# LETTERS TO A YOUNGER SELF

SUPPORTING FUTURE INTERDISCIPLINARY ACADEMICS

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# Abstract

Most contemporary universities are organised around discipline-based units and the notion of discipline is deeply intertwined with academic life and this creates challenges for interdisciplinary scholars.

This work is focused on identifying the barriers to interdisciplinary scholarly activity in New Zealand universities, and to examine the strategies used by established interdisciplinary scholars to navigate those barriers. The ultimate objective of the work is to distil these strategies into advice for early career academics wishing to purse an interdisciplinary career.

A survey was used to collect data related to the barriers to interdisciplinarity as well as the motivations for undertaking interdisciplinary work. The main barriers identified included a lack of institutional support, lack of recognition in terms or promotion, and an increased difficulty in research design.

The study ultimately utilises the notion of a ‘letter to a younger self’ as the mechanism to capture the lived experience of established interdisciplinary academics. A reflexive thematic analysis is used to create the guidance for early career academics, with the main advice focused on developing networks, methodological flexibility, and open mindedness.

In addition, this research makes recommendations for leadership that can result in an improved organisational culture that is better suited to fostering interdisciplinarity.

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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."

Signature:

Date: 18th November 2022

# Acknowledgements

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I am wholly indebted to the various Vice-Chancellors and Deputy Vice-Chancellors of the Universities that approved my data collection within their internal channels. Without that support, this research would have had much less significance. Whilst all the universities provided their support, special thanks must go to Adrienne Cleland at the University of Auckland who was especially patient as we worked through how to navigate the ethics of communicating across institutions. As the University of Auckland was the first place that I asked, Adrienne did most of the heavy lifting that made it easier for me to approach the other institutions.

I also must thank the participants that gave up their time to provide their views and stories. For most of you who completed the survey, I will never know who you are. But thank you and remember that you are not alone. But those who contributed to the second stage of this research deserve a special mention. Thank you for sharing your stories and in doing so helping younger academics on their journey.

Last, but by no means least, Natacha, Isabelle and Daniel. You make it all worthwhile.

This research was approved by the AUT Ethics Committee on 14th April 2021 and assigned reference 21/75.

# Personal Statement

This thesis is the outcome of a personal journey that spans twenty-five years of my career. Whilst it stands alone as a piece of research without this wider context, my relationship with the work and the motivations for producing it have influenced it in subtle ways that are worth recording. It has also had a profound effect on my academic identity.

It was only undertaking the qualitative data analysis that I had a moment of clarity. I was writing about the importance of socialising early career academics in interdisciplinary scholarship that I realised that this was a process that I had been through. My own doctoral research (Connor, 1996) is a piece of work that utilised computational modelling of population genetics as a means to automate the design of mechatronic systems. Here are five disciplines straight away – computer science, biology, design, and both mechanical and electrical engineering. On reflection, I attribute my natural ease of slipping between disciplines to this early work. But at the same time, it is probably also a cause of why I have doubted my own academic identity and felt that I have never quite 'fitted' in any academic environment.

This sense of not fitting has been most keenly felt whilst preparing for the last three Performance Based Research Fund (PBRF) rounds. In every single round I have looked at my panel choices and struggled to decide which would best view my research. As I look ahead to the next round, I now have a more complex choice than previously and could potentially choose one of four panels, namely Engineering, Technology & Design, Mathematics, Information Systems and Technology, Creative & Performing Arts, and Education. None of them are the correct choice.

My career has wound its way through engineering, computer science, creative technologies, and education. I have published in very diverse areas, such as design method for fluid power systems (Connor, 1999), developing wearable haptic game controllers (Foottit et al., 2016), computational simulation of team behaviour (Sosa & Connor, 2018), active learning (Connor, Marks, et al., 2015), software architecture (Schmidt et al., 2011), mining software repositories (Finlay et al., 2011), automated game level design (Connor, Greig, et al., 2017), requirements engineering (Talbot & Connor, 2011), spontaneous interpersonal synchronisation (Ayache et al., 2021) and trying to define what my field of study is (Connor, 2020; Connor & Sosa, 2018) to name but a few. Some might ask "where do these fit in a coherent PBRF portfolio?", but I ask, "why do they have to fit in a coherent PBRF portfolio?".

