Implicit Gender Bias in Music Technology Education

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Abstract

Implicit bias is a contributing factor to how we make decisions based on first impressions and prior experiences. Perception of ethnicity, gender, and sexuality (among other factors) informs our impressions and influences our decisions (Payne et al., 2018). This affects study and career choices. Research continues to find that the music and music technology industries are gendered spaces where women and gender diverse practitioners are underrepresented, and several studies recommend continued research on the reasons behind this gender gap. This investigation looks at implicit bias within music technology staff and students in Aotearoa New Zealand polytechnic music technology programmes using an online survey tool to probe how those involved perceive the influence of gender bias within their worldview.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed: Date: 08-01-2022

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Chapter I – Introduction

There is an old joke that in some ways initiated this research project:

What do you call a woman in the cockpit of a plane?

The key to this joke is the timing – allowing a momentary pause before exclaiming, 'the pilot you sexist!' The 'joke receiver' must not get time to respond – even better if you get the respondent to ask, but riskier in that they will have time to think. There are two interesting things about this joke (and the many variations on it) that occur to respondents: Firstly, there actually are a lot fewer women pilots – around 5% according to the poorly but aptly titled 'Airman Database' (Carsenet & Rossini, 2014) – and secondly many people (albeit looking for a 'joke' answer) don't initially picture a woman in the pilot's role. This is an example of both an implicit bias and the associated gendered role. Think about the number of times that a woman's voice has come over the cabin intercom introducing themselves as captain, introducing the co-pilot and flight crew and discussing flight times and weather – it does happen, but why is it so infrequent that the occurrence seems remarkable?

The recording studio is a similar environment in several ways. So much so that a very common reaction upon entering a studio control room is to compare it to an airliner/cockpit/flight deck or spaceship. The other main parallel is that approximately 95% of the time, you will be greeted by male engineers, producers, and studio managers (pilots) and your initial interaction will likely be with a diverse range of receptionists, administrators, and facility managers (the cabin crew).

The education institutes within Aotearoa New Zealand that are largely responsible for the 'new entrants' to the music technology industry lack diversity in their applicant base – In twenty years in just such an institution male applicants for music technology courses account for between 90 and

95% of total applications (there was a year where male students only accounted for 85% of the student applications but that was a remarkable number and reasons for that proportion were never discovered. This lack of diversity follows through to the classroom, faculty, and into the wider industry. In other words, the diversity of students entering this field may help to explain the lack of diversity in the music technology industry, but the causes are less obvious until you consider the learning environment, faculty, and pedagogy. If these aspects are gendered within educational institutes, it might drive the discourses associating technology with masculinity and the apparent 'lack of interest' in women and gender diverse students applying to music technology education programmes of study

Smith et al. (2021) note in an annual inclusivity study that, within popular music, no woman or gender diverse person has ever won a Grammy for production and women generally only make up 2-3% of mainstream producers. Interviews conducted with women working in the music industry, seeking to understand the barriers for women and gender diverse engineers and producers, revealed several respondents mentioning the difficulty in being in "a statistical minority in the music business" and that the "music industry is male-dominated or functioned as the proverbial 'boys club'". (Smith et al., 2019, p. 10). This makes for the compelling notion that if established women, and gender diverse engineers and producers are struggling with this, how is it affecting each subsequent generation of industry professionals and how are educators contributing to this statistical minority? Associate Professor Susan Rogers, at Berklee School of Music, is forthright in her view about the reasons,

> The bottom line is, women aren't interested, . . . There are no social barriers to a woman becoming a record producer, . . . The more stringent and insurmountable constraint is the biological one. A man can, technically speaking, reproduce on his coffee break. It doesn't take all that long, and biologically it doesn't take much of a toll. For a woman, the opposite is true. . . . The women who do get into it will do really well... until they reach that point in their late 20s where they say, 'Now it's time to have a family'. I tell my

> female students it's going to come for them. It came for me, and I opted not to have children, to not get married. (Savage, 2012, paras. 24–31)

Rogers' brief analysis of the reasons for the gender breakdown within music technology introduces key concepts that this research project investigates and exemplifies some of the traditional essentialist discourses that reinforce the implicit power structures within music technology industry and education spaces. The opinion that women and gender diverse people aren't interested in producing records does not appear to acknowledge the effect that implicit biases have on how we as humans decide where our interests lie – if societal assumptions and biases consistently reinforce attitudes and behaviours that make music technology less appealing, they are, almost by definition, creating social barriers. The toxic masculinity within this (and many other technology-based industries) constitutes a social barrier. The literature examining these discourses along with the associations with technology and masculinity, and the gendering of roles and technology, will introduce some of the counter arguments that social barriers are not just 'involved' but are in fact more pervasive and much more difficult to mitigate.

Expressing Diversity with Binary Language

An example of one such structural barrier inherent in even approaching the subject, from both an everyday life and a research point of view, is the limited number of words for gender in the English language. For example, if a person being described identifies as 'cis-female', meaning that their gender is congruent with their biological 'sex' assignment from birth, the noun 'woman' might be applicable in the right context. For example, "at the time it was unusual for a woman to engage in this activity" or speaking more broadly "women generally make up 2-3% of mainstream producers". However, Butler (1990) cautions against the use of this term being assumed to denote *women* as a common identity. It relies on assumptions of homogeneity within a wider group of people while reinforcing binary gender categorisation and as such marginalising the wide range of behaviours,

opinions, experiences, and gender diversities within humanity. Feminist writers have been developing this understanding of intersectional and re-constructed gender identity and various strategies have been applied to break down the particularly patriarchal aspects of language. As a reaction against the use of he/his as the definitive subject, alternating pronouns were common, along with exclusively (or should that be inclusively) using she/her when referring to gendered subjects. One issue with these strategies is that they unintentionally reinforce binary essentialism around gender. This is often addressed using non-binary pronouns such as they/their rather than making the implicit assumption but can run into grammatical issues as the language develops to accommodate the new usages.

An initial attempt in this research to address inclusivity used the term 'non-male' in drafts but as the work progressed, its use to encompass the wide range of gender identities and performative experiences became more uncomfortable. 'Non-male' both reduced the intersectional experiences of women and non-binary genders into a homogenous representation and simultaneously reinforced the 'otherness' of not being male. The term establishes a heteronormative baseline that excludes those for whom being 'male' is misrepresentative and implies that being non-male is 'not normal'.

Another consideration was the use of 'female and non-binary', the idea being that *female* is an adjective as well as a noun and, used as an adjective it is less representative than when it is used a noun and more grammatically correct in most contexts within this research. However, the terms male and female are often strongly associated with biological distinctions and are not exclusively human terms. Interchanging 'women' with 'female' mitigates none of the problems when applying one term to express intersectional diversity and, similarly, 'non-binary' implies a fixed

representation of a gender identity outside of the 'typical' binary stereotypes, once more reinforcing otherness.

To identify the contemporary terms in use it seemed appropriate to investigate how other academics were approaching the grammatical and representative issue in expressing gender within similar research. In some of the studies that both influenced this research and that were completed within the last two or three years, the terms 'woman' and 'women', coupled with 'gender diverse' appear to be the current thinking on the expression of gender differentiation (Baxter, 2018; Brooks et al., 2021; Charlesworth & Banaji, 2019; Hoad & Wilson, 2020; Smith et al., 2018, 2019, 2021). Baxter (2018) however, acknowledges that "there is relatively little scholarly debate about how mainstream binary definitions may be transformed" (p. 8).

It was also useful to analyse the language and gender terminology in the survey responses, some of which used "female" and "woman" interchangeably, while others used deconstructed gender terms such as "womxn". Not every respondent acknowledged gender diversity but terms such as "non-binary" were present in some responses.

To encompass the spectrum of performative gender and address the exclusionary binary nature of simply discussing 'women' in gender disparity, the terms 'women and gender diverse' were used where practicable to mitigate the binary reinforcement. It must be acknowledged, as Butler (1990) points out, there is still the problem of intersectionality and reducing the wide variety of beliefs, experiences, and attitudes to simply the 'experiences of women', but this is perhaps the least problematic of a small number of choices within the English language. It should also be noted that to mitigate this where possible within this research project, any unnecessary gender distinction has

been omitted, and unless discussing an explicitly stated gender identity or preferred pronoun, there has been a deferral to the pronouns they/their to reduce assumptive gendering.

Gender Bias

Blickenstaff (2005) suggests that biological differences are less fundamental to the loss of women to the science, technology, engineering, and mathematics (STEM) realm than gendered education or gendered pedagogy; the causes perhaps being subtle and more insidious than the obvious differences. If the education or pedagogy behind the education is gendered, the knowledge could be figuratively *locked away* from non-male participants. Akrich (1992), Oudshoorn et al. (2004), and Wajcman (2000), identify a gender bias when technology is designed predominantly by male designers because the technology itself ends up favouring male end-users. While this may be the case, there is a further possibility which follows. What if the roles themselves and the use of technology are gendered? What if we perpetuate the gendering of roles and technology through our unconscious associations and biases?

This is where the potential influence of implicit bias emerges. The concept itself rears its head across several disciplines and has captured the imagination of more than one researcher in recent times. One common manifestation of implicit bias is *microaggression*. The term was coined in the 1970's by Harvard professor Chester M Pierce, from observations of everyday and subtle negative racial interactions witnessed on a college campus. These microaggressions are verbal and non-verbal in nature and involve small movements or large assumptions. Sue (2010) observed that although initially identified as a form of racial bias, the term, and the practice "can be expressed towards any marginalized group in our society" (p. 5) including those socially constructed groupings which are characterised by sexual orientation, class, disability or, most relevant to this research, gender. Sue (2010) continues, providing the following comprehensive definition: "Microaggressions are the

brief and commonplace daily verbal, behavioural, and environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial, gender, sexual-orientation, and religious slights and insults". Common manifestations in this research include, but are not limited to, assumptions made about roles based on gender, commenting on appearance rather than skills, and casual attribution of technical ability.

High profile implicit bias research has centred around the possible contribution of implicit or unconscious bias to racial profiling in policing and the disparate reactions of law enforcement where ethnicity is a factor. While microaggressions are predominantly based in behaviour, implicit bias is an unconscious association between behaviours or actions and a person based on an attribute such as ethnicity, sexuality, or gender. Stanford University professor of psychology, Jennifer Eberhardt, defines implicit bias as "the beliefs and the feelings we have about social groups that can influence our decision making and our actions, even when we're not aware of it" (Schlitz, 2019, para. 8). Greenwald and Krieger agree, refuting that humans act on explicit beliefs and conscious decisions alone, defining implicit bias as a "new science of unconscious mental processes that has substantial bearing on discrimination law" (2006, p. 946). Either way, implicit biases mean that people make judgements on others based on differences or similarities to themselves across a fluid spectrum of criteria such as socio-economic status, ethnicity, gender, sexuality, cultural and sub-cultural associations, the region you live in, and other (seemingly arbitrary) stereotypes. Agarwal (2020) makes a useful analogy, illustrating how an implicit bias is similar in function to that of a smoke alarm in that a smoke alarm is set to respond very quickly to any amount of smoke and, as such, can often be falsely triggered. We live with the inconvenience of this because the technology reassures us that in the event of a fire, the smoke alarm will respond early enough to give us adequate warning to escape or douse the flames. Implicit bias has developed in a similar manner to that described by

Agarwal, proposing that the “over-responsiveness of many of our snap judgments is a survival mechanism” (2020, p. 25).

It is therefore not an untenable leap to suggest that reactions to gender, age, sexuality, or any other demographic might be determined at an unconscious level – at least in the first instance – and that this ‘first impression’ might be more powerful than any mitigation through positive role modelling, marketing, or affirmative action. After all, gender equity and equal opportunity strategies have been in place for decades and appear to have had only a small effect on redressing the gender gap in music technology, DJ culture, and popular music, as demonstrated by Smith et al. (2021) during their 8-year study into the gender of professionals in these areas. The wider science, technology, engineering, arts, and mathematics (STEAM) industries are also experiencing less significant gains in addressing their gender gaps considering the various efforts and initiatives to address the issues over the past four decades (United Nations Educational, Scientific and Cultural Organisation, 2017). Faulkner (2001) discussed the apparent lack of progress in gender equity in science, technology, engineering, and mathematics careers, noting that two decades of government and industry initiatives specifically to promote gender equity has not produced significant results – and this was two decades ago. So now nearly four decades of initiatives have failed to make significant change and as Faulkner indicated two decades ago, there is “a failure to critically analyse the ways in which technology itself is gendered in the eyes of would-be technologists” (2001, p. 79). Faulkner suggests that the male dominance in science, technology, engineering, and mathematics industries, and by extension, education, is due to the “symbolic association of masculinity and technology” (2001, p. 79) and more specifically to the self-perpetuating situation where male-dominance in design teams and programming continues to ‘masculate’ technology.

Disparity in the Music Technology Classroom

Reflecting on being an educator and industry practitioner over the last twenty years, I have often wondered about the causes of gender disparity within the music industry and what is more, the very specific assumptions made around roles that are extremely prevalent and, to a certain extent, self-perpetuating. My own journey started by playing in bands with an interest in recording and live sound, while being somewhat oblivious to the lack of gender diversity in my immediate surroundings. It never crossed my mind that there were very few (if any) women or gender diverse engineers involved in production; that was both how the industry was and all I had known. In 1990's Aotearoa New Zealand, there was no widespread access to the Internet, and access to audio magazines and other resources was limited at best. The little information that was available was invariably about male practitioners and written by male authors. There were women involved, mainly in performance roles but rarely playing instruments – the notable exceptions were just that – 'notable'. Towards the end of the 1990s, I enrolled as a mature student in a recording and production programme run by Tai Poutini Polytechnic, the Music and Audio Institute of New Zealand (MAINZ), in Auckland. My intention, for the most part, to translate my industry skills into those that would be required in the computer age and furthermore to gain access to better recording equipment and acoustic spaces. It was here that I noticed that there was a demographic absent from the picture. I was in a class of twenty-five students of which two to three were women or gender diverse. By the end of the first year only one of them had successfully completed the programme. The tutors, guest lecturers, presenters in video resources, and image subjects, were all men, the textbooks were written by men, and the industry outside was almost exclusively men.

After graduating I returned to freelancing in the music technology industry, doing studio recording, mixing, mastering, and live sound production in Auckland and touring farther afield. While working in the industry with a number of practitioners, I don't ever recall working with any women or gender

diverse people apart from, once again, artists or sometimes working in promotion. Audio engineers and production crew tend to work in isolation and often operate in tight-knit communities. Furthermore, free-lancing can lead one to being protective of clients and one's own job – not a good environment for promoting equal opportunity employment.

I was approached after a few years of working in the industry to join the MAINZ faculty teaching part-time, initially in the studio focusing on practical recording but moved rapidly into lectures on more theoretical topics. Each year the staff noted the lack of diversity in applicants and often discussed what we could do to improve the disparity and increase the number of women (and later on, gender diverse) audio professionals. We all knew very few women or gender diverse engineers but endeavoured to be inclusive with guests in lectures, advisory roles and, when roles came up, employment. Despite our best efforts, the numbers never really changed. I think having an all-male teaching staff – many successful graduates being men and mostly male role models – did little to mitigate the 'male space' that women and gender diverse applicants (and in fact, successful students) found themselves about to be immersed in. I think that while we recognised the disparity, we, as a staff and in a lot of ways as an industry, did not really look hard enough to find the causes. The easy answers were that women and gender diverse people 'weren't interested' in the technical aspects of engineering and therefore didn't apply, or the 'biological imperatives' proposed by Susan Rogers (Savage, 2012) the choice between a career in music production or a family was seen as a powerful dissuading influence. I recall having many conversations on various levels with different colleagues about the issues and concluded that we had zero tolerance for the toxic masculinity culture that these circumstances can foster, but I don't recall anyone considering the fact that education and employment existed as 'male spaces' and that our continued presence in these spaces was potentially a contributing factor. The recognition of privilege was something that we

simply couldn't see from the inside, and I suspect still goes 'under the radar' in many educational and industry situations.

While the professional engineering aspect of my life was reinforcing the stereotypes in the music technology and production industry, my personal life was bridging two musical worlds, which collided, at least for me, in the early 90s. Extreme metal, which was (and in all honesty is) an apolitical male-dominated space, and the underground crust punk scene, which was much more driven by the ideals of the far left, including activism for equality of ethnicity, gender, class and sexuality. The mingling of these subcultures and the people involved in these groups was rare in many parts of the world, but they were merely strange bedfellows in Aotearoa New Zealand, possibly due to the small number of people involved in the subcultural 'scenes' and there being more commonalities than differences in the musical presentations. The exposure to the simplified tenets of anarcho-punk and more importantly anarcho-feminism proved to be a strong influence on my worldview, and eventually on my teaching practice.

The Research Project

The objective of my research project is to explore examples of the incidence and effect of implicit bias within music technology education and the wider industry in Aotearoa New Zealand. Additionally, the views held about bias and role gendering within those communities will be investigated through a small sample, based around current music technology education spaces. The wider objectives of this research are to explore the essentialist discourses that women and gender diverse people are 'less interested' in music technology studies, and that because of this *inherent* disinterest, are under-represented in the music technology fields. It is proposed that the gendering of roles and technology establishes a structural barrier, which perpetuates the gender imbalance

within the music technology sector. The primary research question seeks to interrogate these structural barriers:

- *What are the views of music technology professionals and students on the effect of implicit gender bias in the industry?*

In addressing this question, my dissertation will follow a traditional format, introducing the reasoning for the research and establishing the space in which the inquiry is conducted. A review of the literature and thought around gender issues including implicit bias, the extent of the gender disparity within music technology and the wider technological world will follow, leading into the current opinions and experiences of music technology educators and industry specialists. Having established the background and identified both the foundational and most recent thought on the topic area, the methods and methodology chapter will establish the research design, paradigm and philosophy underpinning the data collection, ethical considerations, analysis of the research, and reflection on the effectiveness of the research methodology. The findings chapter will detail the data collected and use the methodology informed by the literature as a lens to analyse the responses, and profile the participants and their experiences from a post-structural feminist standpoint. The analysis framework will be informed by the work of Derrida in identifying and deconstructing binary oppositions, for example, masculine/feminine, technological/emotional, and Foucault's thought around discursive power/knowledge structures to interrogate the 'text' created in the survey answers to expose the discourses that underpin attitudes and behaviours in the music technology industry and education communities. This is followed by the discussion chapter, which expands on the findings analysis and groups the shared experiences, facilitating a closer look at the prevalent discourses within music technology education and the wider industry. Finally, the conclusions chapter will summarise the findings and analysis, the use of the literature and

methodology, and place it all within the research context with reflections on limitations and proposals for further research into this currently under-developed area of knowledge.

The next chapter will explore the literature and theoretical work underpinning the concepts contributing to or intensifying the gender gap in relation to the use of technology in music to establish the themes and support the findings of this research project.

Chapter II - Literature Review

Boys love technology. They are likely to be technophiles. They like getting their hands dirty and pulling things apart because they are more technically minded and excel at tasks requiring complex tools and processes. Girls avoid technology. They are likely to be technophobes. They start with a concept and reluctantly find the technology to fit the purpose. They have an emotional nature, which makes them more nurturing and creative.

The above statements and similar sentiments are examples of a prevalent discourse or a binary essentialism where the "socially agreed upon" (West & Zimmerman, 1987, p. 131) biological differences between sexes are attributed behaviours and traits considered essential to the concepts of masculinity and femininity. This form of binary opposition nearly always establishes one term (usually the first) in a privileged position in the relationship. In this case, there is an associative understanding and high-level association of technology use with masculinity, while being less technically minded, nurturing, and emotional is associated with femininity. These statements are not always articulated but the implicit discourse nevertheless exists. One effect of this implicit bias is a gender disparity in applicants to music technology education, continuing into underrepresentation in the music technology industries. These seemingly innocent statements provide pervasive and damaging reinforcement to gender disparity arguments in technology heavy industries and the areas of science, technology, engineering, arts, and mathematics (STEAM).

This chapter will be exploring and integrating research and thought around the relationships between gender and technology, from the imposition of gender in design to the gender disparity in end-users, as well as the social gendering of roles, specifically in music technology education and the music technology industry. Due to the wide-ranging nature of music technology incorporating

a variety of instruments, equipment, roles and specialities, there are many aspects of gender research to investigate as well as the overarching establishment of gender as both an implied social construct and a performative action. Many of the studies and articles focus on the extent to which gender disparity characterises various professional domains rather than the experiences of those involved in music technology, although there are several articles investigating the reasons for gender inequity and the unconscious associations connecting gender and technology.

The concept of attributing behaviours and traits to gender, specifically in the context of who we think about in technological roles, involves a "latent technical determinism" (Smith, 2009, p. 162) that insinuates promotion of the idea that technology is democratic in nature while ignoring the effect of socially gendered roles and objects. This is the effect of an essentialist binary relationship between technophilia/technophobia and, more importantly, the designation of technophilia as masculine and technophobia as feminine. This idea is central to Oudshoorn et al. (2004) and their design concept 'I-methodology' which builds on the work of Akrich (1992) and describes the process by which designers assume the role of the end-user as they work on user-interfaces. Akrich discusses a blend of technical determinism and social constructivism used to describe the relationship between design and implementation of technology; a process through which the designer's projected user meets the real user. Oudshoorn et al. (2004) introduce a specific gender bias in as much as they presume technology to be designed predominantly by males and that they will therefore see themselves as the end-users, meaning by design the technology literally favours male users. Meredith Broussard provides an excellent example of this "Technochauvinism" (Thompson, 2018, para. 5), framed in the context of driverless cars, being touted as an amazing technological advancement for society where "these engineers often don't think about the woman's experience in a driverless car" (para. 6). Broussard continues to explain that the driver is an intermediary and a deterrent from potential harassment from other passengers, which if

removed makes rideshare and similar collaborative experiences less safe and demonstrates in Broussard's opinion that "autonomous vehicle companies are designing a technology that half of the world won't want to use" (para. 7).

