loudest volume that could be achieved with the selected catalogue of free plugins. As stated previously by Taylor (2017), the louder is better paradigm can be seen as a bias and having a negative impact upon the results of the blind test. Using the DJ mixing desks it was possible to match the levels by referencing the two musical recordings in conjunction with the decibel visualizer. The DJ mixer has a trim knob on each musical recording, making it possible to match the musical recordings more precisely.

The interview process consisted of a survey that each participant filled out during the blind test followed by an interview that was recorded and transcribed after the blind test had taken place. One limitation of the ABX blind test was the small number of participants. Qualitative research allowed for a much deeper understanding of the differences between free and commercial plug-ins. However, a large scale quantitative analysis would be necessary in order to draw a final conclusion on whether or not the majority of participants could hear a noticeable difference between the free and commercial plug-ins.

6. Discussion

6.1 Results

Five music industry professionals were chosen to participate in the research project. William Bowden was a Grammy Award winner in 2013 who has been a mastering engineer since 1988. Michael McGlynn is an Australian Recording Industry Association Music Awards (ARIA) nominated producer; he is also co-owner of Vienna People Studios and Vienna People Records (label) where he works as a full-time producer and mix engineer. Jacob Augimeri is a music producer and artist who has previously released a 4 Track EP, and is currently producing and recording music from his own studio. Chris Payne is an artist/rapper, who is currently recording an album at professional recording studio Vienna People, and has previously released two mixtapes independently. Thierry Mboumbo is a producer and DJ, specializing in electronic dance music he is currently working on his first independent EP release.

Track A was mixed and mastered with commercial plugins while Track B was mixed and mastered with free plugins.

When asked which track each participant thought was created with free plugins the majority guessed correctly, although not by a significant margin. 3 chose B while 2 chose A. 3 preferred A aesthetically over B. 4 out of the 5 participants thought that the quality of mixing and mastering on track A sounded excellent while the outlier thought the quality was average. Track B received a variety of opinions; 2 said B sounded excellent, 2 said it was good and 1 rated the quality as poor. 4 out of the 5 participants reported noticing a difference in quality between the two tracks. When asked to participate in the X test, where the participant had to listen to one of the tracks in isolation and guess if it was track A or B 3 out of 5 guessed the track correctly.

Overall, these results show that the majority of participants could hear a noticeable difference in quality between the two tracks when listening back to back. However, when deciding which track was created with free plugins and the results from the X test, they reveal an inconsistency in the ability to distinguish between the two tracks. There was also no unanimous choice for which track was preferred over the other, rendering the results towards the two tracks being near indistinguishable to which one was created with free or commercial plugins. As previously stated, mixing and mastering is an aesthetic decision and everyone has their own unique preferences when it comes to mixing and mastering. A different approach to the mixing and mastering process may have also produced different results.

Question	William	Michael	Jake	Chris	Thierry
Which track do you think was created with free plugins?	A	B	B	A	B
Which track did you prefer aesthetically?	A	B	A	B	A
How would you rate the quality of mixing and mastering on track A?	Average	Excellent	Excellent	Excellent	Excellent
How would you rate the quality of mixing and mastering on track B?	Poor	Excellent	Good	Excellent	Good
Is there a noticeable difference of quality between the two tracks?	Yes	Yes	Yes	No	Yes
X Test	Correct	Incorrect	Incorrect	Correct	Correct