My own leadership journey has been tightly coupled with this interdisciplinary exploration, and certainly taking on formal leadership roles was significantly easier when the bounds of those roles fell within traditional disciplinary norms. More recently, as my understanding of interdisciplinarity has developed and I have attempted to support and promote interdisciplinary programmes and research, the inherent contradiction between the structures of the university and the goals of interdisciplinarity have become apparent to me. My own personal views on interdisciplinarity align very much with the early work by the likes of Eric Jantsch who argues that interdisciplinarity needs to be understood as a teleological and normative concept and involves the coordination of disciplines towards an end that exists as a higher level concept. And yet the hierarchy of most universities is certainly the opposite of teleological which gives rise to the inherent contradictions. These then entail certain challenges for those taking up formal leadership positions in how they attempt to shape interdisciplinarity in the context of institutional practices and norms. My own solution to these challenges was initially to step back from formal leadership, noting the difference between being 'in authority' as opposed to 'an authority'. The conduct of this research has instrumental in the continuation of that leadership journey and changed my views of the academy in general.

As an educator, I am deeply concerned about the changes that are happening around us. More and more it seems that education doesn't value curiosity but only conformity. Every research output seems to need to have some definable impact to make it worthwhile, and more and more it seems like we are losing richness in the conversations that arise by focusing entirely on disciplines and work contained wholly in them.

This dissatisfaction of the status quo has been the driver for this research and has undeniably made me biased. But I have attempted to keep that bias out of the research as much as possible. I personally struggle to resolve the tensions of not fitting in a system of faculties, schools and departments, but purposefully tried to not collect data in a positivist way to find affirmation of my own lived experience. Rather, I tried to be open to hearing what others felt about what made them interested in interdisciplinary scholarship as well as what made it hard. There are places where I purposefully allowed my bias to slip into the initial data collection, firstly in the context of PBRF, the national research excellence evaluation, also in asking whether terminology was used interchangeably at an institution. I notice more and more that people will swap multi-, cross- and interdisciplinary even though they have different meanings. It is something that undeniably irks me, so the bias does need to be acknowledged, and indeed embraced.

Collecting and reviewing the data has had a profound impact on how I view myself. I now know that I am not alone, and others have succeeded in existing in a system that is not designed to allow them to flourish. Bringing these stories out in the open and sharing them for the benefit of the next generation of academics is major contribution of this thesis along with how the process has impacted my own leadership practice for the future.

At the outset, this research set out with a phenomenological perspective. As it turns out, my lived experience is one that is shared by many academics. As such, my voice as the researcher has a place in story being told. As a result, I participated in my own data collection, which involved completing the survey that was used in the first phase, also writing my own letter to my younger self in the second stage.

This thesis also sits across the boundary between education and educational leadership. Throughout the research process, I've become increasingly of the view that real change in universities is hard because they are constrained by the wider tertiary environment. That has led the development of the work down a path that focuses on individuals and how they can thrive in a system that is not well set up to accommodate their aspirations. More importantly, it is about how I as an academic leader can help those individuals on their journey. I have at times drifted into thinking about policy and governance issues, though perhaps not in a fully informed or justified way. I have therefore tried to shift some of these aspects into the discussion, which mostly focuses on discussing the implications for leadership that arise from this work. Some of this content is purposefully speculative, borrowing a phrase from Rob Hopkins, it asks how we move from 'what is' to 'what if?'. I have thoroughly enjoyed the writing of this chapter, even though it may be viewed by some as not fitting well in the thesis. I believe that we do need to challenge what is normal in the disciplines and this grounded speculation does that.