With various reports and articles over the past decade (and more previously) indicating a lack of gender diversity in the wider music industry, and especially within the technology driven production and engineering realms (Armstrong, 2008, 2011; Bell, 2015; Born & Devine, 2016; Brooks et al., 2021; de Boise, 2017; Hoad & Wilson, 2020; Hopkins, 2017; Savage, 2012; Smith, 2009; Smith et al., 2018, 2019, 2021; Young, et al, 2018) it raises the question: Where are the women and gender diverse people who should be 'behind the glass' producing and engineering?

In the following pages, this question and speculation on the underlying causes for the absence of women and gender diverse people will be drawn out and filtered through the existing research in this area to support the research topic. This will provide a deeper look into some of the seminal texts on gender and feminist perspectives, articles, reports, and larger publications on the gendering of roles and technology. Furthermore, both quantitative and qualitative research into the music industry, the use of technology, and education provider experiences will be examined.

The Wider Context

To take a step back and look at the bigger picture. In the 2018 United Nations Human Development Report, New Zealand is ranked number 34 on the UN Gender Inequality Index (Switzerland is #1 with a low 0.039 value, New Zealand has a score of 0.136, and Yemen, #159 has a score of 0.834) (United Nations, 2018). In the music industry context, Smith et al. (2021) in a report analysing the gender and ethnicity of artists, songwriters, and producers in the top nine hundred songs between 2012 and 2020 offer quite staggering disparity figures (80% of artists, 87% of songwriters, and 98%

of producers identify as male). Closer to home, Hoad and Wilson (2020), in a report about diversity in the membership of the Aotearoa New Zealand Australasian Performing Right Association/Australasian Mechanical Copyright Owners Society (APRA/AMCOS) community, found comparable figures with approximately 68% of artists, 65% of songwriters, and 78% of producers identifying as male.

Young et al. (2018) researched author gender for those delivering presentations at Audio Engineering Society conferences for the period between 2012 and 2016 and found (in both single and multi-authored papers) male authors made up approximately 91% of presenters. These authors noted that there was negligible difference in author gender across subject areas, although there were slight exceptions in health and education related subjects where male authors represented 80% and 75% respectively. The perception is that health and education are associated more with nurturing or caring than technology and, as such, may be subject to gendering in the sense that health and education are seen as domains where it is 'acceptable' to see women occupying professional positions in significant numbers. These researchers also noted that the Audio Engineering Society's (AES) membership and participation at conferences correlates in terms of gender breakdown to the gender disparity in industry – between 90-95% – and declared that "more must be done to ensure that gender equality is addressed, creating an environment where future students can thrive regardless of gender" (p. 7). This said, Smith et al. (2018) in the first iteration of their annual report, conclude that further research needs to occur around inclusivity in the technical side of the music industry and further down the 'pipeline' in education, arguing that "research should explore whether there are biases baked into music education" (p. 27). Smith et al. also allude to the possibility that there are barriers to entry into technical education for both women and gender diverse applicants in terms of "pursuing math, science or other science, technology, engineering and mathematics fields".

Blickenstaff (2005), who previously conducted theoretical research on this topic, draws from a wide range of research literature. Blickenstaff identified and critiqued nine reasons why women and the gender diverse were “leaking from the science, technology, engineering and mathematics pipeline” (p. 369) and concluded that some of these nine reasons “hold very little water”, for example “biological differences” and “lack of academic preparation” (pp. 371–372). Other areas within the nine listed explanations point towards a need for further study, such as gender difference in attitudes to science and technology and, more interestingly, how some of the other identified reasons in the list may be affecting these attitudes including role modelling, gendered curriculum, and gendered pedagogy. Blickenstaff makes some of these connections in the research review, concluding that there is a potential correlation to music technology in the sense that there is similar underrepresentation for perhaps similar reasons. Both Born and Devine (2016) and Hopkins (2017) draw the same conclusion from Bickerstaff’s research and specifically refer to the ‘leaky pipeline’ metaphor in the music technology and education context.

In a final observation of the leaky pipeline, several researchers broach the biological imperative, which anecdotally removes a significant number of women from science, technology, engineering, and mathematics – and music technology careers – for reason of their desire to have a family. Smith (2009) concludes from interviews with Aotearoa New Zealand audio professionals that sound engineering with its late nights and long shifts is often incompatible with family commitments and especially child-rearing. Bell (2015) includes opinions from record producers Sylvia Massey and Trina Shoemaker, discussing their acknowledgement of the perceived incompatibility of their careers with family life, while Savage (2012) recounts Susan Roger’s reflections on choosing a production career over a family. These examples highlight acts of the ‘symbolic violence’ that Bourdieu (2001) refers to involving use of a subtle mechanism of masculine domination – careers

in the music technology industry are 'gate-kept' in the sense that society often accepts that women must choose between their career and a family, while male engineers can choose to have both. To frame it another way, there is a discourse that audio engineering and production inherently suits male engineers because masculine traits are an advantage in music production while femininity must be sacrificed upon the altar of otherness – femininity takes on de Beauvoir's socially subordinated role of 'the Other' (1953).

Smith et al. (2019) conducted 75 qualitative interviews with mainstream industry professionals and concluded that "the need to balance personal and professional concerns may restrict the opportunities women are able to take but is not sufficient to explain the low percentages of women in the field overall" (p. 28). In the same report however, they describe the structural "barriers faced by female songwriters &[sic] producers in music" (2019, p. 22) including themes that appear within this research project. Smith et al. asked the open question "what barriers have you faced as a songwriter or producer in music?" (p. 23) eliciting some non-gender specific barriers such as how difficult it is to break into the industry, and the financial instability inherent in the industry. "Women's skills and abilities being discounted" (p. 24) details gender inequity with an explanation that women shared experiences of being undercut, having their skills doubted or ideas not being taken seriously, and having to prove their competence to male colleagues where men entering the same spaces do not face the same challenging attitude.

The next barrier that Smith et al. (2019) discuss is headed up "Sexualised and Stereotyped", (p. 25). They explain that many respondents had reported occurrences of gender stereotyping, especially around the expectation that, as women, they would be "warm, supportive, or kind", which Smith et al. regard as "*not* the traits that describe successful leaders" [emphasis in original] as one might expect in the production role. Instead, traits such as being "ambitious, dominant, assertive", which

are often described as *masculine*, are preferred. By way of conclusion, Smith et al. state that it appears that "when individuals think producer, they think male". This research also highlights sexualisation and objectification as contributing significantly to the participant's experience, with incidences of both objectification and constant subjection to the 'male gaze' through to not feeling safe in the workplace.

In the final section of Smith et al.'s (2019) report that the respondents identified the music and music technology industry as "male-dominated" (p. 26), citing the damaging effects of being "a statistical minority" (p. 26), which in turn reinforces the effect of the increasing normalisation of sexualisation and stereotyping identified in the earlier discussion of barriers, and having ideas and suggestions overruled or discounted. The male domination of spaces also influenced a lack of positive role models. Smith et al., however, make the point that role modelling alone does not always encourage entry to an industry, especially if there is an established negative stereotype such as a lack of technical competency. In the case of music technology (and technology-based industries in general), the decision of an individual to enter a career can be influenced by "experiencing stereotype threat, or the fear of confirming a negative stereotype about their gender" (p. 27). The results of these interviews recounting the negative experiences of successful women in mainstream industry highlights a discourse underpinning the entertainment industry in which men are understood to be the wielders of power/knowledge in roles associated with creating, producing, and manufacturing music, leaving women and gender diverse persons on the margins.

Gendered Roles

In discussing the gendering of roles, it is useful to begin by looking at the discourse that focuses on the conceptual differences between sex and gender, and the ways these terms have historically been used and continue to develop and change as research in this area has progresses. From a

positivist perspective, sex identification in humans is determined by the existence of a Y-chromosome in 'male' DNA and the lack of a Y chromosome in 'female' DNA, as proposed in Nettie Steven's and E.B. Wilson's separate but concurrent 1905 research (Miko, 2008), although one might argue that this definition is a form of social contract within the sciences since the scientific method allows for redefinition as further evidence emerges. The unrepresentative nature of 'biological' sex assignment fails to recognise the diversity of both the biological spectrum and the social construction of gender (Abrams, 2020). West and Zimmerman (1987) discuss their experiences in the 1970s and how there was a clear distinction between sex as biological difference and gender as "constructed through psychological, cultural and social means" (p. 125). Their argument further develops to show how society also decides how to categorise sex and is especially relevant when considering gender diversity. Furthermore, sex also alludes to the nature of how we define 'maleness' and 'femaleness' at a biological level. If society understands sex as biological, and the categorisation of sex as socially agreed, as West and Zimmerman suggest, then gender can be considered a 'role' – in the same sense as an actor might portray the traits and social signalling of a character archetype. This was introduced earlier, and Butler (1990) contributes significantly to this discussion, approaching gender through a feminist lens with the focus of gender as *performative* rather than fixed. Abramo (2011) extends this to propose further that one's identity is not 'sexed' or fixed biologically but rather is gendered and fluid, depending on the social situation. This socially situated nature of gender leads into two important areas – the gendering of roles and actions within society, and the social gendering of objects.

Gendered Technology

Wajcman (1991) was one of the first feminist theorists to explore the idea that "technology itself is gendered" (p. ix) although not the first (nor the last) to point out that the culture surrounding technology has become inherently masculine. Armstrong (2008) highlights Turkle's observation

that although the technology itself is not inherently biased, the culture of the technology will promote socialised behaviours, which can bias gender (amongst other factors). It is important to note however that it is difficult to conceive of removing masculine bias from technology when it is predominantly designed and created in male-dominated science, technology, engineering, and mathematics industry with all the inherent biases therein. Blickenstaff (2005) alludes to the similar attitudes fostered by a dearth of positive role models, a societal expectation of fulfilling 'traditional' gender roles, and "an inherent masculine worldview" (p. 372) in the science, technology, engineering, and mathematics realm.

Caputo (1994) critiques the assumption that technology in the music classroom is neutrally gendered, will benefit *all* students, and that mastery of technological processes leads to social progress. In this case, 'mastery' is identified as a masculine trait and women or gender diverse persons exhibiting technical prowess equates to a loss of femininity (Smith, 2009; Wajcman, 1991). Caputo's deconstruction of these assumptions investigates the attitudes imbued in the creation of the technology through the lens of Foucault's (1995) notions of societal disciplinary power structures and the perpetuation of this technological power through representation and design.

Foucault has been a significant influence on feminist writing and the concepts of power/knowledge structures underlying discourse, critique of essentialism, and the concepts of the body and sexuality as cultural constructs. Although contested in some areas of feminist writing, notably Hartsock, who was critical of Foucault's tendency to reduce individuals to "victims of disciplinary technology or objects of power" (cited in Armstrong, n.d., para 9), Foucault does initiate compelling ideas detailing the power structures embedded within society that are nurtured in part with implicit biases. The underlying power structures in the patriarchal relationship of technological industries is maintained by those who wield the knowledge of the technology. In this case (and nearly every other), this

power/knowledge is a male domain, and as Caputo (1994) reveals, this benefits those in powerful normative positions and excludes those marginalised by their access to technology. This is Foucault's disciplinary power, wielded by male practitioners, educators, and designers, subjugating the industry's marginalised membership – women and gender diverse persons.

The question of whether technology creates a 'level playing field' (not just in terms of gender, but class, sexuality, ethnicity, and socio-economic status) is a fertile ground for opposing views. Armstrong (2008) reminds us that 'the great equaliser' of technology, when described as an agent for social change, ignores "the social contexts in which it is used" (p. 376). Yet there were many optimistic studies heralding a new age of equality through technology (Brynin, 2006; Burnett, 1996; Carruthers, 2009; Kanevsky, 2012; Moorefield, 2005; Shuker, 2008) claiming low-cost computers and open-source software would mean that everyone would have access to the tools with which to create music regardless of ethnicity, sexuality, gender, or class. Wajcman (2000), on the other hand, was critical of notions of technology, given the strong relationship with masculine identity and the culture of technology, as having a democratising influence on society. Similarly, Taylor (2001) urges caution in that "the claim that a particular technology is democratising should always be accompanied by questions: In what ways? And for whom?" (p. 6). Caputo (1994) also asserts that an assumption that technology holds 'benefits for all' continues to silence those who are most disempowered by the relationship with technology. In the music technology realm, it is often women or gender diverse students in these disempowered roles even if the intersectional factors such as class, sexuality, ethnicity, age and so on, are denied the benefits as well.

Caputo (1994) describes the concept that 'mastery' of technology allowing musicians to 'gain control' and 'manipulate' sound as being inherently masculine (from an essentialist standpoint) and that it traditionally ignores the role of creative praxis. In a related area, Smith (2009) analyses gendered terminology often associating music technology with "masculinity, technical prowess,

specialised knowledge and male-dominated fields such as science and mechanics" (p. 81). These aspects alone speak to the conscious and unconscious gendering of technology in the music technology classroom and by extension, the roles associated with technology use. Caputo continues to caution that 'girls' are often socialised to relational knowledge and that to achieve mainstream (or 'malestream') success with technology, they must conform to male norms (1994). This echoes both Wajcman's criticism of creating opportunities for women to participate in masculine culture by exchanging "major aspects of their gender identity for a masculine version" (1991, p. 2), and Smith's (2009) sharing of a personal response to her research, indicating that equality in the music technology industry often equates to a loss of femininity.

Gendered Subjects and Objects

The gendering of roles can also be transmuted to objects in the sense that objects might be identified or associated with a gender. Doubleday (2008) delves into the gendering of instruments both historically and with a nod to the current situation, concluding that there is a commonly held instrumental bias that feminine instrumental traditions are trivialised in comparison to masculine instrumental culture. Hallam et al. (2008) did a major survey of Local Authority Music Services in the United Kingdom and documented instrument choices from preschool through to tertiary level (although sample sizes were too small in the pre-school and tertiary sectors for 'reliable' positivist themes to emerge). Their findings showed very clear gender-aligned instrument choices being made through primary and secondary education streams, indicating the presence of a discourse around instrument choice and roles. One of the most gendered instruments was the flute, where 89% of learners were identified as women or girls. Waters (2016) provides an historical perspective, the researcher recounting that in the late 18th century, the flute was a symbol of masculinity (p. 63), something which today shows the gendered mutability of its role. A (slightly) more recent example

can be seen in Johnson's (2000) account that using a microphone and electrical amplifiers in the 1930's was seen as "feminising" the singer (cited in Smith, 2009. p. 173). One might argue that this is still the case with Hallam et al. (2008) finding 80% of vocal students were 'female'. Within music technology and in the digital realm, Bell (2015) expands Armstrong's (2011) notions of difficult software being masculine and easy or intuitive software being feminine, comparing the gendering of technology to the gendering of instruments. Hopkins (2017) synthesized studies from several prominent gender researchers to discuss this idea of gendered instrumentation, historically to contextualise where the prevalent masculine attitudes have emerged from and notes that in contemporary society, the electric guitar and turntables are both perceived as more complicated technological instruments that have become male dominated objects. Music technology software is in a similar category, something shown by the high numbers of software-based productions in the popular music realm; a fact that correlates with the 98% male producer phenomenon (Smith et al., 2021).

Where does the pipe start to leak?

Studies conducted around the gender disparity in science and technology roles indicate that the disparity exists in tertiary education and industrial contexts despite there being indicators of parity in high school education (and in some cases even tertiary), which point to equal numbers of students with aptitude in the science, technology, engineering, and mathematics areas (Miner et al., 2018; Moss-Racusin et al., 2012; Stoet & Geary, 2018). Similar gendering of philosophy study is indicated (Ma et al., 2018) where an interesting correlation with science, technology, engineering, and mathematics seems to be occurring. Of the humanities, philosophy courses regularly have over 80% male students. The proposed reasons for this disparity appear to be strikingly similar on the surface, predominantly male tutorial staff, male authors of the seminal texts and an intriguing hypothesis that potential students "are aware of the negative stereotypes that others may have

about their capacity to engage in the field, which in turn inhibits them from performing" (Ma et al., 2018, p. 69) and possibly from enrolling in the first instance.

Yansen and Zukerfeld (2014) assert that the gendering of the roles around technology starts in early childhood, especially through toys and associated reinforced play behaviours (parental, cultural and wider societal influence), and media, in the form of cartoons. In fact, there is an indication that "[m]ore specifically, inspiring models of women making innovational use of technologies are not detected in any media format" (p. 310). Yansen and Zukerfeld also recount Wade's (2009) short investigation into gendering at a large toy store chain, which revealed that from twenty-four sample recommendations for each available gender interested in 'techie' toys, thirteen were building/engineering toys for boys, with just one building/engineering toy recommendation for girls. Girls had more media player recommendations, leaving Wade to tellingly conclude "[s]ure enough, [the toy store chain] confirms that girls may *like* technology, but boys build it" (Wade, 2014, para. 8, emphasis in original).

Eberhardt (2019), investigating racial bias in the United States, explains that children soak up the nuances and microaggressions in the world around them from a very early age, and that they do this as a survival mechanism that leads to associating gender roles with technology. Eberhardt discusses discovering racial bias and stereotyping in her own toddler, despite growing up in a liberal, well-educated household, as a consequence of exposure to people outside of the family group. Eberhardt discovered the microaggressions of strangers, even actors on television, and the constant portrayal of stereotypes were more persuasive than conscious examples or explicit actions. These initial biases are hard-wired at an early age indicating that children develop very sophisticated and nuanced detection and analysis abilities from birth, and that these formative biases tend to govern our unconscious reactions throughout life.

Hallam et al. (2008) synthesised and analysed several surveys done in the United Kingdom, which explored gender division in musical instrument choices, and found that divisions begin in the primary school age group. Interestingly, these authors note that women and gender diverse students learning a musical instrument of any type outnumber men (approximately a 60:40 division) although there is some evidence (albeit in a compositional context) that the incorporation of technology is changing this gendered behaviour. Born and Devine (2016) indicate that there is a gendering division that occurs prior to tertiary education. They extrapolate this evidence from the fact that their research indicates that the acceptance rates for women in higher education are slightly higher than those for men. It is worth noting that gender diverse applicant information is still being adopted across the sector and so this information will be changing over the next few years and will thus require further research. This indicates that, rather than many women or gender diverse applicants being turned away, there is in fact not many women or gender diverse applicants in the first place. It is easy to see where the essentialist argument around inherent interest becomes pervasive, because there is an allusion that there exists the possibility of gendered pedagogy and the effects of implicit bias at play. To extend Oudshoorn et al.'s (2004) i-methodology concept once more, if curriculum, course content, and assessment are designed predominantly by male lecturers, the programme and pedagogy are likely to be biased towards other males and 'masculine' traits and behaviours.

Blickenstaff (2005) discusses why gender disparity should be addressed in relation to the following three main points: equity, 'brain-drain', and loss of diversity, and there is no reason to reinvent the wheel. However, to contextualise this framework to music technology: Addressing inequity by removing the systemic barriers, so that anyone should feel able to choose to study music technology regardless of gender. Addressing 'brain-drain' in that the music industry loses vast amounts of talent

to other study areas and careers due to the implicit gatekeeping of knowledge and technology. Finally addressing the loss of diverse perspectives self-perpetuates the inequities as technologies, roles and pedagogy remain gendered. The culmination of Blickenstaff's framework is that women and gender diverse persons remain underrepresented and marginalised within music technology education institutes and thus the industry they service.

Conclusion

The themes drawn from the literature reveal gender inequity within music technology education, the wider music industry, and science, technology, engineering, arts, and mathematics education areas generally. The proposed reasons for this are wider and more complex than have been addressed here. However, it can be said that gendering technology itself and the gendering of technological roles are critical factors in this imbalance, and furthermore that the unconscious biases developed and supported through this gendering are limiting factors when redressing this imparity.

The technical determinism in the design of technology, led by predominantly male design teams, for male end-users contributes to the wide gender disparity across many areas of technology. Music technology is no better, as the educators of the next generation are predominantly men, articles and professional literature are predominantly written by men, and the technology itself has been culturally constructed as masculine. For the few women or gender diverse students to be considered technically proficient often requires adoption of masculine attitudes that subordinate feminine traits in an industry-wide act of symbolic violence.

With technical roles identified as masculine, it follows that the objects themselves take on a masculine gender by proxy. This implicit bias starts from a very early age, with the social

construction of narratives which contribute to the music technology gender breakdown beginning soon after birth as the brain develops. The continual reinforcement of pervasive positive and negative stereotypes only perpetuates this 'hard-wiring', which in turn perceptually mitigates conscious manifestations of bias. Most of the literature reviewed provided recommendations for how change to the *status quo* might be implemented – fertile ground for research and study in the future. The thoughts, experiences and developed themes related in the literature have influenced the design and the approach taken within this research project. The following chapter will address the project design from a theoretical and philosophical perspective, as well as unpacking the specific details of the tools used to gather data, analyse the data, and interpret the results.