6.2 Interview analysis

Grammy award winning mastering engineer, William Bowden, was the most critical of the two recordings but this was to be expected from his 29-year career in the music business. He mentions many of the same criticisms provoked by the loudness wars and hyper-compression. He states that tracks “overcooked hugely in level” is a common mistake made by producers today. He goes on to say that B distorts much worse than track A, and also noticed synth lead breakup and bottom end fuzziness. However, ARIA nominee, Michael McGlynn, noticed that track B had “a little more bottom end, and a little more punch,” describing the overall sound to be warmer. Artist Chris Payne, agrees with Michael’s opinion and states that “B sounded bigger and more professional”. Bowden describes track A as perceptibly louder and brighter, McGlynn agrees with this notion by claiming that A seemed “punchier” overall. Payne also agrees that track A sounded “tighter”. Producer/artist, Jacob Augimeri, preferred the sound of track A more than track B. Mostly because he found that there was more control over the bass in track A”, supporting Payne’s notion of tightness in track A. Producer, Thierry Mboumbo, also agrees that Track A sounded better than Track B. Track A sounded a lot brighter, crispier, and cleaner... like it’d been mixed and mastered by a professional in a major recording studio. Track B on the other hand had a little “scruff”. Augimeri, also found the bass to be flabby and over the top in certain sections. Bowden also notes that track B also felt less exciting and present. Payne opinion is conflicting as he states that Track B appeared to have more volume and clarity.

McGlynn states that either one sounded ready to be played on the radio, where Mboumbo felt that track A was more radio ready. McGlynn’s reasoning for this is that only one thing matters, does it sound good? Does it move you? His attitude towards music is that it has to move you emotionally, physical or mentally. This supports Vickers (2001) claim that listeners are more

influenced by the way in which the music is constructed through; lyrics, instrumentation, harmony, melody, emotion and texture instead of pure loudness. McGlynn goes on to say that 98% of the population would most likely not be able to discern a serious difference between the two tracks, if any. In the likelihood that they could, “they certainly couldn’t explain what it is”. This statement supports Fenton et al. (2011) argument that some people claim to have the ability to hear elusive amounts of compression whilst other listeners are completely unaware of any hyper-compression.

When asked if each participant thought that they could mix or master a song by only using free plugins. Bowden states that it comes down to the expertise and skill of the operator more than the tools employed. This ties in with Payne’s analogy between a \$50 and \$1,000 tennis racket. To apply this in a musical context it would be the similar to giving a Grammy award winning engineer and a beginner producer an expensive EQ plugin; in the end it doesn’t matter about the price or quality of the plugin it all comes down to the “expertise of the programmer”, to quote Bowden. Augimeri was the only one who disagreed about free plugins, he states that “there would always be a difference.” He claims that free software would be good for “housekeeping” tasks such as equalization, but for finishing music the power of commercial plugins is needed. Whilst both arguments have their merits, it does come down to the expertise of the engineer, the more experience and knowledge on has the more capable they are of achieving a higher quality result. However, there will always be limits to what an engineer can achieve with a specific set of tools for example, an EQ that has been poorly created could add artifacts into a mix such as a constant hissing, tweaking different parameters on the EQ will never remove the hissing from the track. The use of a noise gate or a different EQ plugin could help tame the issue, however if this was the only plugin an engineer had access they would be limited by the quality of the tools they

had available to them. Whilst Bowden's theory is plausible, without high quality hardware at an engineer's disposal their "expertise" is limited by the tools available to them. That is not to say that free plugins are not to be regarded as high quality, MeldaProduction MAutoPitch and Audio Assault Transient are two examples of high quality plugins which matched almost identically to their commercial counterpart when tested during the creative component.

7. Conclusion

VST has played a pivotal role in the recording revolution and allowed for producers to move away from analog equipment, giving them the tools to mix and master music exclusively inside the computer. Significant literature has been outlined describing the process of mixing, mastering, the free and open software movement. This research has identified and addressed a gap in the field due to insufficient research on free vs commercial studio technologies.

A brief history and use of the recording studio and the shift to mobile and digital technologies helped to identify the current context in which this research is situated. The democratization of freeware and commercial software show the relevancy and need for further investigation. An overview of mixing tools and practices over the course of the last half decade has shown how mixing has developed and what practices are used in the present day. The same was done for the mastering tools and practices where the criticisms of the loudness wars and hyper-compression were identified in detail and exhibited the specific trends in the overall loudness and compression that takes place in current day music recordings.