Having been on this journey for some time, I don't see this thesis as an end but just one more step forward. The next step may not be in the same direction, but there will be a step. As I think about what that step is, am I confident for the future? In the long term yes, but the short term there is a hard road ahead. Disciplines have a momentum that is hard to deflect. As a case in point, my teaching area of Creative Technologies has always been framed as an interdisciplinary programme. The decisions made to house this in a department, with in a school, and to embed majors in the programme all demonstrate this disciplinary momentum. It is always going to be easier to adopt discipline-based constructs and those most able to influence change often seem to be the ones that take the easiest path. But I remain committed to helping interdisciplinarity flourish even though the path ahead is not easy. That is my future leadership journey. I strongly believe that the solution is

not getting rid of disciplines, but just building enough of a critical mass of interdisciplinary scholars so that disciplines and interdisciplinarity co-exist in a productive way. To achieve this, we need to start at the beginning…

# Chapter 1: Introduction

This chapter provides a brief introduction to the research presented in this thesis, focusing on the background to the study, the objective of the research, and the structure of the thesis.

## BACKGROUND

Universities around the world are typically structured hierarchically around discipline-based units. Whilst the terminology differs across the tertiary sector, broadly speaking, departments of similar disciplines are grouped together into schools, and again similar schools are grouped together into faculties.

The structuring of universities in this way has produced a system that is discipline centric, and the role of disciplines in socialising new academic staff is clear (Beyer & Lodahl, 1976; Weidman & Stein, 2003). Some researchers argue that disciplines have evolved into cartels, where effectively they exist to produce the next generation of academic staff that will continue to perpetuate discipline norms and cultures to ensure that the discipline survives (B. Turner, 2000). The result of this is the creation of unique subcultures in the university that do not share the same language, values, or ideals (Becher, 1989).

In contrast, the world outside of the 'ivory towers' is increasingly calling for more integrated and holistic approaches to solving contemporary challenges, arguing that issues such as climate, poverty, social justice, and so on cannot be approached from a single disciplinary perspective and different ways of thinking are needed to move towards more sustainable futures (V. A. Brown et al., 2010). More recently it has been noted that "interdisciplinarity is widely considered necessary to solving many contemporary problems, such as those related to climate change and sustainability" (Salmela et al., 2021, p. 355).

Universities have long been considered central to the production of knowledge (Godin & Gingras, 2000) and the apparent disconnect between the needs of society and discipline centric approaches to knowledge production are potentially problematic. Lechevalier and Laugier indicate that there are "strong signal[s] of the problems associated with the disconnect between scientific developments and the needs of society" (Lechevalier & Laugier, 2019, p. 4) and the fact that siloes between disciplines still exist (Gannon-Cook & Ley, 2020) emphasises the challenges of addressing this. Whilst some argue that "age of disciplinary knowledge may be ending" (Frodeman, 2011, p. 111) the process of shifting to new ways of thinking is at best slow, with few apparent changes to how universities are structured.

The structuring and governance of universities can be argued as creating barriers to innovation and collaboration across disciplines (Darbellay, 2019). Indeed, some authors go as far as to indicate that university structures and interdisciplinary knowledge are fundamentally incompatible (Bergland, 2021). Whilst there is a growing movement for change, understanding the barriers to interdisciplinary collaboration in universities is essential both as an interim measure to allow interdisciplinary research and teaching to gain a foothold as well as ensuring that knowledge production in the future is designed in such a way as to remove these barriers.

## RESEARCH OBJECTIVE

The objective of the research described in this thesis is to develop an understanding of the barriers to interdisciplinarity in New Zealand universities. Further to this, the research aims to identify the strategies used by established interdisciplinary academic to navigate these barriers to produce guidance to support early career academics to adopt interdisciplinary careers more easily.

## THESIS OUTLINE

This thesis consists of seven chapters. Chapter Two presents an overview of the literature related to the topic and Chapter Three describes the research design and methodological choices. Chapter Four outlines the analysis of data from a national survey of academics and Chapter Five presents the approach used to identify and distil the strategies of established interdisciplinary academics into advice for early career academics. These chapters include a preliminary discussion of the separate results. Chapter Six provides a much broader discussion of the findings, primarily focusing on the implications for leadership. This chapter also includes grounded speculation as to how the barriers faced by interdisciplinary academics could be addressed. Finally, Chapter Seven concludes the thesis with a consideration of limitations and specific directions for future work that emerge from the grounded speculation in Chapter Six.