Chapter III – Methods and Methodology

The purpose of this chapter is to explain the research methods and methodology employed in this study of the attitudes that are implicit to gender bias in music technology education and the wider music technology sector. The research question is seeking data about the attitudes and opinions of those experiencing music technology education or the music technology industry. Their experiences will constitute knowledge about their world, and the discourses in play which are affecting their lives. For this outcome, a qualitative approach is appropriate. Furthermore, this feminist post-structuralist approach has been chosen to encompass localised subjective analysis of data, and a plurality (or multiplicity) of viewpoints and lived experiences. Lastly, post-structuralism as a feminist methodology will be discussed, along with the methods used to collect data, the analysis methods employed, and ethical concerns.

Several of the following themes are introduced in the previous chapter, and it is worth reiterating key areas that lead into justifying the chosen research methodology. The research project objective is to gather and interpret data enabling identification of the extent to which implicit bias and role gendering exists within the music technology education and industry community in Aotearoa New Zealand, and to investigate the views held about implicit bias and role gendering within these communities. The data collected will be analysed through a post-structural feminist lens to deconstruct and interrogate several themes including the essentialist discourses linking technology to masculinity, the prevalence of role gendering in the music technology community, manifestations of privilege, experiences of gender bias, and the barriers faced by women and gender diverse persons entering this field. The larger intention of identifying the link between unconscious gendering of roles and technology will interrogate the social discourse that women and gender

diverse people are 'less interested' in music technology studies and that because of this *inherent* disinterest there is an underrepresentation of diversity in the music technology fields.

There have been steps in place to redress the gender balance in music technology for several years, with many focused positive events and practises producing very little progress. For example, over the period from 2006 to 2016, The Music and Audio Institute of New Zealand (MAINZ) had an average of 10% women or gender diverse student enrolments – varying up to 14% and down to as low as 4%, despite ensuring that there was representation of women in marketing materials, industry representation, student councils, and face-to-face recruitment. Anecdotally the gender breakdown in the other music technology programmes in Aotearoa New Zealand has been similar.

The idea that technological roles generally, and specifically music technology are inherently masculine is a theme repeated in the works of Blickenstaff (2005), and Wajcman (1991, 2000), specifically discussing the gendering of music technologies (Armstrong, 2008, 2011; Bell, 2015; Born & Devine, 2015) and the role gendering associated with musical instruments (Doubleday, 2008; Hallam, Rogers, & Creech, 2008; Taylor, 2001). This research demonstrates several fruitful insights into gender equality, including the prevalence of views on the gendering of roles, and technology in music technology education and the wider music technology industry.

Research Question

The methods for this research project have been designed to answer the following question:

> What are the views of music technology professionals and students on the effect of implicit gender bias in the industry?

The question itself is intentionally open to encompass a wide variety of opinion and experience, as the music technology industry is a space of diverse views despite the narrowness of its demographic

make-up. The issue of gender disparity within the music technology education space and the wider industry has been brushed off for many years as simply reflecting a lack of interest from women and the gender diverse people. A range of simple answers have been used to explain this disparity such as: the biological imperative; women and the gender diverse people not liking technology, the school system not adequately preparing the students; a lack of equity in approach to career counselling in regard to careers in music technology. Furthermore, seldom has there been an overt or sustained discussion about the themes drawn out by this project in the above-described context. The intention of the project is to investigate and recount experiences and opinions across a range of people involved in music technology or embarking on their career journeys in the music technology sector. The intention of exposing prevailing discourses in terms of beliefs and experiences will reveal the underlying power/knowledge structures and allow interrogation of the binary essentialisms. The intention is not to create overarching meta-narratives upon which society should move forward, but to present information, interpreted through my own biases and opinions, so that the reader may interpret their own narrative, draw their own conclusions and be more aware of the ways in which their own unintentional behaviours, microaggressions, and assumptions sit within these discursive power structures.

Paradigm

Weedon's (1987) contextualisation of the difference in ontological viewpoints, regarding women's experiences, is a relevant starting point. Weedon states that "[e]ither we can see women as essentially different from men or as socially constituted as different and subject to social relations and processes in different ways to men" (p. 8). Unpacking this idea touches on the consideration of gender as a predominantly binary performance, a common stance in feminist writing in the latter half of the 20th century, leading to the criticism of feminism's lack of intersectionality, reinforcement of binary gender representation and language which marginalised gender diverse

persons (Butler, 1990). Regardless of the language used, the concept remains valid in that the ontological considerations involve a belief that there is an *essential* difference between all genders, or alternatively that the performance of gender is a social construction, that is; gender is "subject to social relations and processes" (Weedon, 1987, p. 8) that differ depending on the gender being performed. Ontologically this research stems from the latter position that gender is socially constituted.

O'Leary (2014) identifies the positivist paradigm as the belief in an unchanging universal truth that is embraced by everyone, regardless of experience or circumstance. This truth can be sensed and measured and is thus empirical. Truth can be identified by repetition of experimental results – the scientific method with its focus on validity as that which is achieved through objectification of the subject examined. There are no universal objective truths being sought here, no essentialisms or generalisations, no 'drilling down' to discover the reality for all humans because the humanist objective reality or rationality of traditional research methodologies have been long critiqued by both post-structuralist and feminist scholars as supporting the patriarchal research norms, gatekeeping academia, failing to acknowledge the non-male experience, and silencing the already marginalised and powerless (St Pierre, 2000). O'Leary's comparison continues into a 'post-positivist' paradigm, identifying a relativistic truth, socially constructed by the human experience, with both similarities and uniqueness existing simultaneously while being subject to multiple interpretations. Although feminist research itself has been criticised for a lack of intersectionality through prioritising the white middle class American perspective (Butler, 1990; Harding, 1991), post-structural feminist researchers continue to challenge the scientific method with its framework of all reality as a constant unchanging truth of all, regardless of the individual's relativistic experience. St Pierre (2000) incisively sums up this sentiment when saying that "removing itself from the realm of

human activity, *reason* supposedly remains untainted by the messiness, the chaotic nature – the irrationality – of daily existence" (p. 486, emphasis added).

So, with the ontological assumption that knowledge can be produced from lived experience and subjective truth, and that multiple versions of the truth may exist simultaneously, the research methodology can be introduced. As contested as modern methodologies are, O'Leary (2014) identifies commonalities in feminist methodologies using several explicit criteria, including but not limited to; political motivation, commitment to empowerment of women, challenging social inequalities, representing diversity and marginalised voices, recognising the differences between genders and within genders, acknowledgement of power relationships, and the acceptance of multiple subjective truths. Harding (1991) clearly delineated three aspects of her research method seeking to clarify a distinct feminist methodology – epistemology, methodology and method, from which a useful framework can be used to explore the methodological basis of this research.

Firstly, in addressing the underlying epistemological concerns, we need to ask, can the participants produce knowledge? In the positivist paradigm of thought, common threads might be drawn from the research participants and represented as truth provided that the sample is large enough for statistical significance. However, given that this truth comes at the expense of the individual's experience, particularly affecting marginalised groups within any community, and since a variety of studies indicate that 90–95% of people involved in music technology identify as male, the common threads in large enough numbers to represent 'truth' are likely to represent male opinion and privilege in similar measure. In this research project, the epistemological view is that the women and gender diverse participants expressing their experiences and opinions constitute the knowledge of those in the margins of the music technology industry although some participants may be closer to the heteronormative 'centre'. Harding (1991) and others, such as Hartsock (1983),

claim that the standpoint of the margins and therefore the marginalised, reveals experiences that are less visible the closer you are to the systemic structure i.e., males in the music technology area do not always experience the results of implicit bias and the gender disparity. A potential limit standpoint theory is that the view from the margins constitutes the essence of truth for all women's experiences, but this 'feminist empiricism' runs the risk of reducing everyone to an average of experiences within a sample and leans towards the same positivist requirements for research that meet quantitative standards of statistical validity. Two examples of the dangers of relying on these averages especially in the study of people, can be found in Rose's (2016) book, *The End of Average*, where 4000 air force pilots were examined with a view to calculating the average pilot-size to design an ideal cockpit. The study revealed that of the 4000 pilots interviewed, none of the participants met all ten criteria used, resulting in the subsequent cockpit design not adequately fitting any of those interviewed. Similarly, a renowned gynaecologist sculpted a statue of the average woman, based on fifteen thousand adult women's measurements, and staged a contest to find women who could submit measurements closest to that of the statue, only to find no exact match. In an object lesson in how bias can shape responses, the Air Force reacted to their result by changing the designs to be adjustable to individual requirements (potentially the immediate stakes are higher), whilst many of the medical profession of the time of the statue contest interpreted the results as meaning that American women were unhealthy and out of shape. This 'average' body type, which no-one conformed to, still became a cultural construct of the idealised 'female' body to be used as a comparative measure to wield structural power over body image.

Tandon (2018) places the association of feminist methodology with post-modernism and post-structuralism at its roots of the "second wave of North American feminism" (p. 3), potentially taking the ontological and epistemological framework of second wave feminism and mitigating the lack of intersectionality, or prioritisation of white middle-class feminism, which excluded other factors that

shape a person's life experiences. Post-structuralism itself has been concerned with, among other aspects, the deconstruction of binary essentialisms and the investigation of inherent power structures, including the plurality in positions of being at once powerful and powerless depending on the changing dominance of the discourse at play.

Post-structuralism emerged as both a reaction to structuralist thought (which in turn rose from a move away from phenomenology and existentialism), and a continuation of the work of structuralist thinkers (Mann, 1994). Structuralism is based on the notion that society and social interaction is governed by complex structures or underlying rules and protocols constructed, maintained, and followed by society, both consciously and unconsciously (Mann, 1994). Post-structuralism is in some ways symbiotic with structuralism in that if there are no structures, they cannot be exposed. Post-structuralism seeks to critically interrogate the structures underpinning society and more specifically, how people are affected by and interact with these structures. Three of the more prominent academic pioneers influencing post-structuralism were Barthes, Derrida, and Foucault although many other philosophers and academics could be argued to have heavily influenced post-structural approaches. Each of these protagonists were seeking a new way of understanding, researching, and critiquing and, as such, it is useful to look at their approaches in broad strokes, especially in terms of how their ideas directly inform the analysis of the gathered data in this research project.

Barthes contributed heavily to several academic fields and disciplines including post-structuralism, and in some ways his work on semiotics, particularly in the analysis of mythology foreshadowed the post-structural plurality of truth for a given sign. Although sometimes overshadowed by Derrida and Foucault in feminist writing, Barthes' ideas can be seen as a bridge from structuralism's fixed meaning of text limited to the intention of the author into post-structuralism's multiple

perspectives of text based on the reader's interpretation of the author's intentions. Barthes' essay, "*The Death of the Author*" (1967), proposes that the author's intention is both unnecessary to the reader's understanding of how to interpret the text, and is itself made up of opinions and quotations interpreted by the author; "the text is a tissue of citations, resulting from the thousand sources of culture" (Barthes, 1967, p. 4).

Derrida's ideas contributed to the use of deconstruction of text seeking to "expose, and then to subvert, the various binary oppositions that undergird our dominant ways of thinking" (Reynolds, n.d.). Derrida followed on from the work of Barthes, proposing that text cannot be objectively interpreted and that the text is subject to the reader and their experiences. There may be multiple interpretations of any text, and all are equally valid from each readers' point of view. In issues of gender, the binary oppositions are defined by the gender 'norms' male/female, masculine/feminine or, to be more inclusive of gender as a spectrum, male/non-male (which has the unfortunate side-effect of reinforcing heteronormative values or emphasizing the 'otherness' of non-male members of society). The dominant way of thinking, or *structure* in music technology has influenced the formation of a male dominated space, and so Derrida's deconstruction framework and interrogations of the binary will, in part, be used to look at the survey answers as text and to look for examples of reinforcement or subversion of these binary oppositions and interpretations.

Foucault's contribution to post-structuralism is vast and combines history, sociology, philosophy, and psychology in a blend of discourse analysis that he termed both archaeological and genealogical. From a feminist perspective, Foucault's work on power relationships within discourse (power/knowledge) has been very influential to several prominent feminist writers including the works of Butler, Weedon, St. Pierre, and Baxter that have in turn contributed significantly to this research project. The notion of discourse for Foucault was not simply about "ways of thinking and

producing meaning" (Weedon, 1987, p. 108), but was about socially constructed knowledge and practises with embedded power. We express ideas and knowledge within a framework of power which can be reinforced by societal 'common sense' or prevailing discourse, resisted by the same structure, or used to wield power by changing the discourse (as discourse evolves and changes from a historical perspective).

Weedon (1987) and then Baxter (2003; 2008) outline a method of feminist post-structural discourse analysis (FPDA) which has been used to inform the method of this research project. FPDA works toward exposing localised social inequalities; representing the marginalised voice of the 'other' in the form of the text and context from participants, and comparing the multiple, subjective, and partial truths held by participants considering the dominant discourse or heteronormative experience. In the context of this research FPDA is used to interrogate a possible gendered preference for technology and attitudes to implicit bias. Weedon (1987) establishes that the interpretation of discourse and language around experience, gives meaning to experience while "poststructural feminist theory suggests that the experience has no inherent essential meaning" (p. 34). The style of question created for this project was partially formed considering how Baxter gathered data for two FPDA projects – interview and observation *in situ*. In this research project, the desire to maintain the anonymity of the participants made these exact methods unavailable but influenced the intention of the design to make the questions open for participants to freely discuss experiences and opinions having been prompted by scenarios, statements, images, or a combination of the three – interview and observation by proxy. For the analysis of the research data, it is useful to consider that the participant's answers, based on qualitative open questions, constitute a text, shaped by the participants' experiences, and by comparing each participant's answers throughout the survey these shaped experiences and the underlying discourses may emerge in strong individual themes or pluralistic contradictions. The interpretation of this 'text'

forms another layer of subjectivity within the analysis in the traditions of Barthes and Derrida. Baxter (2003) highlights the possible plurality of experiences of a woman in a position of responsibility, such as producing music or teaching audio, can be, in a Foucauldian sense, both powerful in that position and yet be simultaneously rendered less powerful by the undermining of male clients, colleagues or students because of their gender, through a variety of mechanisms ranging from dismissiveness and assumption through to sexual harassment.

So, a post-structural approach is one that resists delivering objective truths and instead accepts the notion that multiple perspectives of the same phenomenon will differ due to the experience of the participant and yet be true for that participant with their subjective past experiences contributing to the sum of their total experience. In addition to this, their individual experience will be both interpreted and reinterpreted by each reader and filtered through the reader's own experiences. One might begin to think that 'it is turtles all the way down'. Baxter (2008) reinforces the notion that feminist post-structural analysis resists any emancipatory agenda that might "'become a will to truth' and therefore 'a will to power'" (p. 3). There is not one single reliable truth or essentialism which can be generalised and applied, but a multitude of truths simultaneously for each experience coexisting and even interacting with the truth of others – who inevitably must of course include the researcher and the 'researched'. Some may perceive a post-structural approach as a disadvantage for this very reason – that no generalisable rules or essential truths are being produced but from a feminist post-structural view, the investigation and documentation of experience produces knowledge by seeking out the experiences of the marginalised, exposing implicit and explicit power structures so that differences and similarities might be discovered, acknowledged, and ultimately navigated.

The Respondents

The respondents were sought from within the polytechnic degree programmes delivered at the Music and Audio Institute of New Zealand (MAINZ) Auckland and Christchurch, the Southern Institute of Technology (SIT) Invercargill, and the School of Audio Engineering (SAE) Auckland. At any given time across these programmes during the academic year, there are between 100-200 students actively engaged in music technology study, but the percentage of probable participants for this research project was estimated to be between 1-2%. The only criteria for selection to participate in this research was that the respondent had engaged in music technology education as faculty or as a student within the past 2 years, at any level of the music technology degrees offered. The nature of the survey meant that it would have been difficult to maintain participant anonymity and apply any selection criteria simultaneously.

Initial contact was made by contacting the programme managers or campus administrators through website contact pages or email. Those contacted were asked to distribute a flyer (either as a poster or electronic attachment) to the student body in the areas of interest. Some of the programme managers were approached through the primary researcher's network and were glad to help. The survey itself was advertised via these posters and flyers with QR codes that linked participants to the survey, and by sharing the flyer throughout the virtual learning environments at all the polytechnics and private training institutes that currently deliver music technology courses in Aotearoa New Zealand. Although targeted at the student body, most staff at these institutes are industry practitioners as are many of the senior students. Furthermore, the institutes themselves have a high level of engagement with industry professionals and alumni, culminating in a potential pool of participants from across the spectrum of music technology disciplines. The survey also included basic demographic data to collect age-range, gender, ethnicity, and the highest level of education for the purpose of providing some context to the information being shared and to help

with further research. Gender information was collected by asking about preferred pronouns rather than by requesting a direct identification of gender, which in hindsight was a little ambiguous and left some room for misinterpretation of gender. It might have been useful to gather regional data as well but to a certain extent looking for trends influenced by any of these demographic details does not benefit a post-structural framework except in terms of individual context.

Method

To encapsulate some of the post-structural approaches such as the interpretation and deconstruction of text, and an analysis of the inherent underlying power/knowledge structures in the gendered relationship with technology, a 'text' was required. Normally this text would be acquired by conducting interviews and/or focus groups but this research project's design was influenced by a desire for anonymity. While research of this nature can involve confidentiality, where the researcher and participants interact and the interaction itself forms part of the research, there was the possibility that the researcher's position in the education space might limit participants from discussing experiences or attitudes if they felt exposed. By ensuring anonymity, participants were encouraged to answer questions, which may have contained their thoughts about sensitive experiences without the anxiety that the researcher could identify them. Because there was the possibility that the researcher also taught some participants, anonymity removed the real and perceived power to influence the participants' grades or education outcomes, again in the hope that this would remove any potential anxiety about sharing experiences, attitudes, or examples. After considering a few methods involving proxy interviewers with a 'cut out' between the raw data and the researcher, an online survey seemed to be the most effective way of maintaining anonymity when using carefully considered questions to elicit qualitative data. This text separated the research from interrogating answers more fully and, as such, creates a powerful post-structural interaction

as the researcher is interpreting the participants' authorship as a reader. With no opportunity to dig down into the authors' intentions, this interpretation becomes part of the experience.

Qualitative, and especially, post-structural methods of data collection do not usually include surveys, which are more closely associated with quantitative research. However, the term 'survey' is stretched in this case as the data collected is open and qualitative in nature, as the researcher's intention is to interrogate participants more in the manner of an open interview with a view to collecting vicarious observations. The questions will be described in more detail in the coming pages but essentially posed scenarios, some with visual images, some with statements, and some as direct questions, were asked to prompt reactions and underlying attitudes, experience, and self-reflections.

The initial idea for online survey questions was to introduce a scenario where participants were asked to react to the scenario in the hope of uncovering any implicit bias or a recognition of how implicit bias might come into play in the scenario. Initial research into implicit bias testing, (Eberhardt, 2020; *Take A Test*, n.d.) indicated that there are many quantitative designs, but a degree of technical sophistication beyond the researcher's knowledge base was required as the functionality of the freely available tools did not seem capable of capturing meaningful data. The draft survey thus consisted of visual images representing a range of gender identities with a descriptive situation involving an aspect of the music technology industry. The question subject images were to be chosen for their diverse range of ethnicity, age, and gender presentation, although this was more difficult than was my initial expectation and in fact led to the creation of a survey question. The initial plan also involved incorporating a secondary interview or focus group to ask follow-up questions from the survey to dig into the data a little more deeply while still maintaining anonymity, but this approach was difficult and potentially outside the scope of this

project. In the final survey tool, the participants were asked to identify roles based on the visual imagery for the purpose of investigating their conscious and unconscious biases in determining the roles depicted. In some cases, the participants were given the roles in the scenario and asked to comment on their feelings about gendered roles and to share experiences that may relate to the imagery, or they were given the imagined results of a survey question and asked to comment on their feelings about the results. The final question text is contained in Appendix 2: Survey Tool and the following is breakdown of the question development; why the question was included, what each question sought to explore, and some reflection on the efficacy of the question post-survey. Further reflection on the questions is included in both the findings and discussion chapters.

Question One:

This question involved two stock photo images and included fictitious information about both images. The subjects in the images were labelled with their preferred pronouns to be inclusive of gender diversity and to avoid potential discussion around assumptions of gender by presentation clouding the question's intentions. The intention was to use a diverse range of ethnicity, gender, and age within the survey images, but the stock photo database made this difficult, as most images sourced when searching for ‘recording’ or ‘music technology’ themes portrayed Caucasian males. Since the database was American, I was not expecting ethno-diversity to be especially inclusive of oceanic ethnicities, but the diversity of images did limit the number of visual image questions.

The initial question scenario was that Thomas and Mereana (names that required some consideration to be both unambiguous and inclusive) were in a studio discussing a technical aspect of recording. The question would ask the participant to ascribe a role – either engineer or singer – to each person (with no other information provided). The object was to uncover feelings, opinions, and experiences about implicit bias but, based on the target participants and their awareness that

the survey was about implicit bias, there was the concern that it might elicit responses about the question structure or format rather than about unpacking the participants' feelings about implicit bias. The final wording of the question ended up splitting the question across two pages, the first introducing the subjects and allowing time for the participants to unconsciously assign roles to Thomas and Mereana, and the second page revealing fictitious results indicating that most people identified Thomas as the drummer and Mereana as the engineer. There was an additional statement about fictitious survey participants having difficulty assigning a role to Mereana, hinting that both roles are male-dominated and that the roles themselves have masculine associations.