This study aimed to test the differences between free and commercial VST Plugins for mixing and mastering through the production of two versions of a creative work; one using free plugins and one using commercial plugins. The results of the ABX blind test proved to be inconclusive, the survey results that were collated and placed into a table reflect this as there is no clear distinction as to which track was preferred or which track was predicted to be created with free plugins. However, many interesting points arose from the interview transcripts from the five music industry professionals that linked back to research from the literature review.

During the interview the participants were asked to describe the qualitative differences between the free and commercial plugins. An analysis of the interviews was made to establish the

perceived differences and opinions of the artists, producers, professional mixing and mastering engineers when it came to free and commercial music software. Whilst academic terminology was not commonly used when speaking about the two tracks, similarities between the perception of the two tracks and the prior literature review can be distinguished. In addition, this study recognized and document the different perspectives that each participant had when it came to mixing and mastering, and whilst the majority of participants spoke highly of free software none of them had a use or place for free plugins in their own professional workflow.

Future research should aim to test free vs commercial plugins against a larger quantity of participants, focusing on quantitative rather than qualitative data accumulation. A variety of different combinations of the creative component should be constructed in order to test out free vs commercial plugins for mixing and mastering in isolation. For example; to establish whether free plugins would be suitable for mixing but not for mastering. Analysis of the source code for both free and commercial plugins could be analyzed and compared to see the differences that go into the creation of a free vs commercial plugin.

Overall it can be said that the commercial plugin mix was referred to as the more professional sounding track. However, the professionalism of a track did not seem to hold enough influence over some of the participants to prefer the track created with the commercial mix.

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Appendix

Interview Transcripts

Participant 1 - William Bowden Grammy Award Winner 2013, CD Mastering since 1988

King Willy Sound began operations in November 2001, mastering the work of many of Australia's top musicians. In 2013 William Bowden was the first mastering engineer to share the Record of the Year Grammy, for his work on Gotye's Somebody That I Used To Know. (This award recognizes both artistic achievement and technical proficiency on one track or single.) The mastering room at King Willy Sound features state of the art hardware from Lavry, Weiss, Fairman, Tubetech, Elysia, EMI and Manley, etc.

"But in the end it's the ears that count."

K: What is your opinion of the two recordings you have heard?

W: Not too bad, but overcooked hugely in level sadly (a common mistake). Both distort a lot especially at the end, B is much worse in this regard, lead synth breakup very apparent as is bottom end fuzziness.

K: Can you discuss the differences you perceived between them?

W: A is perceptibly louder and brighter than B, B has more midrange and distorts far more overall - also feels less exciting and present. They are very different, but probably more down to the use of tools than the tools themselves.

K: What is your opinion on the use of free plugins in a professional context?

W: They are fine, can be very useful I'm told.

K: Do you use free plugins? Why or why not?

W: No, I need the service required for any issues, also don't try out many plugs as I like to keep my machines off the net and free from potential viruses or programming conflicts (PC) K:

What do you think the differences are between commercial and free plugins?

W: Service, marketing, I think free plugs can no-doubt be amazing, down to the expertise of the programmer and usability in the end.

K: Have you ever come across a free plugin that is better than any commercial alternative?

W: No but again, don't use a whole heap of them - certain it's possible even likely. K:

Do you think you could mix or master a song by only using free plugins?

W: I'm sure, all down to the taste and skill of the operator - much more than the tools employed.

Participant 2 – Michael McGlynn Australian Recording Industry Association Music Awards (ARIA) Nominated Producer for Best Urban Album – L-Fresh The Lion Become.

Owner/Producer, Vienna People Studios/Vienna People Records (Label)

Michael has worked as a producer, recording + mixing engineer, and musician for over 15 years, both as a freelance operator and studio owner. He is known for his vision and energy, and has produced a wide array of genres, from country to indie to hip hop. Michael has also composed music for television, short films, documentaries, advertising (clients include SBS, Belle Property Group, Komatsu Forklifts, Meat and Livestock Australia and the Made Advertising Agency) and many artists across a wide variety of genres. He has proven himself to be an integral part of the production process and not only supports the artists, but helps them grow in their songwriting and performance.