# Chapter 2: Literature Review

This chapter introduces several key themes and brings together the literature related to each theme in the context of this study.

## THE FEUDAL UNIVERSITY

The starting point in setting the scene of this research is an examination of a painting by Laurentius de Voltolina, which is reproduced in Figure 2.1.

Figure 2.1 Liber Ethicorum des Henricus de Alemannia (de Voltolina, 1350s)

This painting can be used to pose questions about how much universities may have changed since their inception, if at all. The painting bears some similarity to many lecture theatres today, rows of students in a lecture hall looking forward to the 'sage on a stage'. The details are uncannily like a modern lecture, the students at the back of the class talking amongst themselves, the hungover student in the third row wishing they hadn't woken up, and the sleeping student in the second row failing to be engaged by the content or the delivery. If instructional methods haven't changed significantly since the 14th century, is it possible that there are other aspects of a university that

haven't changed as well? Bergami certainly suggests that "little has changed since feudal times in terms of governance and decision making structures and behaviour." (Bergami, 2019, p. 38).

In contrast, Yielder and Coddling (2004) suggest that Australasian universities have gone through a period of change over the last four decades. However, when viewed realistically, many of the changes would relate to the operational context and size, and do not necessarily relate to the internal structures and governance. Wolfe notes that "the university seems to be sailing along, impervious to the forces buffeting the rest of society" (Wolfe, 1996, p. 54). Wolfe argues that university structures and governance are founded in the feudal system that was common when universities were created and concludes that the "imperviousness to change owes much to faculty's suspicion of the market, which is the major agent of change in modern society, and to their ability to resist it through the maintenance of a feudal order" (Wolfe, 1996, p. 66). Wolfe is not alone in drawing parallels between University structures and the feudal system (Brechelmacher et al., 2015; Holligan, 2011; Kerr, 1987). Some authors argue that that the feudal system is constantly reinvented in universities, leading to the use of the term neo-feudalism (Reitz, 2017).

Whilst universities often attempt change, it also seems that change can be short lived. Perhaps the reinventing of the feudal system observed by Reitz (2017) is more akin to reversion. To some extent, the question is not whether universities have changed, but more on what makes change difficult to achieve?

## ORGANISATIONAL INERTIA AND CHANGE

Inertia is a tendency of an object to do nothing or to remain unchanged unless the state of the object is affected by an external force. Meanwhile, momentum is the impetus gained by a moving object by virtue of its motion and its mass. Momentum can be thought of as the effort required to bring an object to rest or change its motion.

A university can be thought of as a moving body that will continue its trajectory unless a change is brought to bear upon it, either from within the university or from outside. For that change to occur, it needs to overcome the momentum of the university itself. Organisational inertia is not a new concept and studies of organisations have identified such inertia as one of the main causes behind the failure to change when needed (Kinnear & Roodt, 1998) or indeed when change is resisted (Pearse, 2010). Personal experience would suggest that change is nearly always resisted. When university leadership introduces something new, it is resisted by academic staff. Similarly, when academic staff ask for change it is resisted by the leadership. Such anecdotal experience needs to be elaborated on with support from the literature.

There are, of course, different views on resistance to change in the literature. For example, some studies suggest that individuals aren't resisting change itself, but are actually resisting perceived threats (Chreim, 2006; Dent & Powley, 2002). Often such perceptions may relate to practical issues such as a perceived loss of pay or status, or instead a feeling that there is a loss of autonomy or integrity. Other studies suggest that people will subconsciously resist all change that does not obviously improve the circumstances of the individual, which can be conceptualized as personal survival (Karp & Helgø, 2009).

Resistance to change needs to be viewed in relation to the source of change. When considering change initiatives from leadership teams, some studies have shown acceptance of change is more likely when individuals believe that they have a higher quality relationship with their superiors (Smith, 2018). Whilst this seems intuitive, it follows that effective governance in universities can only be achieved when there is a high degree of trust. Kezar argues that "leadership, trust, and relationships supersede structures and processes in effective decision making" and also indicates that governance can "operate with imperfect structures and processes, but if leadership is missing and relationships and trust damaged, the governance system will likely fail" (Kezar, 2004, pp. 44–45). This would certainly be the case in a change initiative.