The intention was to elicit deeper discussion around the gendering of roles, but in hindsight it might have been more effective to telegraph gender biasing in the initial question by identifying Thomas as a more accepted 'feminine' role such as a backing vocalist and Mereana as a 'masculine' role such as engineer to invert the binary discourse and gauge reactions to this gendered deconstruction. After the survey data was gathered, reflection on the responses indicated that a very simple gendered set up of Thomas as engineer and Mereana as a vocalist might have equally drawn-out experiences in an uncomplicated way, although the more obvious construct was covered in the subsequent questions.

Question Two:

The second question depicted four people in a recording studio, labelled A, B, C, and D (see Appendix B) and asked the participants to assign a role to each person depicted and elaborate on their reasons for doing so. A follow-up question asked if their choices were based on their experience, an ideal or another basis. The intention of this question was to explore what choices people might make for the one female-presenting person in the image more than anything else. The image was chosen because the two central characters are particularly useful in that the male

character holding the tablet device (using technology) has an 'authoritative air' while the other characters are engaged or listening. This reinforced the gendered role of authority and use of technology in the studio and allowed participants to discuss their thoughts about this. In hindsight, the question had limited success perhaps due to the wording or the idea that participants would be looking past assigning the roles into the reasons why. This question might have worked better in a focus group or interview format where the follow up questions could be more usefully applied to 'dig' into the answers. The image itself is staged with models and under the direction of a photographer, which some respondents acknowledged as they considered the image, as none of the subjects seem particularly realistic in any role and perching on a console worth more than a small house deposit is an unusual position during a session where the focus tends to be behind where the subjects are staged.

A further reflection that arose once some of the data had been gathered was that it might have been more pointed to ask a question based around identifying the female-presenting subject as the engineer with the band in a recording session and asking the participants what behaviours they might expect this person to recount from the situation. This would become an opportunity for sharing experiences around stereotyping, assumption, objectification, and the power/knowledge relationships of being in a 'powerful' position as engineer and how being the gender minority in that space affects that position. These shared experiences and examples were present in other questions but appeared here only if a respondent elaborated on their comments, rather than as the result of a direct question, and so this became a missed opportunity.

Question Three:

While designing the survey, some image searches were required for the visual questions. In doing this, it became apparent that when searching generically for images in one of the largest paid stock

photo libraries in the world, that images tagged with recording, recording studio, music recording or similar terms, showed a pattern where nearly all female-presenting subjects were behind a microphone while anyone behind a mixing console or computer was male-presenting (and mostly Caucasian). The discovery of the results of these searches led into the development of this question to identify the pattern (real or imagined) and ask participants to comment on whether the stock photo database was representative of the industry. The intention was to see if implicit bias might be playing a role in image choices being made by the providers of stock images and if, in turn, anyone thought this subtle device reinforced biased ideas. The question wording, upon reflection, may have hindered the results in some ways, as the word 'intentionally' made the question more about the intentions of the stock photo database (read: Patriarchal conspiracy) rather than whether the image providers were trying to reflect the reality of the industry as they understood it. Further reflection on this aspect of the question circled back to the idea that someone, or something designed by someone is ultimately tagging the images, and selecting the image tags, which the search algorithms sorts and selects. This reveals the possibility of the influence of implicit bias or perhaps unconscious intentions, but the question unfortunately was not, in the hindsight, designed to probe this further.

Question Four:

In a similar vein to the previous question, the introduction to this question developed from using Google image searches for non-gender specific roles to make a point about how the role is presented to a young woman or gender diverse applicant wanting to become a sound engineer. It was initially developed as a 2-minute presentation on the research topic as a demonstration of the gender disparity in the music industry through freely available material. The introduction uses the search term 'audio engineer' but it is a depressingly similar result for 'recording studio', 'sound

technician' and 'recording engineer'. The actual question continues to ask about the perceived difference in experiencing the role of audio engineer or student as a man compared to that of a woman or gender diverse person. With this question, there was an opportunity for respondents to discuss their own experiences of gender issues within music technology and to comment or share their perceptions of how engineers of different genders experience the music technology realm. The introduction appeared to unintentionally distract the participants from the question – the question text drifted as it spoke to a similar concept as did the previous question. It did however serve as a reminder that the overwhelming majority of audio engineers are male, and the media imagery associated with it reflects that. The hope, in the end, was that it might gather comparisons between the experiences of the participants and the search results, and to disrupt the participants from the train of thought in the previous questions. Whether this was successful in the end is debatable and it might have been more fruitful to ask a question directly related to the results of said search terms as one of the participants pointed out.

Question Five:

This question started with an opening statement "Boys/men are into technology and toys, while girls/women prefer emotional content and stories" which came from noticing over the years that variations of this statement and the practice of reinforcing gender stereotypes are often the first thoughts that emerge when asking why the music technology industry is so heavily weighted towards male participants. Since it equates to an essentialist discourse, it was useful to ask participants if they had thoughts along this line, and perhaps how these statements had been a part of their experience. The intention was to see if statements reinforcing gender roles would be viewed positively from the participants' perspective since, on the one hand, this response 'gate-keeps' technology through gender preference but identifies strengths in other aspects of music production. Another aspect that this question intended to address the possible detrimental effects

of ‘throwaway pop-psych’ statements, as an explanation and how this might reinforce the stereotypes, and effectively aid the practice of keeping women and the gender diverse in the margins.

This question ended up being a little less successful than first imagined as the wording directed respondents towards their opinions of accuracy, and their answers sometimes boiled down to the respondent disagreeing with the sentiment rather than considering the effect of such statements.

Question Six:

This question came up at the last minute from classroom discussions about privilege (although question four is essentially asking the same thing without the loaded term ‘privilege’) in the context of the ‘Black Lives Matter’ movement, and the surprising lack of understanding about how the term privilege is perceived and how difficult it can be to see from inside a privileged position. Previously, the privilege of being near the structural centre or being part of the majority was discussed and can make the standpoint from the margins difficult to imagine.

The intention of this question was to see how privilege might be perceived within the music technology industry and more importantly within music technology education. While the term privilege can be emotionally loaded, it was intended that the question might reveal thoughts and experiences around how privilege manifests in the music technology education system and how it contributes to reinforcing the gendering of roles. Upon reflection on the answers, the word ‘privilege’ was a double-edged sword in that it telegraphed the answer to anyone not in a position of privilege to answer ‘yes’. An interesting aspect was that, for respondents in a privileged position, their answers were evasive and negating of the concept, a common attitude among the privileged in wider society (or at least on social media/Internet forums/comments sections). There was a

missed opportunity to expand on this as it became central to the application of implicit bias, and it appears to be an area requiring further study.

Question Seven:

This question was split across two pages, much like Question One, to allow the participants the opportunity to freely consider traits of successful music technology professionals or students without considering gender for the moment. The second part of the question asked participants to determine if the traits or behaviours they identified might be considered gendered (for example, emotional connection being feminine or technological prowess being male), and further if their consideration of the gender trait (or otherwise) would be a widely held belief. The intention of this question is to interrogate similar themes from question five where emotional connection or vulnerability are seen as feminine and more importantly whether those behaviours were valued or seen as valuable approaches in music technology and music technology education communities.

Question Eight:

This was an open question asking participants to summarise, question or comment with additional thoughts in case experiences came up from the survey that a participant might feel were useful or clarifying but did not fit entirely within the scope of the questions or the opportunity to elaborate or add thoughts which may have arisen through consideration of the subject matter.

Question Nine and Ten:

The final question intended to solicit common demographic data including gender/pronouns, age-range, education, and ethnicity to understand the participants engaging in the survey. In hindsight, it might have been wiser to have asked for this information before launching into the survey proper as a few respondents partially completed the questions (commonly stopping after the first couple

of questions) and never got to the demographic data. Although this research is not seeking to necessarily link opinions to a gender or background in a grand narrative structure, it was useful to view the participants' responses through the lenses made available from this demographic data.

Ethical considerations

In the introduction to the methods section, the reasons for creating an anonymous survey for the purpose of this study centred around two main issues. Firstly, the potential power issues around the researcher being a lecturer at some of the sites where potential research participants are studying. Secondly, the potential for participants to be concerned that there may be consequences to disclosing their experiences openly, inviting harassment or other unwanted attentions should they be identified. Although these are the primary ethical concerns, which led to the anonymous survey, being cis male in a feminist research space raises issues in terms of privilege and more importantly recognising that this privilege may bias the research process. This is reflected in more detail in the Conclusion but analysing the participants' results brought home several areas of reflection on how male privilege in this space is affecting the student experience and how difficult the journey is regardless of reaching the destination.

Conclusion

The methods and methodology, taking a relativist ontological stance, coupled with the epistemological belief that the experiences and opinions of the participants active in music technology education in various roles and in the wider music technology industry constitutes a valid and reliable experience-based truth, interpreted by the researcher as reader, forms the framework of this research. The use of feminist post-structural discourse analysis, based on the work of Weedon (1987) and Baxter (2003, 2008), and the methodological influence of Barthes (1967), Derrida (1981) and Foucault (1978, 1995) forms the method, adapted to maintain anonymity to

counter the potential power imbalance and mitigate any conflict of interest in the outcome of the project. The breakdown of the intention and development of each question in the survey tool, along with some observations around the effectiveness of the question post-survey, serve to contextualise the methodology and form the basis for further analysis and reflection in the discussion section to support the findings of the research project.

Chapter IV – Findings

This chapter will present the results of the survey responses, presenting the insights of each respondent who completed the survey as a profile created from the raw data obtained. This data refers to the narrative that involves their participation in the survey, experiences, and opinions in the context of implicit bias in the music technology education space and the wider industry.

Demography

A brief analysis of the collected demographic information reveals the nature of the participants. Of the thirteen respondents, five chose not to answer the question, leaving one in the 16-20 age group, three in the 21-29 age group, three in the 30-39 age group, and one in the 40-49 age group. In terms of ethnicity, there were four respondents identifying as Pākehā or NZ European, one identifying as British, two as Māori, and one as Pākehā/Māori. Two respondents used he/him as their pronouns, five preferred she/her, and one preferred she/her/they/them. Finally, the education level was more diverse with one level 5 certificate, three diplomas (level unknown), one bachelor's degree, two master's degrees, and one university level with no other indication. From this, there will be a diverse range of experiences, social filters and biases revealed, that may have to do with gender, ethnicity, and age group.

Initially, the intention was to present the results of the survey question-by-question to compare each participant's response in each context. Although this approach was a tempting one to take, in the sense that there would have been clear similarities and distinctions between experiences, the human tendency to seek out similarities may have ended up producing a series of meta-narratives, reducing the participants to an archetypical sum of their collective experiences, rather than acknowledging their individual truth and opinions. While analysing the survey answers question-by-

question, it became clear that grouping each participant's answers as an individual response served to create a more fully formed picture of each experience. This approach was more sympathetic to the stated post-structural methodological goals of recognising each individual's experiences as their truth and making the survey response more like an interview and observation in the style of Baxter's feminist post-structural discourse analysis (2003, 2008). Since there is still some merit in identifying discourses within the music technology industry, especially in terms of recognising toxic behaviours and speculating on how widespread these behaviours are, common and notable experiences were included in the discussion chapter.

The grouping of the participant's answers forms a profile to unpack the responses from each substantial participant. 'Substantial' was defined as a participant providing answers to most questions and elaborating on their answers where requested. Of the thirteen respondents, some answered less than half of the questions although ended up providing occasional insights. These respondents' answers have been omitted from the main findings process that had to do with creating profiles, but any fully formed answers the respondents gave are reflected and noted in the summary section after the completed profiles.

One of the primary tools used in the analysis of the survey responses involved identifying discourses within the answers. Baxter (2003) identifies discourses as "forms of knowledge or powerful sets of assumptions, expectations and explanations, governing mainstream social and cultural practises. They are systematic ways of making sense of the world by inscribing and shaping power relations within all texts" (p. 7). In earlier sections, it was suggested that the constitution of experience as knowledge forms the foundation of post-structural analysis. The binary essentialisms within the participants' answers expose the underlying power structures upon which the discourse both has

been formed and is formed by, and the analysis seeks to expose these formations and the effect of shifting power structures within the text on the participants.

To remove some of the clinical nature of analysing anonymous information, the participants and respondents have been given pseudonyms based on song titles which have proper names in the title. This seems apt considering the focus of the industry being researched is music. Bob Dylan has a large enough catalogue of songs with a good mix of names to choose from and so it makes it a little more consistent to base the participant pseudonyms on Bob Dylan song titles. Each title will be used in its entirety as the title of the profile, and thereafter the eponymous character of the song. Should anyone want to listen to the referenced song while reading the findings note that the participant and the song are not intentionally linked in any way. The first profile is named Woody after "Song to Woody" (Dylan, 1962) which was on the first Bob Dylan album, and the subsequent participants will be named chronologically where practical. The grouping of names alphabetically from Dylan's catalogue was considered, as were using songs from multiple artists to reflect the original Participant A-G designations, but the decision of which names to use for each respondent may have involved unconscious bias or interpretation on the part of the researcher, and so choosing one artist, Bob Dylan, using *name* songs where appropriate (avoiding "The Lonesome Death of …" and similar potentially uncomfortable titles) chronologically will remove the potential of intentional characterisation through song lyrics.

A: "Song to Woody" (Dylan, 1962)

From the demographic information, Woody identifies as Pākehā preferring he/him pronouns and is between the age of sixteen and twenty with a diploma qualification. From the answers given, he refers to some work experience in recording studios and shares his opinions based on his experiences.

In the first visual question, participants were informed that the two characters pictured were in a studio scenario and that one was a drummer and the other an audio engineer. On the next page, the question revealed that more people had assumed that Thomas was the drummer and Mereana was the engineer, and that other respondents had commented on their difficulty in deciding Mereana's role. Participants were then asked to both speculate on the reasoning, share experiences, thoughts, and feelings, and secondly unpack their assumptions when first presented with this information and share any thoughts or feelings. Woody assigned roles to the characters in the photographs based on clothing, body language, and facial expression, indicating that the male-presenting subject "has a funky hat" which was identified as indicating someone "who is laidback, creative, and doesn't worry about life too much" which are described as traits of "most drummers". The female-presenting subject has a "very serious look on her face" indicating to Woody that she had an "analytical mindset, therefore being better suited to a technical role." However, in the second visual question where participants were presented with four subjects in a recording studio session and were asked to assign roles to them, Woody identified the drummer as the latter was seated (another "typical" behaviour). The female-presenting subject in this image is identified as a bass player based on "[t]he jacket and the hat." The other band members are partially identified by their haircuts. The discourse presented in these 2 images appears to be that there is a uniformity to the way certain instrument players present in terms of clothing, facial expression, and body positioning. In the second question, there does not seem to be any correlation between the

characters' facial expressions and their suitability to a particular role. For example, in the image related to the second question, the female-presenting character has a serious expression, which in question one indicated the "analytical mindset" of one with a technical role. The second male character from the right also has a serious expression and is using a tablet device, yet neither of these characters were identified as having a technical role.

In the final visual question, the participants were presented with a group of stock photos depicting images of male-presenting engineers operating computers and equipment, and female-presenting subjects singing. It was revealed that these images were the results of a gender-neutral search of a stock photo database. The stock photos concur with Woody's experience of reality that there are more "female" singers than engineers. Nevertheless, Woody also claims that stock photos do not reliably represent reality.

In the following question, when asked about the differences in experience in the music technology industry based on an engineer's gender presentation, Woody shares his experiences with other engineers, finding men to be "a mixed bag" of both competency and attitude ranging from "very good" to "absolutely horrid", while "[b]y contrast, every female engineer I have worked with has been hostile towards myself and other males in the room" and Woody has experienced "much more sexism from women to men". It should be noted that Woody acknowledges that he has "only encountered a small handful [of female engineers]".

The next two questions asked respondents to comment on throwaway phrases, which equate technology with masculinity and emotional content with femininity and asked about men holding a privileged position in the music technology industry. In terms of the gendered statement, Woody finds women to be more "practical and professional" in the studio (apart from his earlier stated

experience of overt sexism from a woman in a studio environment). However, he does not mention technology in his answers despite identifying, in the first question, engineering as a "technical role". When asked about privilege, Woody responded that "older male engineers" have a privileged position, but that gender bias has not been an issue since there is a "lack of gender bias from *their* points of view" [emphasis added] – 'their' in this case indicating a number of Woody's "female peers" with whom he has discussed gender bias.

The next question asked respondents to think about traits which are desirable in successful engineers and then (on the next page) asked if these traits were 'gendered' in both the participants' eyes, and if they thought other people might gender these traits. Woody noted that people were "far more individualistic than that" but identified traits of "creativity and aesthetic awareness" as being "ascribed … to women more commonly". The final question was an open forum that invited participants to share experiences or comments. Woody returns to his experience of the "female engineer" who was openly hostile, loudly declaring their hatred of men. Woody continues that there are "more women acting hostile" and "acting as though every man in the audio industry is inherently sexist". He describes himself as "an emotional male". This prefixing of emotion to his gender performance or masculinity highlights how a person might unconsciously acknowledge the social norms of masculine performance, i.e., being comfortable expressing emotion as a male, above the social expectation of masculinity to eschew emotional display. This discursive language device is associated with reinforcing 'otherness', for example *female* drummer, *male* nurse, or as Woody [and other participants] demonstrate, "*female* engineer". A prevailing discourse in wider society in Aotearoa New Zealand is typically that men are more stoic in nature whilst women express their emotions openly, facilitating the binary oppositions masculine/feminine and stoic/emotional. In Woody's related experience, "female engineers" exhibiting negative and hostile attitudes might be a perception of masculine behaviours exhibited by women in a gendered space,

for example, the labelling of women displaying ‘masculine’ traits such as confidence and assertiveness as ‘bossy’ or ‘pushy’.

B: “Ballad of Hollis Brown” (Dylan, 1964a)

Hollis identifies as Pākehā preferring he/him pronouns and is between the age of twenty-one and twenty-nine with a certificate qualification. In the first visual question, participants were informed that the two characters pictured were in a studio scenario and that one was a drummer and the other an audio engineer. On the next page the question revealed that more people had assumed that Thomas was the drummer and that Mereana was the engineer, while other respondents had commented on their difficulty in deciding Mereana’s role. Participants were then asked to both speculate on the reasoning, share experiences, thoughts, and feelings, and secondly to unpack their assumptions when first presented with the information and share any thoughts or feelings. In relation to the visual questions, Hollis asserts that the roles have “nothing to do with [g]ender” and identifies Mereana’s “expression aligning with” engineering, which is a “more serious and technical role”. Thomas’ expression, on the other hand, is more aligned with music as he expresses “playfulness and freedom”. Hollis continues to unpack the question and the results of the fictitious survey as evidence that gender bias is much less prevalent in music technology “than people make it out to be,” while at the same time identifying engineering as a “male dominated field”. Despite recognising male domination and suggesting gender disparity is less prevalent, Hollis admits that he had agreed with the question text and had assumed Thomas was the drummer and Mereana, the studio engineer, following up with “I really don’t believe it’s a negative to assume someone is a studio engineer”. In the context of Hollis’ entire response, the final statement appears to relate to his belief that gender bias does not play a part in whether a person chooses to become an audio engineer, a discourse introduced in question one and revisited throughout the survey answer. It is worth seeing Hollis’ entire response in this case.

> Question 1A(ii) – Assuming that Mereana is perhaps a studio engineer in my opinion goes to show that the gender bias is much less than people make it out to be. This is because the survey showed most assuming that she is an engineer which is a male dominated field. If the gender bias was more prevelant [sic] one would expect to find more people answering that Thomas was the engineer because he is male.
> Question 1B – I thought Thomas was the drummer and Mereana the engineer. And I really don't [sic] believe it's a negative to assume someone is a studio engineer…

In the next question, the participants were presented with a group of stock photos depicting images of male-presenting engineers operating computers and equipment, and female-presenting subjects singing. It was revealed that these images were the result of a gender-neutral search of a stock photo database and were then asked if the images were representative, and to elaborate on their answers. Hollis believed that the stock photo images reflected reality in that "more men are studio engineers" and that the reasons for this are clearly down to choice: "more men choose to be engineers than women". Hollis offers the opinion that to "suggest that this is solely due to bias and oppression is wrong" and to reinforce his point he elaborates on "nursing and teaching" where "society isn't complaining about too little[sic] women in those fields" and restates that "[a]udio engineering is a choice", in that in Hollis' society, "[w]omen today are able to make that choice" and anyone "holding *them* back" [emphasis added] would be easily identified.

While it is tempting to pick holes in these statements and point out that this is the result of perception from a position of privilege, it does demonstrate one of the more pervasive manifestations of bias and microaggression. In the same response, Hollis asserts that as a society we are "the closest we have ever been to equal opportunities" and yet many high-profile articles in the music technology community indicate that less than one in ten women pursue a career in music technology. Numbers like this are difficult to attribute solely to choice.

In the following question, when asked about the differences in experience in the music technology industry, in relation to an engineer's gender presentation, Hollis continues reinforcing the point that 'choice' is the main barrier to women in the music technology realm but paradoxically acknowledges that "women feel intimidated by a male environement [sic]" – the recording studio. According to Hollis' response, "most male engineers in the present day" endeavour to "treat everyone the same" in their "male environement [sic]" and are "more assertive" in the same "competitive environment" of the studio. Seeing the wider industry through this lens contributes to the privileged 'level playing field' discourse. "[I]f a woman is talented and dedicated and most importantly *chooses* to be an engineer/musician she will succeed *just like a man would*" [emphasis added]. Blam Blam Blam! might point, "There is no depression in New Zealand" (Von Sturmer, 1981, 00:30).