K: What was your opinion of the two songs that you just heard?

M: I thought they both sounded ready for radio

K: Could you discuss any perceived differences between the two?

M: I think they both sound great. I noticed in B a little more bottom end, and a little more punch. It felt warmer

K: Do you think it sounded tighter in track A, or more controlled?

M: In a way A seemed a little punchier. I thought B was a more warm listening experience. They both punched beautifully, they just punched differently

K: So what are your opinions of using free plugins in a professional context?

M: Look, my opinion is the same as anything else. If it sounds good, use it K:
Do you use free plugins?

M: Look to be honest I don't actually use many free plugins at all. I've got the Waves bundle, the UAD bundle, I also bought all the Softube and Soundtoys bundles. I got Sausage Fattener and Kickstart as well. Look, I have used free plugins in the past, but I usually reach for UAD, Waves, Softube and Soundtoys.

K: Would you say that your choices are based on convenience or branding?

M: I think it's always impossible to tell how much branding influences me because everyone will say that UAD plugins sound amazing. So the second you pull up a UAD plugin you've already got it in your head that every professional that you have ever heard says that they are amazing. So I can't really answer if the branding influences me or not. For me the GUI (Graphical User

Interface) makes a difference. I'm a bit of a preset guy, particularly with synths. I'll end up tweaking but I want good presets available if I have to do something quick and the user interface dictates that.

K: Do you use presets for mixing as well or just sound designing?

M: Yeah sure. There is only one thing that matters, does it sound good? Does it move you? My attitude with music is that it's got to move you either emotionally, physically or mentally.

K: As a business owner and a record producer do you think that it would impact your clients opinion of you if you only used free plugins and you willingly told them you only use free software, but you still turned out the same results?

M: Clients are always swayed by a myriad of things, it's hard to say

K: I know that a lot of people say that with microphone choice people just buy a Neumann because it's a Neumann and it attracts the customer, and when they see the badge while they are singing, mentally, they think it's a better experience

M: Yeah, that may be the case for some people.

K: I remember you saying that you produced a hit record using a cheap Rode NT1-A microphone

M: Yeah, it's had about 40 million streams on Spotify and the lead vocals were a Rode NT1-a with an SM57 next to it, blending between the two. I am the last person to get into gears, I don't care at all, if it sounds good it sounds good. And if it feels good it feels good.

K: So what do you think the differences between free and commercial plugins are?

M: Look I don't know. I'm not a gear nut so I don't research gear, I don't care about it. K: Well then, do you think that all EQ's are fundamentally the same program with different graphical interfaces?

M: No

K: So what would make one EQ different from the next?

M: Well on a lead vocal I will 99% of the time reach for the UAD Pultec and if you boost a vocal at 12kHz it will sound very different to if you boost a vocal at 12kHz on another EQ K: How about the differences between the Logic and Pro Tools EQ?

M: I actually started reading an article on that the other day. I got halfway through and realized I didn't care.

K: So basically no noticeable differences?

M: Nope! I don't even care if I'm in Logic or Pro Tools. People will tell you they sound different and I'm sure they probably do. What is going to get the best performance from your artist?

What's going to mean that your workflow is good and when you reach for something you know where it is? I think it's brilliant the research you are doing, but the important questions in the field should be musical ones not technical ones.

K: What differences have you noticed between different compressors that you have used and the way the effect your mixes?

M: Thickness and the way they interact with the different frequencies.

K: Have you ever come across a free plugin that is better than a commercial one?

M: No I don't think so, but that's got nothing to do with the cost of a plugin

K: Lets say I gave you the set of mixing plugins that I used for this experiment, do you think you could use them to mix a song? Given that the GUI is intuitive and easy to use.