It is important to recognise that most large organisations often consist of subcultures, where each of those subcultures most likely has a different perception of the leadership of the organization and a differing degree of trust. In a university context, it has been shown that different disciplines can be viewed as subcultures and that each have different preferences when it comes to leadership (Kekäle, 1999). Change initiatives can therefore be more challenging in an academic environment, particularly given that organisational culture is the "emergent result of the continuing negotiations about values, meanings and proprieties between the members of that organisation and with its environment" (Seel, 2000, p. 3). It is not unreasonable to infer that if different disciplines have different preferences in terms of academic leadership that any change initiative may be viewed differently by different subgroups. This existence of sub-groups is also noted by Schein, who states "Much of the work of organization development practitioners deals with the knitting together of diverse and warring sub-cultures" (Schein, 1990, p. 72). Given the challenges on academic leaders because of this, it is perhaps not surprising that universities are slow to change.

Much of the literature relating to change initiatives in academic institutions has focused on the role played by those in formal leadership roles. However, several studies have suggested that the most meaningful change is achieved when it is implemented at the grass-roots level (J. Thomas & Willcoxson, 1998) although other studies have indicated that innovation or change at the lower

levels of an organisation is often blocked by leadership (Edmonds & Stolk, 2018). Given the earlier discussion around how individuals perceive change, is it possible that leaders are resistant to change from below for the same reasons, namely a perceived fear of loss of autonomy, control, power or status? Imposter syndrome has been identified periodically in academia across different roles (Parkman, 2016), so is it possible that academics in senior leadership roles suffer the same insecurities as early career academics? This could easily be the cause of the belief that organisations and leaders can be viewed as oppressors (Kezar, 2011) and when compensating behaviours are taken too far then this can see the emergence of what is known as toxic leadership, which can be the cause of a poor lived experience in academia (Fahie, 2019).

Toxic leadership is a concern both in terms of culture and change. Schein notes that organisational culture is a learned phenomenon (Schein, 1990). Whilst 'learningful conversations' can be helpful for early career academics in order to develop an understanding of the environment they are immersed in (McKay & Monk, 2017), if the culture of an organisation is already toxic then such conversations can lead to the belief that the toxic behaviours are acceptable and are the norm that arises from the values of the organization. This would then perpetuate the ongoing culture and create more momentum, making it even harder for change initiatives to gain traction. This is commented on by Langfield-Smith who notes:

> With successive generations of organisational members these values are increasingly taken for granted, and they become the assumptions that underlie the organisational culture. They influence the more tangible aspects of the organisational culture - the work practices, the rituals and symbols - and will protect and sustain the culture. The culture is perpetuated and may grow in intensity as shared experiences increase.(Langfield-Smith, 1995, p. 192)

Culture as a concept was "originally developed by anthropologists to describe the least changeable elements of a society" (Evans et al., 1989, p. 31), which would indicate that organization culture itself has its own inertia and momentum. It is important to consider how to avoid the perpetuation of poor culture, break the cycle of propagation of toxic behaviours, and improve culture. Branson argues that:

> Organisations are, in the first instance, a collection of individual people. This implies that changing the people should be the first step in any process that seeks to change organisations. If there is a need to change organisations, then the first consideration should be to bring about an appropriate change in each person within the organisation before turning attention towards changing the non-human parts of the organisation such as the structures, the processes, and the preferred practices. (Branson, 2008, p. 392)

Whether this is achievable in universities is debatable, given the scale of a typical university and how deep some of the fundamental divisions exist. Nevertheless, it is clear that organisational culture should be a shared responsibility. Whilst Stensaker and Vabø aren't specifically addressing change, they argue that:

> One option for solving this challenge [decision making] is to clarify key principles, norms and values, a priori specific decisions that have to be taken, creating a kind of social contract between the academic staff and the leadership on how certain issues are to be tackled. (Stensaker & Vabø, 2013, p. 271)

When combined with trust, which arises from having good leadership practices, such an approach is most likely to lead to more successful change initiatives. Despite this observation, the complexity of the university and the 'academic tribes' that exist across the structures still present challenges.