Hollis' use of the phrase, "succeed just like a man would" might be indicative of the discourse that many traits of a successful engineer are masculine traits. This relationship of engineering to masculinity is continued in Hollis' response to the question that specifically addressed successful engineering traits and asked whether they are commonly attributed to a particular gender. He reveals that in his view, masculine traits include working "extremely long hours" and "being firm when dealing with [people in] this very cutthroat industry", while feminine traits include having "better hearing on average than men" and "understanding the needs of the band to a deeper extent". The ability to work longer hours is often equated to an abdication of responsibility for family and the duty of care that is typically passed to the mother (whether this be in the context of child-rearing or caring for the deeper needs of the band) – essentially a sexual division of labour. This can also be linked to the stereotypical nurturing behaviour culminating in the deeper understanding of the 'needs' of the band, and the stereotype behaviours identified by Smith et al. (2019), where women are expected to be more "warm, supportive, or kind" (p. 25).

It would be remiss to conclude this section without sharing Hollis' experience of working with a "female engineer". Hollis found this experience to be "the most dismissive experience Ive [sic] had where I felt truly unwelcome in the studio". As with Woody in the previous section, it is a shame that there was not more detail provided in relation to this experience, as it may have significantly contributed to Hollis' attitude to "female engineers". While he may have been exposed to an unpleasant and unprofessional engineer who happened to identify as "female", the underlying themes of privilege and an almost libertarian insistence that the playing field is level in terms of gender, in music technology in his responses, also allows for the possibility that Hollis could be encountering an assertive "female engineer" in a 'male space' exhibiting behaviour equating to "being firm" in this "very cutthroat industry".

C: "To Ramona" (Dylan, 1964b)

Ramona identifies as Māori preferring, she/her pronouns and is between the age of twenty-one and twenty-nine, with a diploma level music technology qualification.

In the first visual question, participants were informed that the two characters pictured were in a studio scenario and that one was a drummer and the other an audio engineer. On the next page, the question revealed that more people had assumed that Thomas was the drummer and Mereana was the engineer, while other respondents had commented on their difficulty in deciding Mereana's role. Participants were then asked to both speculate on the reasoning, share experiences, thoughts, and feelings, and secondly unpack their assumptions when first presented with the information, and share any thoughts or feelings. Ramona noted that she was unsure why more people identified the roles the way they did in the question text but agreed that she had assigned the same roles. She continues by stating that "I'm inclined to say that this is my *bias* toward empowerment of women", placing Mereana "higher in the hierarchy of the conversation around microphone selection and

placement" and expressing a desire to understand why she did not "assume she was the drummer". This reveals Ramona's recognition of a discursive hierarchy in the studio setting, with the producer and engineer sitting at the top of the production chain, wielding specialised knowledge as power in the context of a conversation around recording equipment. With Mereana in this role, she is the wielder of this knowledge and thus takes on the privileged position in the binary expert/layperson discourse.

In the second visual question, where participants were presented with four subjects in a recording studio session (see Appendix B) and were asked to assign roles to them and elaborate on their choices, Ramona has not applied the same empowerment bias and the female-presenting actor is identified as either "assistant engineer/artist". These positions are somewhat less powerful in the 'hierarchy' of studio responsibilities that Ramona alluded to in the first question. The more 'powerful' roles of producer and engineer are assigned to male subjects, except for the slightly out-of-frame male subject (subject D) whom Ramona has relegated to "artist" based largely on the positioning of the subject in the photographer's framing. Ramona expresses uncertainty, being "unsure of what his role is – standing towards the outside of the frame, meaning he is further away from the centre of conversation". Similarly to other participant responses, the framing of the image, positioning of the subjects, the subject's body attitude and facial expression, all contribute to the assignment of roles and, perhaps, unconscious associations of gender in these roles. In Ramona's case, the assignment of roles has some connection to style, perhaps echoing the previous participants' identification of role by clothing and perceived attitudes imbued in the costume. Ramona, however, did not elaborate further on this observation. The first male subject is assigned their role partly based on their physical situation – as the subject is "sitting in the chair" and is the "oldest (looking) of the group", which Ramona either equates with being "pretentious/elitist" or equates those attributes to the traits of male engineers. This seems to be based on experiences that

Ramona shared in a later question about privilege in the music technology industry involving older male engineers being rarely subjected to “mansplaining, misogyny, sexism etc.”.

In the following question, the participants were presented with a group of stock photos depicting images of male-presenting engineers operating computers and equipment, and female-presenting subjects singing. It was revealed that these images were the result of a gender-neutral search of a stock photo database and were then asked if the images were representative, and to elaborate on their answers. The stock photo images prompted Ramona to share her opinion and experience about the wider industry, namely that men “dominate” the production side and women “make up a larger percentage of the artists”. Recent studies (Hoad & Wilson, 2020; Smith et al., 2018, 2019, 2021) paint a bleaker picture of the make-up of artists in that men seem to dominate all aspects of the music industry, the role of vocal performance is an acceptable gender stereotype in society, which is possibly what Ramona is alluding to here. The example she gives is Taylor Swift’s “entire exec circle being run by white men” and points out that men are determining the “kind of content that is being produced”. Ramona is recognising Taylor Swift’s “exec circle” as the curators of her musical output, wielding gendered control (Wade, 2014) of the “content being produced” and in some ways, applying a design methodology, or ‘I-methodology’ to the *design* of popular music (Oudshoorn et al., 2004). This observation of the underlying ‘white male’ machine behind Taylor Swift’s artistic output often invites exposure to further marginalisation where pointing out that the cynical production of empowered artists for profit can lead to accusations of being ‘woke’ or indulging in ‘cancel culture’. However, the data in multiple studies indicates exactly the situation Ramona has observed – most engineers, producers, songwriters, promotional teams and “exec circles” (and performers) in the mainstream music industry are male (Smith et al., 2018, 2019, 2021).

In the question relating to the differences between male, female and gender diverse engineer's experiences, Ramona's experience in music technology education points toward several key aspects about representation and the effects of being a minority in an education space as a student. She observes that students, who identify as the same gender and culture as their teachers, develop a different relationship to those who don't and that "[t]here is a massive lack of underlying communication that goes on" which is less available to those *other* students. This observation speaks to deeply gendered and culturally focussed divisions in the music technology classroom, which reinforces the existing hetero-normative and ethnocentric realities evident in the research (Hoad & Wilson, 2020; Hopkins, 2017; Smith et al., 2018, 2019, 2021). The point here is that commonalities of culture, gender, and other societal aspects maintain a discourse around an us/them binary, which in turn becomes a form of structural power as the 'us' group share an understanding or experiential basis unavailable to 'them'. If you want to be 'us' you need to act like 'us', meaning your 'them' experiences become less relevant. Ramona sums this up by stressing the importance "of being seen, heard and understood", reinforcing the *otherness* of being a woman or gender diverse student in a space dominated by men, and the need for diversity in the teaching faculty and wider industry.

The next question asked respondents to comment on throwaway pop-psych phrases, which equate technology with masculinity and femininity with emotional content. Ramona identifies the "stereotypical gender roles" in the question relating to binary statements, although admits making similar statements in the past before unpacking "the ways in which such statements are harmful". There was a period where such statements were common ('men are from Mars' is an axiom in pop culture example, however the basic concept was widespread as discourses around technology/emotion, engineering/music, etc.). It was seen as a celebration of difference without the critical analysis of the ways in which such positive reinforcement can simultaneously

disempower the receiver of such critique regarding Derrida's *preferred* side of the binary essence (1981).

Ramona continues this thought when responding to the question regarding privilege in the music technology industry, noting that a vastly higher representation of "male engineers in the industry" translates to women "fighting a lot harder to secure their place" and being routinely exposed to "mansplaining, misogyny, and sexism". She deftly states, that privilege is "the absence of those things in an already competitive and challenging industry". In the final section, Ramona refuses to be drawn into ascribing overt character traits to a gender, instead identifying "being proactive, approachable, easy to work with, not having a giant ego, being a good listener, [and] showing up on time" as things any gender is "capable of". It should be noted that although these character traits can be exhibited by any person, being 'unapproachable', 'acting superior', and 'having a giant ego' are implied behaviours associated with male engineers (Smith et al., 2019), that are especially exhibited towards women or gender diverse peers and musicians. This may indicate a manifestation of Ramona's formative experiences in education and the wider industry.

D: "Gates of Eden" (Dylan, 1965a)

Eden identifies as a NZ European, preferring she/her/they/them pronouns and is aged between twenty-one and twenty-nine, with a bachelor's degree. The use of multiple pronouns might indicate a non-gender specific identity or inclusive language but there is no way to discern this with the information given. Considering this, they/their pronouns have been used in reference to this participant.

In the first visual question, participants were informed that the two characters pictured were in a studio scenario and that one was a drummer and the other an audio engineer. On the next page,

the question revealed that more people had assumed that Thomas was the drummer, Mereana was the engineer and that other respondents had commented on their difficulty in deciding Mereana's role. Participants were then asked to both speculate on the reasoning, share experiences, thoughts, and feelings, and secondly unpack their assumptions when first presented with the information and share any thoughts or feelings. Eden shares their experiences, identifying with the issue of people having difficulty assigning Mereana's role as they are a "live engineer" with "countless stories" of being the "FOH [front of house] audio engineer" where "someone has asked the male lighting engineer to make changes to the sound, blatantly ignoring me". They also noticed that they had assumed Thomas was the drummer, attributing it to "the hat giving it away" but this may also be from experience as a live engineer and seeing many male drummers. Jennifer Eberhardt (2019) discusses one of the inherent problems reinforcing this kind of unconscious bias in police officers as the endless stream of radio chatter describes armed assailants as 'young black males'. The constant reinforcement is pervasive – in our society there are 'drummers' and 'female drummers' – the gendered role identified in the discursive language or prefixing.

In relation to the second visual question, Eden does not elaborate on their choices. However, they assign the only female-presenting subject, in the picture, to the role of "guitarist or vocals", and choose not to comment on the assignment of males in the role of bassist, drummer and engineer. This was surprising given the earlier response when they related their experiences of marginalisation and gendered assumption, not that it should have any effect on the outcome of their choices based on the observation, but that there was no elaboration on the presented situation.

In the question depicting the search results from a stock photo database where the respondents were asked to comment on their thoughts as to whether the image results were intentionally

representative of the industry, Eden responds, “[n]o it is not” and asks, “where are the images of women on the computers, behind consoles, and working?” One might well ask why a gender-neutral search of a database of stock images (which by its very nature is designed to mirror both society and often a carefully curated inclusive version of society) had no women or gender diverse subjects doing any of these activities. Eden continues “[t]here are multiple multi-cultured woman engineers, producers and mixers” and then mentions that the chosen images are “missing the entire band that records also”; a comment that potentially places the stock photo library even further from their view of the industry.

When discussing their views on the differences of men's experiences in the industry, they share that they have “been told time and time again that it’s a male industry, and that it is weird to see a woman in it”. Eden then reflects that their “experience has been mostly good with strange moments of sexism”, or even moments when a man might have been just “unsure how to include me”. Eden goes on to recount an anecdote about a “particular instance” where an AV company “apologised for not having a women’s bathroom… even though they still had a bathroom that didn’t have a male sign on it anywhere, it just said ‘staff’...”. These experiences and insights point to an industry where the gender disparity speaks to such a wide gulf between the genders that it triggers a gender-normative response to women and gender diverse people entering the space. This is indicated by both the fumbling overt apologies for not being prepared for diversity in staff to more subtle undercurrents of uncertainty and gender identifying women in a masculine role, such as *female* drummer and *female* engineer, typified by the language “it’s weird to see a woman [doing this job]”. This uncertainty may emerge and is almost certainly amplified in the education spaces where a disparate number of young white males (Hoad & Wilson, 2020; Smith et al., 2018, 2019, 2021) learn how engineers behave from a programme designed with a gendered pedagogy in a “male dominated space”.

In the following question, regarding the gender differentiating statements, Eden was of the view that such statements were “not accurate at all” and that technology was “just a tool to express your feelings and/or creativity” regardless of gender. Eden asks, “why put gender specifics around using technology”? and yet earlier related that “it’s weird to see a woman in it [the engineering role]”, and the experience of being ignored in favour of a nearby “male lighting engineer”, when technical changes are required, recognising, and acknowledging the experience of gender bias.

The question regarding whether male engineers hold a privileged position in the industry draws a response indicating a growing “space for womxn [sic] in the industry as the old men retire/die”. This may be predicated on the idea that there are women and gender diverse engineers in training to replace the “old men”. The current state of the education space to date, as far as research reveals, is that this is not the case and although one might optimistically hold the view, as Eden does, that “systemic sexism in the industry is literally dying out”, it remains to be seen if the legacy of the today’s aging engineering population produces a sea change in the space of a generation or if the perpetuation of unconscious biases continues.

In their final comments, Eden asserts that men have been “allowed to dominate [industry] spaces for too long” and that a “womxns [sic] place in the music and audio industry is valid” calling for a “fast, radical change”. This notion of men being “allowed to dominate spaces” hints at the wider issue of representation and the central theme of self-perpetuation of male domination. This hegemonic power structure is constructed, perpetuated, and reinforced by both overt means (majority representation and visibility, hetero-normalised language, generalising individual negative experiences) and implicit biases (marginalising, exclusionary language, “common sense” explanations, assumption, compliments unrelated to ability).

E: “Queen Jane Approximately” (Dylan, 1965b)

According to the demographic information provided, Jane identifies as Pākehā and Māori and prefers she/her pronouns. She is aged thirty to thirty-nine and has a master’s qualification in music. In the first visual question, participants were informed that the two characters pictured were in a studio scenario and that one was a drummer and the other an audio engineer. On the next page, the question revealed that more people had assumed that Thomas was the drummer and Mereana was the engineer and that other respondents had commented on their difficulty in deciding Mereana’s role. Participants were then asked to both speculate on the reasoning, share experiences, thoughts, and feelings, and secondly unpack their assumptions when first presented with the information and share any thoughts or feelings. Jane opens by recognising the intention of the question and rather than commenting on the question itself, shares some of her experience of biases as a practitioner. In her words, “as a musician and [a]udio engineer I have definitely found myself at the forefront of people’s biases, often being referred to as ‘catering staff’ or people assuming I am hair and makeup instead of audio (television)”. Presumably, Jane is alluding to the question text where it was stated that people had expressed difficulty assigning Mereana’s role of engineer in the scenario framed by the question. Jane continues to identify a need for “more gender neutral” terminology in the industry to discourage automatic gender assumptions, for example, “sound operator” instead of the more commonly used “soundman”. She also shares her insights on her experience of bias as a performer and how different this was from the bias experienced as a technician. She described the performer’s experience as “less severe”.

In the second visual question, Jane didn’t elaborate on reasons for assigning roles to those actors portrayed in the scene but interestingly assigned the only female-presenting subject the role of producer. This may be based on her experience in the production industry, seeing herself in that

role, or a similar 'bias' as the one identified by Ramona, which highlighted the promotion and empowering of the female-presenting actor in the scenario.

The question based around stock photo images elicited a single poignant response based on the experiences as a musician that she related to in the first question, and later as a "guitarist": "Oh how great you're in a band! Do you sing? Oh [sic], it must be keyboards". This correlates with the widespread assumption of roles based on gender presentation in the music industry and wider society. It is notable that the stock photo database, Google searches, and the aforementioned studies (Hoad & Wilson, 2020; Smith et al., 2018, 2019, 2021) show the over-representation of male participants in the music technology and performance industry. These assumptions of gender determined roles also illustrate an example of a powerful role (singer – leading the band, centre stage, socially constructed as the main contributor) being simultaneously gendered and rendered less powerful (female singer) in terms of the male/female, masculine/feminine societal discourse and vocalist/instrumentalist musical discourse in the studio and band environment.

In the following question, participants were prompted, by the results of a Google search, to share their thoughts on the differences in experience of each gender identity in education and the industry. Jane recounts experiences as both an educator and a former student of music technology and offers the opinion that the difference in experience of a male student to that of a woman or gender diverse student is that their experience "differs to such an extent that it effects outcomes." When a student, she was the only "female in a class of 30 male students … [and] all my lecturers were men", which she describes as "an isolating experience". Jane also shares that she had predominantly male employers in the industry and goes on to talk about becoming "... the lecturer that I wanted as a student ... reaching out to the female students as much as I can". Even in this position of authority, she shares an experience as a lecturer where she was told by a male student

“women aren’t as good with technology, so I’m just going to ask him [male lecturer]”. This is an example of the plurality of power dynamics as seen in Jane’s position of power as lecturer and as a holder of knowledge, in that students sought her out. However, a student undermines this position asserting the masculine/feminine technology discourse and stating their reinforcement of the preference for males as the holders of technological knowledge despite their own relative inexperience. In my own experience, all women and gender diverse lecturers and support staff endure similar experiences in various guises, while few, if any, “male lecturers” must endure this in the music technology space. It is no wonder that Jane discusses suffering “a constant state of feeling out of place and fraudulent”.

At the end of Jane’s response, she reveals that “sexual harassment has also held my audio career back significantly” but has understandably not elaborated further on this issue. Although not apparent in the responses of this study, the issue of sexual harassment has lurked beneath the surface and is a real and serious threat to safety and equity in the music technology industry. Such behaviours, with manifestations in injuries, physical danger, inappropriate sexual advances, pressure to behave, dress or perform inappropriately, sexualisation of roles, discomfort, and the effect of the ‘male gaze’ could account for the gender gap by itself without the additional effect of implicit bias.

Despite behaviours such as sexual harassment being explicit and having associated legislative penalties, there is a structural power issue in that these manifestations of sexual harassment (and worse) often come from an experienced and ‘powerful’ actor, with reporting or complaining having ongoing career repercussions. There is currently a lot of discussion and disclosure of incidents at the time of writing within the music and music production industry in Aotearoa New Zealand. This is following the worldwide focus on the issues broadly captured under the umbrella of the #MeToo

movement, in addition to gender inequity reports, with sections on structural barriers and behaviours (Hoad & Wilson, 2020; Smith et al., 2019). This year, there was an exposé article by journalist Alison Mau exposing high level music industry professionals in Aotearoa New Zealand who were fostering "a culture of sweeping things under the rug, often leaving the burden of change to victims alone. I think a lot of behaviour has gone unchecked because many of us ... accept or downplay it as an 'industry norm'" (Mau, 2021, para. 24). This is evidenced at the grass roots level of the industry by, for example, an anonymous Instagram account – beneaththeglassceilingnz – which focuses on "sharing the experiences of those sexually abused in Aotearoa's music industry" (Martin, 2021, para. 1). These movements, in addition to giving voice to those victimised by the inherent power structures underpinning toxic masculinity have been trying to change the narrative from victim blaming and repercussions, to refocus onto the perpetrators and a societal recognition that they should not be holding these positions of power.

In the following question, interrogating the example statement that emphasises the presence of the masculine/feminine binary in the technology discourse, Jane refutes the accuracy and the use of such statements but acknowledges that the idea surfaces in the industry, sharing the experience of hearing it applied to her as "a justification for why female guitarists are 'not as good' ...". Continuing to the question on privilege, she agrees that being male privileges engineers, "especially the older ones" and, by way of an example, she provides an account of her struggle in gaining pay equity. "[H]aving to know my stuff inside out and make absolutely no mistakes" was frustrating in the context of the double standard of men being able to "walk in and pretend that they know what they are doing … make heaps of mistakes and keep getting gigs." It seems the culture of 'fake it until you make it' only applies as a privileged male tenet. She does however express the opinion that the "younger generation" are more aware of privilege but acknowledges that "sometimes younger male engineers get pulled into this trap; [the toxic workplace environment]". With many industry

workplaces being male dominated spaces filled with and run by privileged older male engineers, students coming in with more awareness of privilege may not be enough to change the entrenched attitudes and behaviours that are reinforced in these spaces, but this is the challenge that educators face in the music technology industry.

In her final thoughts about the traits a successful engineer exhibits and what women and gender diverse persons must do to be successful, Jane sums it up expressing sorrow, "...never be vulnerable. Never show emotion or weakness and be tough. Essentially just the values of toxic masculinity".

F: Visions of Johanna (Dylan, 1966a)

Johanna identifies as New Zealand European, preferring the pronouns she/her and is between the age of thirty to thirty-nine, with a diploma level qualification. Johanna did not answer the questions as fully as some of the other participants and did not share a lot of information regarding her experience. However, her experiences and observations concur with other participants' responses and, as such, are valuable additions to understanding the discourses present, which underpin the prevailing power structures faced by women and gender diverse persons in the music technology space.

In the first visual question, participants were informed that the two characters pictured were in a studio scenario and that one was a drummer and the other an audio engineer. On the next page, the question revealed that more people had assumed that Thomas was the drummer and Mereana was the engineer, and that other respondents had commented on their difficulty in deciding Mereana's role. Participants were then asked to both speculate on the reasoning, share experiences, thoughts, and feelings, and secondly unpack their assumptions when first presented

with the information and share any thoughts or feelings. Johanna begins by sharing her experience "as a woman in the music industry"; that she is "usually assumed to be a singer or 'someone's girlfriend [sic]'...". She agreed with the underlying intention of the first question in that she identified with the assumption that there are gendered roles but did not offer an explicit opinion on the question. She notes that she "wondered which person was in which role and ... why the text didn't specify" which without elaboration, could mean that she could not assume a person's role by appearance or that both roles are, in her experience, regarded as masculine, making the decision more difficult.