M: Yeah I could definitely use them and pull a great mix. I don't master as you know, but yeah I think I could make a mix sound really cool with any plugins as long as I had the full range of mixing tools.

K: Yeah well that is what I believe as well.

M: But I mean, when it comes to a lead vocal I reach for an LA-2A and a Pultec

K: Because it gives it that color?

M: Yeah, and I know what they sound like

K: Do you think you could recreate or emulate the sound of those plugins using any plugin of your choice?

M: Well then it comes back to big picture versus tiny minute details. It all comes back to the musicality I was talking about before. No you could emulate the LA-2A exactly, but you could make something awesome regardless.

K: So you aren't really relying on the sound of particular plugins, you are using your skills as a producer and mix engineer?

M: It's all about musicality and does it move you.

K: Any final thoughts on the two songs that I showed you?

M: I honestly thought they both sounded great. And the bottom line is; remember that you could play those two tracks to 98% of the population and they probably wouldn't be able to discern a serious difference, if any. They certainly couldn't explain what it is. You proved that when I was

ABing between the two tracks and I was like “mmm yeah B I think” and then 5 minutes later you just played one of them and I had to guess whether it was A or B and I guessed wrong. I am very different to most producers; most producers are gear nuts.

Participant 3 – Jacob Augimeri Music Producer, Artist: Singer/Songwriter. Releases: 4 Track EP. Currently recording new material.

K: What are your opinions of the two records that you hear?

J: Both were pretty good. I found that I liked the sound of track A more than track B. Mostly because I found that the bass was more controlled in track A, in comparison to track B I found the bass to be a little flabby and over the top in certain sections. Similarly, I found the reverb, especially on the voice to be tighter, focused, and very frequency specific on track A. On track B it was more global and messy and it was particularly notable in the complex vocal areas, and also around the drops.

K: What is your opinion on using free plugins in a professional context?

J: I gave track A the tick of approval over track B. They both sounded very similar but there was a reason I decided that track A sounded more professional. It sounded cleaner and tidy, it sounded more finished than track B did. So really my opinion would be that while I’m sure free plugins are more than appropriate for certain housekeeping items when it comes to producing music. I think that for finishing music you really do need the power of commercial plugins.

K: Do you use free plugins?

J: Absolutely not. I use stock Ableton plugins.

K: What do you think are the differences between the Ableton plugins and freeware software that you can just download of the internet?

J: I would say that with Ableton, or any DAW software that you pay a premium price for, what I would consider an exclusively expensive price. I think what you’re paying for is time spent by a panel of experts who come together, and take what might be very similar to a free plugin in its skeleton and then they finesse it, they spend time on it and develop it properly.

K: Have you ever found a free plugin that’s better than a commercial one?

J: No

K: Say that you mixed and mastered a song using all your own plugins. Do you think if you had an alternative set of free plugins and you could match the settings, do you think you could mix one yourself?

J: That would sound as good?

K: Similar, ballpark

J: I think there would always be a difference

K: What plugins in particular do you think would lack in the free department? For example I feel EQ is fairly universal.

J: Well an EQ is a very simple piece of software. So I don't really think that an EQ is going to vary much. None of the EQ's that I've used have been very different from one another apart from the graphic interface. Some are more desirable and aesthetically pleasing to use, but they all do the same thing. When it comes to specific effects, such as reverbs and things like that, I think there are noticeable differences.

K: Is that what you noticed the most between track A and B?

J: I did notice that, the reverb was the most noticeable thing between track A and B for sure

Participant 4 – Chris Payne Artist/Rapper. Currently recording an album at professional recording studio/record label Vienna People. Releases: Has released two mixtapes independently.

K: What was your opinion of the two recordings?

C: They were good

K: What was your perceived difference between the two?

C: Track A was a lot tighter, where Track B had more volume and clarity K:

In what way? Which one sounded more professional?

C: B sounded bigger and more professional

K: What is your opinion of free plugins in a professional context?

C: I probably wouldn't pay for anything

K: Would you feel ripped off by the producer if they were just using free software?