## ACADEMIC TRIBES AND DISCIPLINES

Before starting this section, it is important to acknowledge the discourse around the use of the word 'tribe' and lack of appropriateness due to its colonial roots, particularly the way it is often used to signify 'primitive peoples' (Manathunga & Brew, 2012), which is certainly not the intention here. The term has been used extensively in the past and needs to be navigated historically before it is possible to move past such value-laden terminology.

The term 'academic tribes' is often attributed to Tony Becher (Becher, 1989), however the ideas underpinning the term trace their roots to much earlier. Bailey indicates that different tribes exist in universities and they interact and relate to each other as a community when he states:

> Each tribe has a name and a territory, settles its own affairs, goes to war with others, has a distinct language or at least a distinct dialect and a variety of symbolic ways of demonstrating its apartness from others. Nevertheless the whole set of tribes possess a common culture: their ways of construing the world and the people who live in it are sufficiently similar for them to be able to understand, more or less, each other's culture and even, when necessary, to communicate with members of other tribes. Universities possess a single culture which directs interaction between the many distinct and often mutually hostile groups. (Bailey, 1977, p. 212)

To understand why these tribes came to be, it is necessary to understand the notion of disciplines and how universities are typically structured. It is possible to define academic disciplines in different ways. Donald, for example, describes a discipline as having "a body of knowledge with a reasonably logical taxonomy, a specialized vocabulary, an accepted body of theory, a systematic research strategy, and techniques for replication and validity" (Donald, 2002, p. 8). A discipline's

body of knowledge also provides the foundation to socialize and train members of that discipline (Beyer & Lodahl, 1976). This socialisation process develops the required competence to carry out the relevant tasks of research, teaching, and administration in that discipline. It promotes the production of relevant research, the process of peer-review, and a system of rewards related to these activities (Beyer & Lodahl, 1976; Reich & Reich, 2006). Disciplines can also be considered as 'cultural phenomena' and as such "they are embodied in collections of like-minded people, each with their own codes of conduct, sets of values, and distinctive intellectual tasks" (Becher, 1981, p. 109). Some authors go as far as to describe disciplines as "cartels that organize markets for the production and employment of students by excluding those job-seekers who are not products of the cartel" (B. Turner, 2000, p. 51).

Whilst Turner's view of disciplines may be considered harsh, others note that:

> Disciplines are the intellectual structures in which the transfer of knowledge from one generation to the next is cast; that is, they shape the entire system of education. Likewise, disciplines have a great impact on the structure of occupations – the world of practice. (Weingart & Stehr, 2000, p. xi)

Similarly, Østreng argues that:

> Each discipline has a distinct subject matter, a research agenda, a curriculum, an associated theoretical framework and a common approach to study using appropriate techniques for understanding and discovering new knowledge. This means that disciplines are relatively delimited contingent of researchers who work within the academic and intellectual bounds considered theoretically legitimate among themselves. (Østreng, 2008, p. 11)

Looking at these definitions, it is reasonable to conclude that disciplines are mostly focused on themselves. Disciplines therefore contribute to the Becher's notion of academic tribes, as each discipline has its own set of discourses. Given the concerns over the terminology at the beginning of this section, and the flaws of many alternative labels, the word 'tribe' will be replaced in the rest of this thesis with the more appropriate 'subculture'. And in that context, it is also important to note that disciplines make a large contribution to the concept of academic identity so can also be thought of as something that differentiates between different subcultures.

Henkel (2005) argues that academic identity is a function of community membership and for any academic this becomes grounded in interactions between the individual and both their discipline and their institution. In this complex dynamic between individuals, disciplines, and institutions the primacy of the discipline in academic working lives and academic autonomy plays an important

role in the formation of academic identities. This potentially feeds into why academics often resist change, because there is a higher degree of affinity with their discipline than with their institution.