In relation to the second visual question, Johanna identifies the first subject as the engineer due to their physical location (as many respondents did). From there, her answers were brief, identifying the remaining subjects as unspecified "band members", seemingly based on their interactions with the central character holding the tablet device. She nominated the male-presenting subject interacting with technology as a "band member", while the female-presenting subject looks "at the ipad [sic] to see what is being recorded next".

In relation to the question depicting the search results from a stock photo database where the respondents were asked to comment on their thoughts as to whether the image results were intentionally representative of the industry, Johanna points out that "this appears to emphasise the misconception that women are always singers, and men are behind the desk". Although her answer is short, the use of "misconception" indicates an awareness of the wider discourse around men and technology, and her opinion of the inaccuracy of such statements.

In relation to the following question about the differences in the experience of engineers across gender identities, Johanna shares an opinion that appears to be based on experience considering

her initial observations, "[u]nknown [w]omen engineers are assumed to be incompetent and must prove themselves, male engineers are assumed to be competent". This agrees with the experiences of other participants and speaks to an aspect of the difficulties women and gender diverse engineers face that most men in the industry do not. Johanna reinforces this when discussing privilege when she says that male engineers "are not constantly questioned and second guessed over everything".

In the final question regarding traits which successful engineers exhibit, Johanna doesn't see any particular traits being required, gendered or otherwise, but highlights "passion for their work" as a standout requirement; a thought she finishes by acknowledging "when women are made to feel unwelcome in their job it can mar that love of the industry". This comment speaks to a lack of representation once again, as the minority in a gendered space, the feelings of isolation, not being 'seen', and missing the ease of shared experience and communication with the majority of those working in the industry, becomes a structural barrier that other participants have also identified.

G: Absolutely Sweet Marie (Dylan, 1966b)

The demographic information indicates Marie identifies as British, preferring the pronouns she/her, that she is aged between forty and forty-nine, with a master's degree. From the outset, Marie appeared to be more concerned with the survey instrument questions than with providing answers, but her views on the question substance and validity of the research approach provided additional insight into the issues faced by those in the industry.

The first question asking respondents to identify roles based on a visual image, was answered initially with disbelief in the (admittedly fictitious) scenario survey results, indicating that the question was based on a "flawed dichotomy" which is true. The question limits the options and provides limited information; however, this was intentional and had the purpose of a launch point

to eliciting experiences or opinions that respondents have in relation to this situation. Marie's comments about this question indicate that in her opinion, implicit bias is predicated on knowing all the relevant information before somehow unconsciously 'assuming' someone's role based on gender presentation. This is further evident in that she did not unconsciously assign any role to the images but conceded that she may have "if you'd actually shown them in the middle of the alluded discussion" referring to the question's scenario.

The second visual question asked respondents to assign roles to people in a photograph based on their experiences or preconceived notions and gender roles. Marie simply responded with "What?" which is difficult to unpack. Despite claiming that she might have assigned roles to people engaged in an activity in the previous question, she declined to do so in this instance.

In the question depicting the search results from a stock photo database where the respondents were asked to comment on their thoughts as to whether the image results were intentionally representative of the industry, Marie stated that they are "not intentionally anything" as it is "likely a database of submitted images". The observation that stock photo images are not meant to represent reality, which is also shared by Woody, speaks to the question of the curation of stock photo images. In Marie's opinion, there is no particular *intention* behind the tagging of images in a searchable database, in which case the results of the search logically fit somewhere between being completely random on the one hand and being shaped purely by the implicit biases of those charged with tagging the images on the other. If the latter is the case, then Marie has made an incisive observation and proposed an area for future research.

The next question introduces the subject with the results of a gender-neutral Google search and is similar to the last question. Marie's response begins with the assertion that "Google image search

results are based on the cookies on your computer" which, Marie claims, makes the results of the search and the conclusions that are implied in the question "not valid." Leaving, the question of validity aside for the moment, according to Google policy on use of cookies, there is no application of the cookies that influences search results apart from "autocompleting search queries based on a user's initial input" (Google, n.d.). This was a valuable contribution, as it raised questions about the nature of the Google search engine and how much a person's previous captured Internet use curates search results. In this case however, the results of the Google search were intended more as a contextual aid to elicit thoughts around the difference in experience of under-represented gender identities in music technology education and the wider industry. Even if they were fictitious or biased, they should still achieve that intention. Marie finishes by pointing out, quite correctly, that the question is not really related to the results of the Google search and then relates her experience in the music technology industry. She says that "many people in the industry assume that we (women) are incompetent at anything technical, & [sic] typically have to work much harder to earn the same respect". This experience is a common one among the participants and speaks to the prevalence of the gendering of technological aptitude in the binary masculine/feminine and technophile/technophobe discourses. She finishes acknowledging that this attitude is common in "many other areas", presumably other industries and areas of society.

In the following question regarding 'throw away' pop-psych phrases which reinforce the gendering of technology and emotional connection, Marie points to the "societal expectation, in group/out group mentality" but declines to elaborate further as the answer "encompassed an entire post grad [sic] research report, which is not going to fit in this text box". Commenting on the question asking about whether males have a privileged position in the music technology industry, Marie responds succinctly, "Yes they do. The same way they do in the majority of industries".

Marie's answers make the underlying acknowledgement that many industries are affected by gender-based assumptions of competency, underrepresentation in the workplace, and a recognition of the social construction of in-group/out-group or us/them discourses. She identifies the masculine/feminine technical competency binary power structures affecting the music technology industry and wider society in technological roles. Her final comments indicate some disdain for the research survey and the wider topic, insinuating that being a male student affords a privilege not available to women or gender diverse students in academia and that, based on the survey and accompanying introductory material, a woman or gender diverse student would not be "permitted to spread a subject this thin for masters level work". This may be indicative of Marie's experiences in education, especially considering her earlier comments relating that women "typically have to work much harder to earn the same respect".

Throughout Marie's responses it was difficult to see any willingness to engage in the project but there was significant value in her albeit brief insights and interrogation of the survey instrument even if it was at times through a rather positivist lens in terms of the "validity" of the research questions. One aspect of value lies in the small snippets indicating attitudes and experience within music technology, which appear despite the conscious unpacking of the survey itself. Another was that it introduced a reflective response to question the assumptions, which formed the research questions and the usefulness of the data collected leading to a deeper interpretation of the research. In a very real sense, this direct critique and interpretation of the method and methodology demonstrates Barthes' "death of the author" in terms of the intentions of the questions and the individual reality of Marie's experience. Marie's attitude to the survey appears to be based, at least in part, on the assumption that a male researcher in this space is academically privileged where a woman or gender diverse researcher would have had the same research proposal rejected. This manifestation of gender bias might be an interesting angle for future research. For example, are

male researchers privileged by virtue of their gender and biases because they wield power through knowledge?

H: "The Ballad of Frankie Lee and Judas Priest (Dylan, 1967); "Peggy Day" (Dylan, 1969); "Alberta #1" (Dylan, 1970a); "In Search of Little Sadie" (Dylan, 1970b); "Sarah Jane" (Dylan, 1973)

Frankie, Peggy, Alberta, Sadie, and Sarah are included in this final profile as respondents that did not complete the survey in its entirety but contributed some insights worthy of note. For the most part, their responses were confined to the first question, although Sadie did provide very brief answers to all the questions, it was without enough elaboration to warrant a complete profile.

Since Frankie, Peggy, Alberta, and Sarah only provided responses to question one, this section mostly recounts their opinions and experiences framed in response to the pictures of Thomas and Mereana, and the roles that that they are said to play in the framing of the question text. The data received from these respondents only gives a snapshot into the discourses that frame their experiences of assumptions but are nonetheless insightful. Alberta simply noted that Thomas "looks like the sort of person that would be a drummer in a band" while Peggy identified a gendered role in the discourse, identifying that "what we see *normally* is men being drummers [emphasis added]". Sarah concurred, saying "so many people presume drummers are dudes" and Sadie remarked anecdotally that they "have heard people say in so many ways over the years that girls can't play the drums".

The similarity of the responses indicates that the discourse about drums and percussion indicates that these instruments are seen as masculine instruments, and that being a drummer is seen as a masculine role. There was a range of opinions about whether gender had any part to play in musical role choices, but there is broad acknowledgement that drumming is seen as a masculine role within society, indicating that this unconscious association is a common and prevalent discourse. Frankie

identified themselves as a “musician” and although in their answer they identified the “prevailing stereotype … that percussion is a masculine instrument group” they then continued to reveal that they had “assumed Thomas was the sound engineer.” This may be an indication that as a musician, they encounter the representation of male engineers much more frequently in the industry, and as such, unconsciously assume that engineering represents a masculine role. They also noted that Mereana’s serious expression prompted them to speculate that “Mereana looks like she’d be a precise, strong, serious drummer”. The counter discourse from Frankie’s experience speaks to a diversity of truth around the gendering of roles, and what happens when faced with unexpected gender presentations in masculine roles. A more carefully crafted question around this might have, in hindsight, revealed more about the multiplicity of truth around role gendering and technology.

Conclusion

The findings within the data gathered through the surveys revealed some of the attitudes and prevailing essentialist discourses reinforcing the specifically gendered power structures inherent in the music technology industry and education areas. Woody and Hollis, as relatively young participants in the music technology education realm, offered male perspectives on the industry as they embarked on their first steps into a diverse and difficult industry. Ramona, Eden, Jane, Johanna, and Marie ranged in age and experience, which gave a diversity of insight into the women and gender diverse person’s experience as current or recent students entering the industry, industry practitioners at various stages and in various industry roles, and as educators in the music technology field. While the goal was not to identify themes emerging from the data that would apply as any type of general rule, there are a series discourses built upon repeated experience of assumptions that arise from gender presentation. There are commonalities in their experiences despite their differences and from a gendered perspective, the manifestations of privilege through experience and observation, and the behaviours hinted at but left undisclosed, included instances

of prejudice and other inappropriate behaviours. In the following chapter, these themes, attitudes, and discourses will be discussed in more detail and related to the literature.

Chapter V – Discussion

This chapter includes a summary and discussion of the discourses presented in the previous section, and will furthermore explore wider themes, re-interrogating the participants' responses, highlighting the more poignant examples of discourse and binary essentialism, and linking them to the relevant literature. While there are several commonalities in the participants' experiences, it is worth repeating once more that this data is grouped for convenience rather than attempting to establish a meta-narrative that might be applied 'across the board' to music technology students. This is a discussion of the individual experiences and opinions of the participants, accepting that the multiple truths and subjective reality of the experience of each individual may coincide without leading to a more transcendent truth. These coincidental experiences – discourses passing in the night, so to speak – are common enough within the music technology sphere, to suggest there are underlying power structures, reinforced by language, behaviour, and biases within that community and, in some cases, wider society.

Uniforms, Facial Expressions, and Body Positioning

In the first two questions, the participants were given visual images and asked to comment on assigned roles (question one) or to assign roles themselves (question two). The participant responses exposed similarities in that Thomas was identified as the drummer because of his hat or more specifically, "funky hat". Thomas's smile also associated him with playing music, while Mereana's "serious expression" associated her with both roles, although more commonly as that of being an engineer.

The fact that some respondents felt that Thomas' hat, was representative of being a musician, potentially speaks to discursive uniforms that are imbued with the role of musician and engineer,

much in the same way as a suit is a symbol of status [power] within a corporate structure. Although this uniform varies widely across genres [punk vs. hip hop, metal vs. bebop etc. etc.], there is an underlying discourse of appropriate style and an ability to identify one's status or role by how and what you wear. For example, in the extreme metal community, arriving to a soundcheck in tan cords, an orange t-shirt with a tweed jacket would not fit the aesthetic choices of that genre and it would likely be assumed this individual was looking for the indie pop club next door, funky hat or not.

The second visual question is worth considering before recounting the responses it prompted. The image (see Appendix B, p. 123) shows four subjects in a recording studio control room. The first individual (subject A) is male-presenting, seated, holding a takeaway coffee and paying attention to subject B. With no further information every respondent who answered this question assigned this subject the role of engineer, except for one assigning them the drumming role, and another the bass player. Analysing the responses indicated that the body position of being seated near the console identified them as the engineer, but the takeaway coffee suggests a client, or recent arrival. It would be highly speculative to suggest that gender played an unconscious part in the decision-making, but the predominance of being assigned a role that has been identified by most of the respondents as being *perceived* as a masculine role (engineer, drummer) makes it a distinct possibility. The quantitative studies reporting these roles being represented by men at a ratio of approximately 9:1 (Hoad & Wilson, 2020; Smith et al., 2021) suggests that the unconscious association or implicit bias is similarly pervasive.

Subject B is casually leaning back against the desk, looking very comfortable in this space – which may be my bias, but as previously stated half-sitting/leaning on a console (worth a small house deposit) as a client is unusual. Subject B is male-presenting, interacting with a tablet device, and

looks to be discussing or indicating something on the tablet device while subject A and C pay close attention. Some respondents did not elaborate on the reasons for their choices and all, but one assigned them as a band member, the exception being Eden assigning the role of engineer. Those that elaborated on their choices, identified subject B as a band member showing the others something, apart from Ramona who identified them incisively as the producer, because the "conversation is centred around him".

Subject C is the only female-presenting subject in the photo, and they are engaged with subject B and looking at the tablet device. Only Jane assigned them a production role (producer) although another suggested that they may be artist or *assistant* engineer. Once again Ramona identified Subject B as producer. Ramona furthermore mentioned the "hierarchy" of studio roles in the previous question and admitted she had a bias towards the "empowerment of women" and yet placed subject C in a role subordinate to subject B. This may be a manifestation of implicit bias reflecting the gendering of the roles and experience of the under-representation of women and gender diverse persons in the music technology industry.

The remaining respondents tended to identify subject C as an artist, although not in the role of drummer. This potentially reinforced the unconscious gendering of the role of engineer, despite the content of the previous question. While this supposition is in no way definitive, only one of the respondents saw subject C in the role of producer and another tentatively as artist/assistant engineer. Despite the content of their other answers, recognising the challenges of being in the very situation subject C would be in if they were in fact the engineer/producer in this scenario with the respondents walking in on this scene.

Finally subject D presented as male and was framed off to the side in the peripheral of the 'action' in the photograph. Every respondent assigned them as an artist, with all but two not elaborating on role or reasons. The two who elaborated, identified the off-centre positioning of subject D as being a factor in their choice of role assignment.

Representation and Role Models

One question showed a series of images from a large paid stock photo database. The images produced in the search for a 'recording studio' showed very clear-cut gender lines in that male subjects were depicted operating equipment while the female-presenting subjects were shown on the other side of the glass, performing behind a microphone. The database reinforces the gendering of roles within the music technology industry. The intention of the question was to see if respondents felt that the images represented the industry and how they felt about the representation of the subjects captured in these images. A prevailing discourse that audio engineering is seen as a masculine role, while singing is a socially 'acceptable' feminine role in the recording studio and wider music technology industry was identified. This role for women as vocalists is at odds with the quantitative data (Hoad & Wilson, 2020; Smith et al., 2021), as are most implicit biases (sexism, racism, ageism etc. etc.).

This did not mean that respondents agreed with the assessment, merely that they were aware of this representation, and had experienced the societal assumption, in some cases first-hand. Ramona noted (albeit in the context of music production) that through their positioning in the industry "men are able to determine [the] kind of content that is being produced at the end of the day". This once again points toward Oudshoorn et al.'s concept of I-methodology of design (2004) being a potential source of bias in the music industry in that if most of the content control is happening through the 'male gaze', and 'designed' for an imagined male end user, then it is hardly

surprising that education leading into the industry is intrinsically less attractive to women and gender diverse applicants and students.

While stock photo libraries are not necessarily supposed to represent reality for several reasons around representation, inclusivity, and identity, they do give some insight into how images are curated for use in the public arena and society and reveal areas of bias and heteronormative expectation. For example, a search for 'commercial pilot' includes fewer female-presenting images, 'fire brigade' reveals similar numbers, as do 'nurse' and 'teacher' showing noticeably fewer male-presenting practitioners. While this has not evident correlation with reality, one might argue that there is a potential that implicit bias and the gendering of roles is playing a part in the search algorithm designed by a team of people. Couple that with the images themselves which are framed and submitted by a person, all of whom are subject to their own inherent biases. These factors could very well be reinforcing binary gender discourses and reinforcing the 'otherness' of the underrepresented, similar to prefixing gender such as the 'male nurse' 'female pilot' or 'female engineer'. Both Woody and Marie made the point that stock photos are not meant to represent reality, but it is nevertheless notable that search algorithms gender the roles in a search where gender is not explicit in the search term, and therefore implied within the role. As suggested in the findings above, if there is no intentional tagging of images to represent reality, then the implicit biases of those tagging images for stock photo databases are shaping the search results and reinforcing gendered roles and stereotypes. A further possibility is that an algorithm or artificial intelligence (AI) is programmed by a team of disproportionately male coders and programmers (Liu, 2021) which is tagging images, having heuristically learned their biases.

Discussing their experiences with "female engineers" both Woody and Hollis indicated that they had first-hand experience of hostility which in turn dominated their answers. Woody noted that he

had only encountered a “small handful” of women represented in that role. This leads to the low number of women and gender diverse engineers or students of music technology, and the direct effect that might have on students (and in fact experienced engineers) as the minority. The effect of this may be multifaceted, as the respondents indicate from their personal experiences: the effect was “isolating”, and engagement was difficult to maintain with “[tutors] who don’t look or sound like you”. The lack of the feeling of “being seen, heard, and understood” adds to the sense of isolation and is reinforced by the reminders that “it is a male industry” and that being women or gender diverse makes you “weird to see” in the production role. Additionally, at least two respondents expressed the opinion that the main difference in experience between genders is how much harder women and gender diverse engineers must work, and how often they are exposed to assumptions of incompetence. Sexism and sexual harassment are also present in the responses although specific experiences or elaboration was (understandably) absent.

Stereotyping

Stereotyping is essentially the headline of this research project and could be considered both the root cause, and result, of assumption, privilege, and implicit bias. One question attempted to delve specifically into this with a loaded statement identifying that in essence men are into technology and gadgets, and that women prefer emotions and stories. The respondents were asked about the accuracy of the statement, their feelings about it and to share any experiences relating to its use. The overwhelming response was that this statement was not accurate at all, or “utter bullshit it’s part of the xitian [sic] genocide” as Sadie put it. Some offered elaboration on their feelings about the statement and other statements like it, in terms of the harm caused by such ‘pop-psych’ phrases in reinforcing gender stereotypes and normalising sexist language and attitudes. A small number of participants noted that gender identity had little to do with either their relationship with technology or connection to the emotional content or story. Ramona was particularly thoughtful about gender

representations being “mallable [sic] states of existing” and recognising both sides of the statement as applicable on different days. Woody agreed that the statement was not accurate as they revealed that he “generally view[s] women as being a little more practical and professional” and himself as more “an emotional male” while Hollis disagreed, acknowledging that the statement is “accurate to some extent” and went on to describe examples of successful women in audio as “outliers and *variations*” [emphasis added] in an implicit recognition of the privileged standpoint he is reflecting from.

Respondents were also asked about the traits of successful members of the music technology space and whether gender was a factor or not. This question also revealed attitudes based in stereotypes – what are successful behaviours and what traits are associated with them and are they stereotypically gendered? The respondents overtly felt the traits of a successful engineer were not “gender-based” although a number did allude to characteristics that they had associated with gendered behaviour in earlier questions. Woody started by suggesting that “people are more individualistic than that”, critiquing the notion that genders have associated behavioural traits. He then continues to ascribe “creativity and aesthetic awareness” to “women more commonly”. Sadie turned the tables, ascribing the successful traits as “good communication and good ears” and followed up by noting that “[b]oth thing[s] that in wider society are typically associated with women”.

Hollis shared similar views, firstly agreeing that there are some traits which might be considered more gendered than others, but many that were not. Male attributes included being “able to work long hours,” and “being firm … in this cutthroat industry” which can be linked with stereotypical abdication of familial responsibility and a sense that successful men are ‘strong’ in business negotiation and won’t be easily ‘pushed around’. “Female” attributes included “understanding the

needs of the band", which could be linked to a stereotypical nurturing attitude, and having "better hearing on average", which is a view that agrees with Sadie's earlier opinion.

Jane also dissented with the majority view in that her answer was tellingly framed around experience of the attitudes of others. "I think others would most certainly ascribe gender" continuing to discuss the way women and gender diverse engineers might display masculine attitudes and behaviours to fit in and succeed, to embrace "the values of toxic masculinity" as alluded to in Wajcman (1991), Caputo (1994), and Smith (2009).

Wider Themes

The research project identified a number of themes in similarities of experience or attitude and these form a useful framework upon which to base these conclusions. Bearing in mind that the research is predicated on the presence of implicit bias, the main threads that can be drawn out and expanded upon are those most closely linked to implicit bias. These threads include examples of privilege which are often manifested in the industry as the assumption that one homogeneously experiences the same attitudes and behaviours from everyone else, regardless of culture, ethnicity, sexuality, age, and, most relevant to this research, gender presentation.

The other main thread is implicit bias manifesting as assumption of roles, especially roles involving technology in the music technology space such as engineer or producer. There are also those assumptions of socially 'acceptable' roles in the music sphere, for example it is common to gender prefix drummers as 'female drummers' but not as common to do the same to keyboard players, lead vocalists, and even less with backing vocalists, harpists and flautists. Assumptions of competency are also a repeated experience amongst the respondents identifying as women or gender diverse, and recognition of the power imbued in this discourse is explored.