C: Yes I would because I don't think it would be very professional if all the software was free

K: What if I told you that Track B was the one that was made with free plugins and you thought that it sounded better?

C: Well then, it depends on a lot of things. It depends who is mixing and mastering the track and how they go. But if you are going to a professional studio you want it done properly. And if you find out if it was done with free software I ask the question; are you paying for the mechanics of the software or the work and labor that goes into mixing and mastering a song

K: I think it's more about how you use the software

C: I agree

K: Do you use free plugins?

C: I have yeah

K: What do you rate that against being in a professional studio?

C: It all comes back to how the person uses it

K: Have you ever come across a piece of software that's free, that's better than a commercial version that you have seen in the studio

C: I'd have to say yes. I've been using Garage Band as my main piece of software for years. I'd also have to say that I love the free EQ's that come in Garage Band. Although, it is an easier version, an easier, simpler way to EQ something, but it doesn't have as many variables as other EQ's

K: What do you think the differences are between the different features in terms of usability between the free and commercial plugins?

C: Nothing really, it all depends on how you can use your equipment

K: Do you think that you could make a song using only free software?

C: Yeah definitely

K: Well clearly you have. For the record, what have you created and released with free software?

C: Recording, producing, mixing and mastering

K: So you've done that all yourself?

C: Yeah, and I've also made two mixtapes. One was 16 tracks and the other was 12 K:
How long did they take you to create from start to finish?

C: One took me about two months to make 16 tracks, The other one is still on going but I have put about 3 months into it so far

K: Okay, that is a very quick turn around time

C: I just found a comfortable workflow

K: With a professional recording that will be released on the radio do you think tighter and more compressed, or, looser and fatter is better?

C: I think for the radio definitely tighter and compressed because all radio songs are the same sort of format and formula

K: So do you think that track A followed that formula better than track B? C:

Absolutely

K: So where do you think track B fits into the music industry in today's age?

C: On the internet, it's more of a free range format, where there are no rules. It let's the artist and the music do what it wants to do K: So more of a dance track?

C: Yeah its looser and raw

K: So do you think that track B would be better suited for the club and track A would be tailored better for the radio?

C: Yeah definitely. Like I said before goes everywhere and its looser, where track A is more compressed and tighter

K: I guess it ties back into rap, because a lot of rappers don't have professional tracks when they first start out. They make mix tapes from home

C: Yeah, its pretty much all about the vocals, about being raw K:

Would you say track A was sterile?

C: Not at all, track B just sounded free and open K:

Did you notice more reverb in track B?

C: Yeah I did actually

K: Any final comments?

C: It's a bit like tennis I guess. If you have a \$50 and a \$1000 racket, it doesn't matter. It depends on the player and how they use it

Participant 5 – Thierry Mboumbo Producer and DJ, currently working on his first independent EP release. Specializes in Electronic Dance Music.

K: What is your opinion of the two recordings you have heard?

T: Track A sounded better than Track B. More radio ready, so to speak.

K: Can you discuss the difference you perceived between them?

T: Track A sounded a lot brighter, crispier, and cleaner... like it'd been mixed and mastered by a professional in a major recording studio. Track B on the other hand sound a little scruff, and could use a little more mastering and mixing.

K: What is your opinion on the use of free plugins in a professional context?

T: I honestly believe if the plugin does the job, use it.

K: Do you use free plugins? Why or why not?

T: It depends, most of the plugins I use come standard with my DAW but if I found a good, decent plugin that could perform to par; I'll use it.

K: What do you think the differences are between commercial and free plugins?

T: The software engineers commercial more focus, and detail to commercial plugins than they did to the free one; and commercial plugins tend to have more versatility.

K: Have you come across a free plugin that is better than any commercial alternative?

T: Not yet, but I am certain there are ones out there.

K: Do you think you could mix or master a song by only using free plugins?

T: I have mixed and mastered songs before using stock DAW plugins which came out to be good. So I'd say yes.