Within in most universities, disciplines have been the root of the basic structures by which the university is organised. In many universities, undergraduate enrol in to discipline specific programmes of study. Similarly, academic staff are appointed into discipline positions and promoted because of their contribution to that discipline. For many universities, revenue is generated and allocated proportionally to student enrolments in discipline-based courses. To all intents and purposes, the department (or school) serves as the structural equivalent of the discipline (Holley, 2009) and as a result the structural and conceptual elements become indistinguishable.

To complete the scenario of academic subcultures, it is important to explore the hierarchy or 'pecking order' of disciplines. Certainly, from a policy perspective, subjects that qualify as being in the areas of science, technology, engineering and maths (STEM) are often prioritised over other subjects with some authors going as far to say that STEM subjects are the "central preoccupation of policy makers across the world" (Marginson et al., 2013, p. 13) and that "politicians and others do not see these areas [arts, humanities and social sciences] as contributors to a healthy and prosperous society" (Linton, 2018, p. 6). Debates over which disciplines are 'best' are not always overt, though do occur (Matthiasson, 1968), but there is a clear undertone that in the current scientific era there is a preference for increased rigour in non-scientific domains (Cotos et al., 2017; Counsell, 2011; Fallman & Stolterman, 2010) that echoes the water cooler conversations of the everyday existence of academics. Indeed, some research into discipline boundaries and behaviours has noted that "intellectual value and rigor of particular disciplines was a frequent topic that arose without prompting in our interviews. The end result is a culture that is more competitive than collaborative" (Simula & Scott, 2021, p. 384).

## INTERDISCIPLINARITY

Interdisciplinarity is not a new concept, and many of its underlying practices can be traced back several millennia (AI-Saleem, 2017). Since the term emerged in the twentieth century there has been a steady increase in interest in relation to policy, practice, teaching, and research (Chettiparamb, 2007). Whilst interdisciplinarity has not gained universal acceptance, its advocates argue that it is both desirable and inevitable. It is seen by many as a means to promote the kinds of collaboration required if we are to address the complex contemporary challenges and wicked problems that the world currently faces (R. R. Brown et al., 2015; Wade et al., 2020).

Whilst the world around them calls for different ways of thinking that transcend disciplinary boundaries, some commentators argue that universities are becoming more deeply entrenched in the disciplines (e.g. Holley, 2009; Millar, 2016). Other commentators make suggestions on how universities can adapt their institutional cultures to better support interdisciplinarity (e.g. Goring et al., 2014; Hannon et al., 2018; Klein & Falk-Krzesinski, 2017). However, most universities around the world offer few incentives for academics to work in interdisciplinary ways, and guidance for those interested in this approach is rare.

As a direct consequence of this, despite many broader social changes, the nature of disciplines in academia has remained largely unchanged. Perhaps the only real observable change being the dynamism that disciplines display: growing, morphing and splitting over time (Trowler, 2014). This lack of change is only observable in practice, as the research literature is filled with calls for changes to this discipline-based governance. For example, Jantsch (1972) describes a set of hierarchical models that describe different forms of collaboration between disciplines as well as a new set of organisational structures that embed this thinking into university governance, whilst more recently Max-Neef (2005) argues for the need to shift towards thematic governance, research and programmes.

It is arguable that the organisation of knowledge into distinct scientific, technical or creative disciplines has resulted in educational systems designed to institutionalize, reproduce, and validate particular occupations or career structures (Connor, Sosa, et al., 2017) and not to address real world problems. The ongoing morphing and subdivision of disciplines can be seen as the product of a reductionist view of knowledge that assumes that the best way to examine or understand an issue is to break it down into component parts for analysis. It has been noted in the literature that "reductionism is deeply rooted in the way we perceive the world and organize our knowledge and educational systems" (Karlqvist, 1999, p. 379), however there are issues with this approach due to the degree of complexity that makes it more and more difficult to recombine the parts. When this is combined with the view that disciplines produce a delimited group of individuals focused on working within norms considered theoretically legitimate among themselves (Østreng, 2008) then there is the potential that the fragmentation and divide between disciplines will, like entropy, always increase.