It is important once again to stress that these themes serve two purposes, firstly, they provide a useful way to discuss the multiple realities experienced by the participants, and secondly, they involve an acknowledgement that shared intersectional experiences point to prevailing discourses rather than essential structures. The distinction being that these themes are suggestive of underlying discourses as manifestations of power constructed and maintained by society, and the community of music technology practice and are therefore subject to change under the same criteria for each 'actor' experiencing the effects of this power, rather than an immutable invisible truth.

While the identification of biases was one important aspect of the research question, the views on the effect of implicit bias of those involved in music technology education and the wider industry was equally important. Due to this the chapter draws out the explicit and implicit views and attitudes from the collected data and weaves them into an implicit bias narrative. It is also worth noting that the theoretical underpinning of this research is based in a post-structural paradigm and will therefore take the manifestations of privilege and gendered role assumptions and interrogate their relationships to deconstruct discourses and binary essentialisms, with a view to exposing underlying power structures and relationships forming and informing these discourses.

Privilege

Both Woody and Hollis have similar experiences and outlooks on the music technology industry and education space in that there is an implicit discourse in both sets of responses that speaks to there not being a particular issue with gender disparity, neither from unconscious biases nor intentional 'gatekeeping'. Woody recounts discussing the lack of gender bias with "female peers in the industry" and is satisfied that it is somehow less of an issue than it appears to be. In weighing up

Woody's opinion here it is worth considering that statistically, or in any other way that you quantify the gender division in the music technology education space, Woody was likely discussing this with no more than 5-7% of his peer group. This minority was likely in a space where a speaking their truth could mean being labelled as hostile, unapproachable, or worse. Hollis points out that in the first question, there is the assumption "that Mereana is perhaps a studio engineer [that] in my opinion goes to show that gender bias is much less than people make it out to be". Here Hollis is looking at one (fictitious) example and drawing a rather large conclusion about the experiences of all people interacting in the music technology space. This lack of recognition of the structural barriers faced by others and, as Hartsock (1983) and Harding (1991) suggest, the failure to acknowledge that belonging to the predominant social group in such a space makes it difficult to see these barriers, and virtually impossible for those farthest from the central power structure within the music technology community to express their frustration with the subtle oppression of marginalisation. For those near the hegemonic power structure, it is possible to wield a large amount of societal power within that space without realising it as you defend what you know to be true from your standpoint. In some instances, this causes the privileged to feel that they are being "oppressed" as any marginalised groups try to establish their own identity in this space or assert their right to participate. Detractors are labelled as 'woke' and change to 'the natural order' is resisted. To many in the privileged space, this 'shift' in power seems one-sided as they are not explicitly wielding power themselves in the first instance and perhaps do not recognise the influence that they have in the space where simply 'fitting in' socially and culturally is the manifestation of that which Foucault (1995) describes as disciplinary power. No single person represents or wields this power, but the discourses manifesting subtle mechanisms of assumption, and reinforcement of the notions that there are no barriers to those who are marginalised are powerful, nonetheless.

Hollis is particularly vocal in asserting that any person with talent and dedication may succeed regardless of gender in what he also acknowledges is a male-dominated space. This demonstrates a large and common blind spot to the concept of what privilege is and how it can affect those around you, especially those already marginalised in the industry. Hollis proposes, “anyone working today in the music industry and being able to live off the income is privileged” which is somewhat true for around 90-95% of people in this space. These attitudes in young male music technology students demonstrates a potential need for further research into the prevalence of this opinion as it appears to be a fertile ground for directly or indirectly perpetuating toxic masculinity and, at best, normalising gender disparity. Ramona discusses her experience as a minority member in the music technology education space and the difficulty in maintaining “engagement with people who don’t look and sound like you”. She mentions not being represented in the teaching faculty often meant experiencing “a massive lack of underlying communication” and becoming dissociated and not having the sense of being “seen, heard and understood”. Jane shares similar feelings of isolation as a minority in the education space, not just with students but tutorial staff as well. The power structure underlying this heteronormative space forms a substantial platform to place. In Hollis’s opinion, any person with talent and dedication can succeed regardless of gender. These shared observations and opinions help us to understand how someone might correlate simply working hard with success, if that is the only difference seen in those others in the education space. To resent the implication that your hard work is made any easier because of an implicit power structure based on criteria you have little to no control over is tempting to discount.

Baxter (2003) studied the discourse driven power dynamics in both classrooms and corporate structures, concluding that a multiplicity of views, truths and experiences highlight the shifting power structures in those spaces. In a similar way, the responses from those participants engaged in the industry show attitudes already seen in the education space – such as the belief within the

heteronormative ‘class’ that everyone is treated equally, has the same experience, as well as the idea that overt sexism is unacceptable, so the problem is resolved. Hollis suggests “in New Zealand the industry is so small it would be instantly obvious who isn’t making women feel welcomed as engineers”. This statement however, as many other participants attest in their answers, does not include the possibility that it isn’t necessarily the actions of individuals that cause the most damage (although they can contribute significantly). It is the fact that the industry has so few women and gender diverse practitioners that they are forced to operate in a male-dominated space. Masculine values are more acceptable and reinforced by societal expectations, in addition to women and gender diverse members of the community not feeling seen and being expected to perform to a masculine gender expectation. In this way, Hollis, by virtue of gender presentation alone, is imbued with Foucault’s disciplinary power/knowledge (1995) by his heteronormative community. This is a difficult position for anyone who isn’t ‘seen’ as intrinsically holding this power, such as is the experience of marginalised women and gender diverse participants. This discursive shift nullifies the power/knowledge for some members, rendering them powerless by virtue of a demographic criterion that has been socially and historically constructed.

Jane alludes to “imposter syndrome” and while the other participants do not explicitly identify this syndrome, the symptoms of the phenomenon are implicit in their answers. The ‘imposter phenomenon’ was coined in a study by Clance and Imes (1978), which examined “over 150 highly successful women . . . [who] do not experience an internal sense of success. They consider themselves to be imposters” (p. 241). In this study, they share the clinical observation “that we have found that the phenomenon occurs with much less frequency in men and that when it does occur, it is with much less intensity”. It should be noted that this was not a researched outcome and the authors cautioned that further research would be required. Following this thread, Tulshyan and Burey (2021) contend that:

> [as] ... men progress, their feelings of doubt usually abate as their work and intelligence are validated over time. They're able to find role models who are like them, and rarely (if ever) do others question their competence, contributions, or leadership style. Women experience the opposite. (Para. 9)

Although the above observation was made in a corporate office context, there appear to be similarities, based on the responses in the survey, with the experiences of women working in the music technology industry. This manifestation of privilege is where women are experiencing interactions and behaviours that many men do not. Ramona relates that women have to put up with "a lot of mansplaining, misogyny, sexism etc" while Jane states that she has "to know [her] stuff inside out . . . [m]en can walk in and pretend they know what they are doing". Johanna agrees that men "are not constantly questioned and second guessed over everything", and Marie confirms that in her experience, women "typically have to work much harder to earn the same respect [as men]".

The term 'privilege' encompasses a number of differences in outlook and experience which in turn are manifestations of being on the "preferred" side of the binary essentialism masculine/feminine as it relates to technology. Derrida (1981) noted, western philosophy has developed a system of binary oppositions where "[o]ne of the two terms governs the other (axiologically, logically, etc.), or has the upper hand" (p. 41). On the subject of competency in the various roles within the music technology industry, the privileges afforded by being male and masculine within the male/female and masculine/feminine binary oppositions are clear. This in turn maintains the interplay of discursive power within music technology, which maintains the preference for masculine values within the culture of the music technology community.

The Assumption of Gendered Roles

One might be tempted to include the assumption of a role, based on gender presentation, as yet another facet of privilege. Many men in the music technology industry and farther afield, end up more often on the 'positive' side of these assumptions i.e., assumptions of technical competence, or assumptions of seniority. Tulshyan and Burey (2021) contend, that men suffer less uncertainty when they find themselves on the end of a negative assumption, as it is easier to disregard or correct any assumptions while being "*seen, heard and understood"* in their space – the privilege of sharing the hegemonic central power structure. This is where the effect of an assumption differs from the privilege of dealing with the consequences of assumption and why it warrants a section of its own.

For those experiencing the 'otherness' of the margins, the effect of constant negative assumption reinforcing the feeling of being a 'stranger in a strange land', an imposter who has somehow, either by an imagined oversight, or having fooled everyone, has managed to reach this position, is worthy of discussion. The effect of this manifestation of implicit bias cannot be overstated as it is a potentially significant cause of the lack of diversity in the music technology industry. Several respondents identified that if you cannot see yourself in a certain role, it is difficult to pursue that goal. If others do not see you in that role, it becomes even less appealing, and when faced with the explanation that you, and people like you, are not equipped for the role because of your gender presentation and a 'lack of interest' into overcoming this shortfall, it is surprising that there are any women or gender diverse people in the music technology field at all.

There were many examples of assumptions given in the survey results, primarily in the technical roles. Marie related that "many people in the industry assume that we (women) are incompetent at anything technical". Johanna states that "[w]omen engineers are assumed to be incompetent and must prove themselves, male engineers are assumed to be competent" and furthermore "I'm

usually assumed to be the singer or 'someone's gurlfriend'[sic]". Jane shares that in technical roles, she is often "referred to as 'catering staff' or people assuming I am hair and makeup instead of audio". For their part, Eden refers to "countless stories of times when I've been the FOH audio engineer, and someone has asked the male lighting engineer to make changes to the sound". These examples demonstrate how masculinity and technology are intrinsically linked, which is to say, as Wajcman (2000) states, "[m]en's affinity with technology is now seen as integral to the constitution of male gender identity and the culture of technology" (p. 454).

It is telling that neither Woody nor Hollis brought up any of these experiences or spoke of any assumption that they could not use technology based purely on their gender presentation. This may be due to their relative inexperience in the industry but more likely, based on the attitudes toward male engineers and the implicit link of masculinity and technology, that they will not experience this behaviour directed at them to any extent. Hartsock (1983), and Harding (1991) established as a basis for feminist standpoint theory, that the view from the margins and therefore the view from the marginalised, reveals experiences that become harder to see *the closer you are to the systemic structure*. Woody and Hollis, who both identify as Pākehā males under thirty are situated very near the centre of the power structure in music technology and, as such, this privileged position makes the inherent inequity for those farther from the centre difficult to see without looking hard at the industry that appears, from their perspective, relatively straight-forward to navigate.

In the findings section in question two of the survey, no-one ascribed the female-presenting subject (subject C) the role of engineer or any 'masculine' role apart from one participant hedging their answer by suggesting assistant engineer/artist, and one participant identifying her as the producer. The reasons for this are most likely to be because of the layout of the photograph and positioning of subject C in the scene, but there were few reasons for subject A to be predominantly identified

as the engineer apart from being seated. It would be speculative to suggest that this is a gendered assumption on the part of the participants but considering the subject matter of the survey and the predilection of some of the participants to “bias toward empowerment of women”, it is worthy of mention without conclusion.

The presence of gendered assumptions based around appropriate or acceptable musical roles in wider society (certainly not excluding the music technology community) was evident in some of the responses. It is worth reiterating at this point that the research question was investigating the views of the music technology community on the effect of implicit gender bias. Many participants in that community are performers as well as being integral behind the scenes in music technology-based roles, and so it made sense to include this angle in the research project. The intention was to establish a wider view of the effect of implicit bias, and specific experiences, which respondents could share to form a more detailed picture of their individual experiences of implicit bias. Alberta summed up this aspect, when she said, “so many people assume drummers are dudes''. Similarly, Sadie shared how she had “heard so many people say in so many ways over the years that girls can’t play drums” and in many ways summed up the whole research project, when she pointed out that “women are more liley [sic] to be singers but that’s because of the toxic mysogyny [sic] of the industry innit [sic].” Jane commented that people’s first assumption when discovering you are in a band is “do you sing? oh, it must be keyboards”. Frankie and Peggy had similar thoughts about assumption of musical roles, Frankie identifying “a prevailing stereotype is that percussion is a masculine instrument group”, while Peggy was more direct “what we normally see is men being drummers”. The discourse, as understood by the music technology community is clear: the role of drummer is gendered, whether they agree or not. Many times, in class, students have casually asked about the drumming on a recording, and immediately gendered the drummer by framing the question around he/his. It is quite widespread and occurs with the audio engineering or production

role just as frequently. Once again, the privileged binary opposition of masculine/feminine where masculinity and technological prowess are intrinsically linked establishes a structural or disciplinary power, that wider society wields in the construction of meanings to gender and acceptable roles performed within a construction of gender.

The underlying power structures within music technology come up in several participant responses when the respondents either overtly recognise the shifting balance of power or when they comment on the implicit effect of the use of such power. The power/knowledge structure in music technology is informed by several discourses including the influences that have emerged within the research project such as gender and age, but like many aspects of Foucault's (1995) thinking on disciplinary power, ethnicity, sexuality, and other characteristics, can influence who is using this power upon whom. For the most part, the power of being an older heterosexual white male is tangible, but there is a kind of hierarchy of gender, ethnicity, age, and sexuality, with (perhaps the sum of) each aspect widening the scope of power over larger sections within the community. Gender presentation is the main interest of this study, and the research questions were designed to focus on that aspect, but it is worth pointing out that there is scope for similar studies to investigate intersectional aspects of implicit bias and their effect and efficacy within the community. The concept of the power structure as an immutable force is not entirely correct however, as Baxter (2003) points out that since power is constructed and applied through discourse, the agency with which power is used can shift depending upon competing discourses which, furthermore, can render agents simultaneously powerful and powerless in discourse. Baxter relates an example from an analysis of Walkerdine (1990) done of a classroom power interaction where the female nursery teacher was subjected to 'sexual' objectification by two four-year old male children. The flow of power presented was that the authority figure, who, in essence, holds a genuine position of power over the children, when objectified and taunted by the children, becomes less powerful (at least in

the moment) and the children who, wield power as males when objectifying the teacher (privileged in the male/female binary essence) are simultaneously young (where they are not privileged in the age/youth binary). Baxter's own observation around classroom behaviour reveals similar shifts in power within classroom discussions (following the rules of collaborative conversation versus calling out and interrupting to dominate the conversation).

Within the research project, this domination through gender as a discourse is demonstrated in Eden's experiences of being the sound engineer in charge and being bypassed to the nearest male for sound changes, undermining their position and negating the discursive power the role affords to male engineers. Additionally, Jane shared that her "first year students often talk over me" and related that "last year, one (male) first year student told me women aren't as good with technology, so I'm just going to ask him (the male lecturer)". These experiences highlight the shifting power dynamic in the male/female binary, as the less experienced male student paying to learn feels that it is acceptable to publicly challenge a more experienced practitioner based on their gender presentation and assumptions of competence. On a personal note, when co-teaching with women or gender diverse colleagues, I have experienced similar issues – never quite so explicit – where a student asks me the same questions, they have asked the women or gender diverse colleagues to compare answers, seemingly to confirm information that they doubted. This seldom (if ever) happens when co-teaching with male colleagues without the question being qualified with an explanation of the information they have received from the other lecturer. The point being that the difference in *explicit* questioning is to confirm and expand on information or gain a diversity of opinions, as against doing the *implicit* 'testing' of a colleague based on assumptions of competency. Another manifestation I have noted is that the same students who are attentive and engaged in my classes can be disruptive, argumentative, and repeatedly talking over women or gender diverse

colleagues in consecutive study periods, when the latter professionals are teaching the same subject area.

With gender being such a powerful influence on assumptions of competency, acceptance, and the various manifestations of privilege, success in the music technology realm often appears to be contingent on a final assumption. The assumption that presenting 'male' attitudes, behaviours, and acceptance of toxic masculinity plays a large part in success in the music technology industry and for that matter, in music technology education. Wajcman (1991) points out that for women to successfully compete in masculine cultures amounts to women needing to acquire the masculine aspects of the gender identity that is respected for being competent in their job. Wajcman (2000) confirms that this had changed little in the preceding (nearly) two decades as "contemporary Western femininity involves being ill-suited to technological pursuits" (p. 454). Smith (2009) also indicates that equality often comes at the cost of femininity. These sentiments are amplified in several responses, such as when Ramona identifies successful traits as including being "approachable, easy to work with, not having a giant ego" which are traits that were commonly identified as lacking in some working male engineers in the industry. Both Woody and Hollis describe unpleasant and "dismissive" experiences when working with women in the industry, although it would be purely speculative to raise the question of whether or not a "female engineer", in control of a session, assuming masculine values, and wielding structural power would be the root cause of their perceived unpleasantness.

Conclusion

These themes of privilege and assumption, and the various guises they appear in, are common enough in the experiences of the respondents to indicate that there is discursive power inherent in both themes. This discursive power would presumably be constructed by the discourse that link

technology and masculinity and, by extension, by the roles related to the use of technology in the contexts of the music industry. This is self-perpetuating in that if an industry is widely based on technology, the discourse privileges males in that space, and since technology is predominantly and disproportionately designed and implemented by male designers, programmers and coders, the design of the technology privileges male behaviours and ways of understanding. In the final conclusions chapter, these themes and literature are summarised, along with the limitations of the study and areas for further research.

Chapter VI – Conclusion

What do you call a woman behind a mixing desk?

The Introduction to my dissertation began along similar lines and hopefully the answer is a little more automatic – an audio engineer. More than that – against large structural and social barriers, and at the cost of feeling like an outsider or imposter – an audio engineer. Having to put up with being overlooked, assumed to be from a less technical department, someone's lost girlfriend, or being judged less competent based on nothing more than your gender presentation – an audio engineer.

This research has focused on the larger structures and discourses in both music technology education spaces, the music technology industry and occasionally strayed into issues in wider society, but it is worth acknowledging that education, and especially tertiary education, is not something that exists outside of the social and historical context of the music technology industry. Education is entwined with the industry it feeds into and the society its community lives in and influences. Several times throughout the dissertation there have been reminders that from a post-structural perspective the outcome of the research is not to create essentialist statements or synthesise grand meta-narratives to explain or fix society. The power structures and discourses revealed in this research interact and are interpreted within everyone's lived experience individually and it is not the goal of this research to change that. Change happens individually and socially through awareness and as such, education institutes and educators might consider investigating the discourses they produce and maintain through their very existence. In audio engineering there is a term, 'insertion loss', which describes the effect of signal loss in an audio system by introducing a processor or additional signal path. This term forms a useful analogy when describing how

educational institutes currently effect gender equity in the music technology industry. Research into exposing biases and attitudes has been illuminating on a personal level and would be potentially as illuminating on an institutional level. Perhaps music technology institutes might engage audio engineering students to apply the principles of signal loss to Blickenstaff's (2005) 'leaky pipeline'.

This dissertation has introduced the idea that there is a need for research in this subject area, with the initial approach engaging the question through prior research, literature, and personal experiences. The literature review looked at the various thoughts of theorists and practitioners about implicit bias, and the gendering of technology and roles using technology as well as instrument choice from both qualitative and quantitative research paradigms. The methods and methodology chapter provided the foundational ontological and epistemological structure and discussed the post-structural framework upon which the research itself would be presented. The findings chapter presented the data as a series of profiles derived from the raw data and included a brief analysis of some of the views of participants, which led into the discussion chapter that, in turn, grouped the raw data into discourses and reflected on the data in conjunction with the literature, through a post-structuralist lens.

What are the views of music technology professionals and students on the effect of implicit bias in the industry? The answer to this research question is largely contained in the previous two chapters and within the lines of the raw data gathered from active participants in both the music technology industry and the music technology education industry from which many professionals emerge.
Although many of the experiences described emerge from the industry, the tertiary education environment feeds into this industry and the attitudes and behaviours of students today, shape the industry tomorrow. Implicit bias produces and reinforces privilege, assumptions of gendered roles, and binary essentialism around masculinity and technology to the extent that the technology itself

has become gendered. Implicit bias forms the 'gate', which women and gender diverse people, wishing to become involved in the music technology industry must enter through and it is important that the education facilities recognise and expose this pervasive power structure if they wish to embrace the ideals of equity enshrined in their policies and curriculum documents. Implicit bias may be involved in the tagging of images, promoting the discourse that men operate the music machine, while women and gender diverse persons participate in 'acceptable' roles but are mainly seen as consumers of the products of music technology. The lived experience and truths of the participants are complex and varied, even across a small and localised sample, but the discourses they operate within in the music technology education space and the wider industry are clear.

In many ways, this is how this research developed. If the industry is to a significant extent staffed by graduates of the educational institutes, it behoves those institutes to highlight and address societal issues within the industry through research and promoting equity. There must be more than positive role modelling practises to redress the gender disparity. There needs to be a normalisation of women and gender diverse faculty and professionals in the industry, normalisation of non-gendered language around attitudes to technology, and normalisation of the wielding of technological knowledge as power regardless of gender. What has tended to happen in many institutes in Aotearoa New Zealand and around the world is members of the industry decide to move out of the high intensity areas of the industry itself, with some shifting into sharing their knowledge and experience with those wishing to gain entrance to the industry. While the in-depth knowledge and expertise gained in a lifetime of professional practice is invaluable and important, some of the perpetuations of attitudes and ideas are less attractive and, at times, damaging. The fact that music technology is largely staffed by men reinforces a 'masculinity as technology' discourse and means that women and gender diverse people don't easily see themselves in this masculine space but rather see the space as isolating, and uncomfortable. Students entering the

space very quickly learn from microaggressions and representation how the discursive power structures operate.

The shared experiences of the participants paints a sobering picture of the insidious nature of behaviour and bias, and for every outward projection of sexism and prejudice, which are at least easy to identify and confront, there are the careless words, everyday assumptions, passing remarks, glances and micro gestures which underpin and create a nurturing environment for more loathsome attitudes.

When Professor Rogers stated that there are “no social barriers to a woman becoming a record producer” (Savage, 2012, para. 24), she was perhaps referring to explicit or legislated social barriers and inequities rather than to the implicit biases and assumptions. These biases and assumptions however, form tangible social barriers for women and the gender diverse within the music technology industry and associated programmes of study. Wajcman (1991) suggested that technology itself is gendered, and that the culture surrounding it is inherently masculine. This identifies one of the roots of assumption, which appears to persist across a number of technology-based industries.

The assumption that masculinity is partially defined by being technically minded and being biologically predisposed to technical prowess imbues males using technology with technical power. It follows that for women and the gender diverse not *performing* masculinity in these roles denotes an inability to effectively engage with technology and thus roles which require technology, self-perpetuating the assumption. Additionally, once this power structure is established to the extent where male participants cannot see anything other than themselves, the technology design, and attitudes to its use along with educational programmes and pedagogies develop through a male

lens. This constant subtle reinforcement makes a call for equity appear *oppressive* or as giving a section of society 'an unfair advantage' as far as the privileged can see, which is a condition that is in no way restricted to gender.

Blickenstaff (2005) alluded to a lack of role modelling, traditionalist gendered roles, and "an inherent masculine worldview" (p. 372) contributing to the science, technology, engineering, and mathematics areas. Privilege-based biases and assumptions evident in the findings of this research project indicate similar contributions in the music technology industries and educational facilities. Respondents discuss not being 'seen, heard and understood', feeling 'isolation' in classes, and not 'seeing themselves' represented in faculty.

The participants who preferred he/him pronouns did not mention any issues with seeing themselves, or any issues with being seen, or understood, having assumptions made about them or any shared experiences of the manifestation of biases with the other participants. Young Pākehā males are vastly over-represented in the music and technology industries and are likely to only identify discrimination and biases as something that happens rarely and mostly to 'others' – although in the case of Woody and Hollis it does appear to have had a profound effect.

Limitations

All research projects have limitations, and this project is no exception, and perhaps has more limitations than the average research project. Fundamentally, the English language was a limitation in its ability to effectively navigate the gender continuum. The discussion around this in the introduction chapter, identified little in the way of a definitive answer to inclusive language which does not reinforce binary classifications, amplify gender diversity into marginalisation or

"otherness", or reduce sections of society into homogeneous groups, all the while retaining grammatical clarity.

Another considerable limitation was being a male researcher when examining both marginalisation and gender identity from the privilege of a centralised heteronormative standpoint. While lived experience is not necessary from a research point of view to share the experiences of others, the lack of direct experience of the manifestations of implicit bias could have reduced comfort levels of participants when discussing some aspects of their experience of the music technology industry. One of the respondents also suggests, the research seemed to them, to be less than substantial enough for master's level work and that male gender identity has privileges, in the academic space. Furthermore, these allowances are unavailable to women and gender diverse researchers. This would potentially also reduce participant comfort and affect the shared experience. Barthes and Derrida suggest that my interpretation of the "text" is influenced by the sum of my privileged experience, albeit something that I am somewhat aware of and able to acknowledge, just as any reader's interpretation of my analysis will be informed in turn by their lived experiences.

A related limitation involves being in a position of power over potential respondents in the research space. Although mitigated to a certain extent by the anonymous survey structure, a possible deterrent for potential participants, might be concern that their identification could result in effects on their educational outcomes. As a result of this limitation, maintaining participant anonymity while conducting post-structural research meant that there was no opportunity to discuss and dig a little deeper into participant responses. This has left areas of interpretation and speculation, where clarifying questions about the data would have been valuable.

Further Research

Many of the research reports which relate to gender and participation or representation in the music technology industry and professional organisations in that space (Brooks et al., 2021; Hoad & Wilson, 2020; Smith, 2009; Smith et al., 2018, 2019, 2021; Young et al., 2018) and the educational institutes or programmes (Abramo, 2011; Armstrong, 2008, 2011; Bell, 2015; Born & Devine, 2016; Caputo, 1994; de Boise, 2017; Hallum et al., 2008; Hopkins, 2017) which provide the next generation, are predominantly concerned with quantifying the extent of the disparity, with only some investment in discovering the underlying causes. This quantification is important work because it highlights the disparity across gender in a range of fields and, as such, places awareness of the imbalance into the forefront of people's minds. It is more digestible for society to see the problem expressed in the familiar language of quotable statistics as this allows for free speculation on the underlying causes. This is a double-edged sword, as 'common sense' factors such as gender disinterest or biology become powerful hegemonic discourses within society that simultaneously dissuades change while reinforcing the said 'common sense'.

Within the literature reviewed in this research project, there were recommendations including Smith et al. (2018) suggesting research into whether bias is "baked into music education" and Young et al. (2018) calling for addressing gender inequity in the student environment. This research, while investigating these aspects on a small and localised scale, would suggest that some research into the effect of representation in faculty for students would be a significant factor in continuing through study into a music technology career. Continuing research into similar areas or over a wider scale with more diverse participants could have the advantage of distance and the ability to use interviews and focus groups, giving women and gender diverse practitioners in the industry a voice and the ability to share experiences that would redress the disparity.

On the topic of gender diversity, there is not yet a lot of information on the experiences or participation of gender diverse persons within the studies informing this research. Smith et al. (2021), for example, make specific mention of the underrepresentation (in fact non-representation) of "gender non-conforming or non-binary" (p. 5) participants, while closer to home, Hoad and Wilson (2020) acknowledge that the "small sample size" (p. 7) of participants identifying as gender diverse makes their findings less "statistically strong". Hoad and Wilson however decided to include their findings regardless "to give visibility to gender diverse communities who are often overlooked in quantitative surveys".

The participants' responses led to potential for investigation into how some of the Internet infrastructure may be contributing to bias. After all, it is another male-dominated industry with predominantly male designers. Initially the issue identified was the tagging of images but there is potential to expand research into search results in text and video, including search engine algorithms and a wider variety of commercial stock photo databases. Related to this is the perpetuation of female-presenting models in the role of singer, reinforcing an 'acceptable' gendered role despite the reality being that the majority of performers and vocalists are male-presenting (Smith et al., 2021). There is scope for research into the duality of power for women and gender diverse persons as lead vocalists, where they are the focus of attention and command considerable power in the performance space, whilst often wielding less power in the recording studio and production space.

All the potential research projects listed might benefit from a more intersectional approach widening the scope of the research to include, ethnicity, culture, age, sexuality, and other demography to reveal areas of imparity and in particular, research into intersections of culture and gender within the context of *Te Tiriti o Waitangi* in Aotearoa New Zealand.

From the small sample of male-identifying respondents, a survey and follow-up interviews investigating the views and opinions of male practitioners in music technology education and the music technology industry might well be valuable research. Although it is important to understand the views and opinions of those that the structural power of implicit bias is applied to, redressing the inequities may well be a matter of better understanding the attitudes and privilege of those wielding the hegemonic power. The wielders of such power construct the narrative explicitly and implicitly and changing the local narrative can most likely only be achieved by those in a position to do so.

A final potential research area, as mentioned in the limitations section above, the genealogy of use of inclusive language and potential development of new language or frameworks would be a useful step going forward.

Final Thoughts

This research project, despite its limitations and the aspects that I wish, in hindsight, I could return to and adjust before the data was collected, has turned out to both reveal some aspects I had previously overlooked and confirm many things I had suspected were true from observations. Being male in this research space, and in the music technology industry I have witnessed assumptions, and privilege, seen ignorance, careless comments, and thoughtlessness, and have made my share of damaging assumptions. I have witnessed and learned to change my assumptions, but it is not my lived experience. I am on the privileged side of the console but, in the classroom, I try to allow my rational consciousness to speak rather than my unconscious bias – as many teachers do. I try to gently correct my students when they assume gender for a musical or production role but the fact I must, more often than I'd like to admit, speaks to the discourses which have threaded through this

dissertation. They all come back to the central question and implicit bias. Whether, as Jennifer Eberhardt defines it, “the beliefs and the feelings we have about social groups that can influence our decision making and our actions, even when we’re not aware of it” (Schlitz, 2019, para. 8) or how Smith et al. (2019) define its manifestation “when individuals think producer, they think male” (p. 25), the effect of implicit bias appears to be clearly visible in front of us all and we need to see it to change it. One of the participants, Jane, sums up the effect of implicit bias in music technology in Aotearoa New Zealand (in the industry or the education spaces, which feed into it): “I reflected on what women have to do to be successful. And that just made me sad, because the answer is, never be vulnerable. Never show emotion or weakness and be tough . . . just the values of toxic masculinity”.

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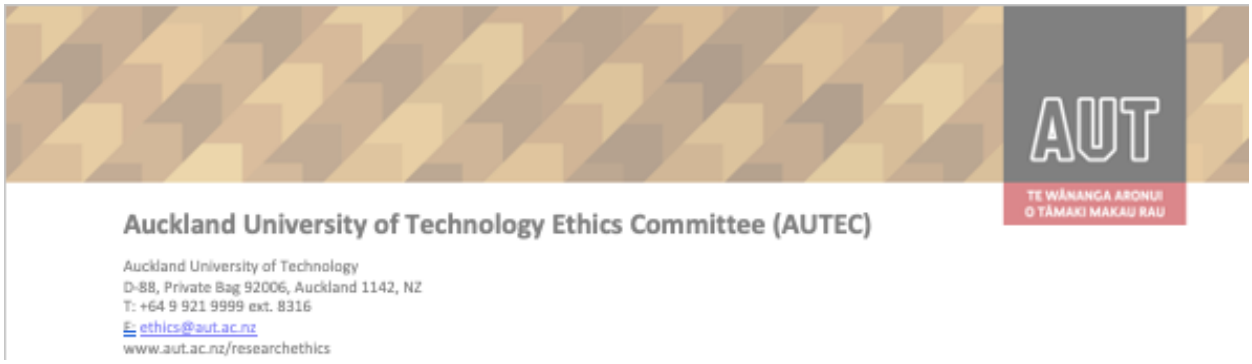
Appendix A: Ethics Approval



25 September 2020

Andrew Gibbons
Faculty of Culture and Society

Dear Andrew

Re: Ethics Application: **20/275 Implicit Gender Bias in Music Technology Education**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC in this application.
2. A progress report is due annually on the anniversary of the approval date, using the EA2 form.
3. A final report is due at the expiration of the approval period, or, upon completion of project, using the EA3 form.
4. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form.
5. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
6. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.
7. It is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard and that all the dates on the documents are updated.

AUTEC grants ethical approval only. You are responsible for obtaining management approval for access for your research from any institution or organisation at which your research is being conducted and you need to meet all ethical, legal, public health, and locality obligations or requirements for the jurisdictions in which the research is being undertaken.

Please quote the application number and title on all future correspondence related to this project.

For any enquiries please contact ethics@aut.ac.nz. The forms mentioned above are available online through http://www.aut.ac.nz/research/researchethics

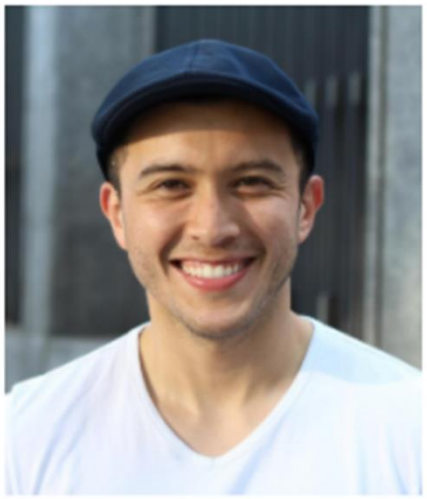
The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Appendix B: Research Tools

1. **<u>Survey Questions</u>**

Question 1:

The people pictured below are involved in a discussion about microphone choices and placement. One of them is the drummer in the band and the other is the studio engineer.



Thomas (Pronouns: he/his)

Mereana (Pronouns: she/her)

With no further information more people initially assume that Thomas is the drummer and that Mereana is the studio engineer. Some respondents mentioned that they found it difficult to choose which role Mereana was most likely to have of the two available roles.

a. What are your opinions on why this might be the case? Have you had any similar experiences? Please comment on your thoughts and feelings around this situation.

b. What were **your** initial thoughts when viewing the pictures and reading the text on the first page? Did you assign a role to each person? Please share your thought processes and assumptions (if any).

Question 2:

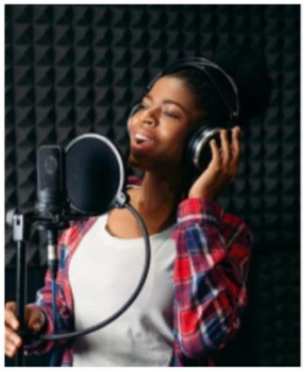
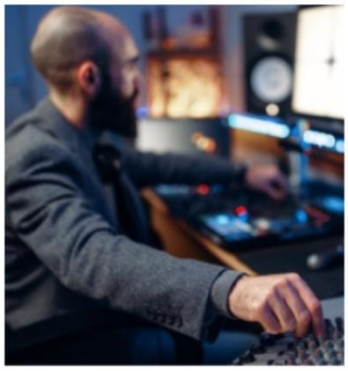
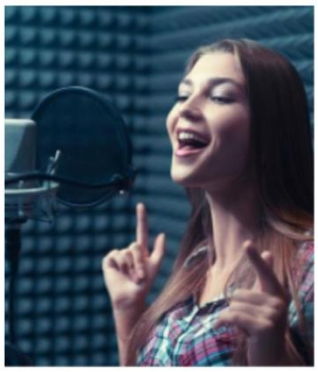
Referring to the image below, please think about the roles each person might play in a recording studio session.

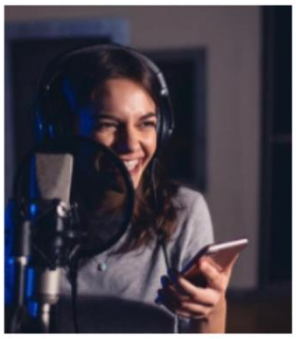
Please assign a role to each person and elaborate on why you chose them. How authentic do you think the depiction is from your experiences in the music technology area? Are your answers based on your perceptions of how the industry is, how you would like it to be, or some other basis?

Question 3:

The images below were collected from a search of "recording studio" in a large stock photo database. Do you think this is an intentionally accurate depiction of roles in the industry?

Please share your thoughts and feelings about the way people in the studio are represented.



Question 4:

After a google image search for "Audio Engineer" the following is the breakdown of the images based on investigating the image source pages further to assess gender presentation. (Please note: In some cases this is based on gender assumption from the image alone)

-50 male-presenting engineers / models (including 1 stock image)
-24 images with people cropped out (mostly leaving a hand or arm)
-17 images with no people in them
-7 female-presenting engineers / models (including 3 stock images)
-16 of the first 25 images contained male engineers / models, while the remaining 9 were partial shots of people or had no people in the image.
-The first female engineer / model was the 26th image.

4. Regardless of your gender, please describe how you perceive the way male engineers' experiences in the music technology industry or in music technology education differ from that of a female or non-binary engineers' experiences. Please feel free to relate your own experiences, opinions, reflections, or impressions you have regarding the gendered differences of experience or otherwise.

Question 5:

“Boys/men are into technology and toys, while girls/women prefer emotional content and stories”
Variations on this statement are commonly expressed in a number of ways to justify the gender breakdown of music technology.

5. How accurate do you think the statement is? Please speculate on the reasons for your answer. Have you experienced or used similar statements yourself?
Please relate how you feel about the statement.

Question 6:

Do you think that male engineers hold a privileged position in the music technology industry? Please elaborate on your answer.

Question 7:

Please think about the most important traits a successful music technology student or professional in the industry possesses?

Would you generally ascribe the traits you are thinking about to a specific gender? If so, please elaborate.
Do you think others would agree with your assessment?

7. Please use this space to discuss your thoughts and why you chose to gender certain behaviours or otherwise. Do you think others might ascribe genders to behaviours?

Question 8:

Please add any further thoughts, opinions or reflections of your experiences you wish to add in the context of music technology education or the industry. Do feel free to comment on any aspect of the survey as well.

2. Participant Information Sheet

Implicit Gender Bias in Music Technology Education

Tena koe. My name is Daryl Tapsell and I am currently teaching across a number of programmes at the Music and Audio Institute of New Zealand (MAINZ). In addition to this rewarding endeavour, I am researching the effects of implicit gender bias in the music technology education sector to complete my master's in education at the Auckland University of Technology (AUT). It gives me a great deal of pleasure to invite you to participate in my research journey and I hope that together we can increase our knowledge about this area.

What is the purpose of this research?

Within the music technology education sector and the wider industry, the gender breakdown is heavily weighted toward male educators and engineers. There is a prevailing view that males are more interested in music technology and technology in general. This research hopes to gain some insight into attitudes towards the notion that there is an implicit gender bias of both technology and technological roles in the music technology programmes on offer within Aotearoa New Zealand.

Bias can be generally considered to be the act of making a decision based on certain characteristics or criteria, and therefore gender bias implies a discrimination or favour based on gender or perceived gender. This research is not seeking examples of overt gender prejudice, but implicit gender bias, which manifests as an unconscious association. For example, the expectation of a certain gender being more likely to operate certain machinery, have a certain responsibility, or be in a role. An example might be medical professionals where an unconscious bias might lead one to assume that the uniformed professional approaching you is a nurse rather than a doctor, based on their gender.

In addition to the completion of a dissertation and master's qualification, the findings of this research may be used for other academic publications and presentations.

What will happen in this research?

Your participation in this research will involve looking at a series of visual images online within the survey and then discussing your impressions and opinions as prompted by the statements and questions accompanying the images. The questions themselves are relatively open to elicit as wide a view as you wish to share on the images and ideally you would try to answer honestly about your initial thoughts which may reveal unconscious biases prevalent in your own thought processes. The survey is anonymous for this reason so that you may be open and honest about your first impressions without concern about judgement. Recent research into implicit bias has posed the notion that many biases are instinctive and does not reflect on the conscious decisions we make. No data collected will be used for any purpose other than relating the potential gender biases in music technology education and speculation on the effect.

How was I identified and why am I being invited to participate in this research?

You have been invited to participate in this research project because you are engaged in music technology education or have been engaged in this education area within the last 2 years, and as such have valuable insight into the sector that will help describe the experience within music technology education as well as sharing your views, opinions, and experiences.

How do I agree to participate in this research?

By clicking on the button to submit the survey you are implying consent to the use of your answers forming part of the research with the understanding that no data which may identify you or any other person or organisation will be published.

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are not able to withdraw from the study once the survey has been submitted as this would compromise your anonymity as a participant. Please consider this before submitting your completed survey.

What are the discomforts and risks?

Any time we are critically looking at ourselves and reflecting on our unconscious minds there is the inherent danger of experiencing some discomfort about our attitudes and opinions, and the potential of humiliation, judgement or further consequences should an underlying bias be revealed.

How will these discomforts and risks be alleviated?

Using an anonymous survey should mitigate any concern about external judgement and humiliation. It is for this reason that I ask that you take care not to answer a question in a way that identifies you, or any other person or organisation. If, when reviewing your data, I find anything that may identify any people or organisations, it will be removed from the results providing a second layer of confidentiality in the unlikely case that this occurs. If you are uncomfortable answering any of the questions for any reason, then please feel free to skip that question and continue.

What are the benefits?

Personally, I will benefit by completing a master's qualification at the completion of this research project, although this is not the primary focus. Any small or incremental addition to the knowledge of the wider community is of benefit to society as a whole, and since there is a focus on improving both gender parity and equity of science, technology, engineering, arts and mathematics (STEAM) participation, any additional research will benefit the move towards addressing these disparities.

While it is hoped that this project has benefit to individuals pursuing education or a career in the music technology industry it is important to note that addressing the issue of gender equity, particularly in the science, technology, engineering, arts and mathematics fields is worth considering as a need for industry and indeed, a wider societal change.

In light of this the benefits of the research are predominantly a potential increased awareness of implicit bias and role gendering, addressing the need for the participants in the music technology industry to recognise the unconscious biases that contribute in perpetuating the gender imbalance the field and allowing for a growth in awareness around the use of gendered language and assumption of role and object gendering in the day to day of music technology education.

What are the costs of participating in this research?

While there are no direct financial costs from participation you will be donating up to an hour of your valuable time and this is very much appreciated. I would like to thank you in advance for donating your time to this.

What opportunity do I have to consider this invitation?

The survey is open for 30 days from 12 October 2020 and will close on 27 November 2020. You may complete the survey at any time within that time period.

Will I receive feedback on the results of this research?

The summary of findings and links to the final research output will be available from the following website.

http://www.genderbiasresearch2020.live

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr. Andrew Gibbons | *agibbons@aut.ac.nz* | (+649) 921 9999 ext 7929

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC | *ethics@aut.ac.nz* | (+649) 921 9999 ext 6038.

Whom do I contact for further information about this research?

Please download and keep this Information Sheet for your future reference [download link below]. You are also able to contact the research team as follows:

Researcher Contact Details:

Daryl Tapsell | *dartap00@gmail.com*

Project Supervisor Contact Details:

Dr. Andrew Gibbons | *agibbons@aut.ac.nz* | (+649) 921 9999 ext 7929

Approved by the Auckland University of Technology Ethics Committee on 25 September 2020 AUTEC Reference number 20/275.

3. <u>Participant Recruitment Poster Image</u>