For many interdisciplinary scholars, the focus has turned to how to facilitate collaboration between the disciplines and several models have been proposed. Bremner and Rogers (2013) define eight models of collaboration that extend disciplinary thinking, namely multidisciplinarity, crossdisciplinarity, interdisciplinarity, transdisciplinarity, pluridisciplinarity, metadisciplinarity,

alterdisciplinarity and undisciplinarity. Similar terms are used in other articles (Jantsch, 1972; Max-Neef, 2005), and yet more terms such as antidisciplinarity (Chen & Luetz, 2020; Jacobs, 2014) and postdisciplinarity (Darbellay, 2019) are also commonly used. These terms are often defined in different ways by different authors, and the subtle nuances between them are potentially confusing. Connor et al. (2017) compare the definitions of only interdiscplinarity and transdisciplinarity across six sources (Bremner & Rodgers, 2013; Hunt & Thornsbury, 2014; Jantsch, 1972; Meeth, 1978; Nicolescu, 2002; Wickson et al., 2006) and note distinct differences between the definitions. These differences are not necessarily substantive or contradictory, but there is enough variability that it is likely that monodisciplinary scholars are very likely to not engage with the debate about the value of interdisciplinarity and potentially building a feeling of being threatened. Both factors will make it less likely that meaningful change in adopting interdisciplinary scholarship will be successful. Indeed, Land argues that "if interdisciplinarity is valued as both a personal and common good, for the reasons intimated earlier, then it might be deemed desirable for more academics to become more interdisciplinary-minded" (Land, 2012) which suggests that there is a need to make interdisciplinarity as accessible as possible.

There is a great deal of confusion between multi-, cross- and interdisciplinarity as it is, that the addition of the more nuanced models of extra-disciplinary practices is potentially counter-productive. The research in this thesis does not aim to enter or resolve this confusion in terminology, nor does it aim to impose a particular view of what interdisciplinarity is during data collection. However, broadly speaking there is an assumption that the interdisciplinarity is a coordination of activities across several different disciplines through alignment with a common goal or purpose. This view is grounded in the early work of Eric Jantsch (Jantsch, 1972) and the suggestion that disciplines exist at different levels of abstraction in a hierarchy with four levels, namely the empirical, pragmatic, normative, and value levels.

Petrie (1976) analyses the history of disciplines and notes that interdisciplinary collaborations occur between disciplinary specialists only when the demands of their subject warrant it, which typically is when a particular issue or problem needs new perspectives to generate new insight. Whether the process by which this is occurs is cross-, pluri-, inter- or transdisciplinary practice is irrelevant, particularly if the complicated and confusing terminology becomes a disincentive for this collaboration to take place and turns researchers back in on their own discipline.

Whether interdisciplinarity in the academy is a success is a debatable point and there are mixed results in terms of both teaching and research (Aldrich, 2014; Jacobs & Frickel, 2009; McClam & Flores-Scott, 2012). In some cases, it has been shown that engagement with interdisciplinary

projects can lead to increased funding success and greater publication (Biancani et al., 2018; Bishop et al., 2014), whilst other studies indicate the opposite (Bromham et al., 2016; Leahey et al., 2017). Despite these differences, the research in this thesis is based to some extent on an assumption that interdisciplinarity is something that has value, but does not enter this debate in a critical way in relation to the outcomes of interdisciplinary endeavours as the context of any initiative is so important that it is hard to infer much from what are relative delineated studies.

How interdisciplinarity is embedded in the structure of a university also has mixed outcomes in the literature. One of the most common approaches is the creation of interdisciplinary institutes or centres that bridge the disciplinary structures in the institution. There are initiatives that have succeeded as well as those that have failed (Biancani et al., 2018; Leahey et al., 2019). Whilst interdisciplinary initiatives offer great opportunities it is clear that they come with great challenges. There is a need to understand the specific operational context of any planned initiative to maximise its chances of success. This needs to be accompanied by a broad understanding of what motivates individuals to pursue interdisciplinary careers and what barriers these individuals encounter.

## MOTIVATIONS FOR INTERDISCIPLINARY SCHOLARLY WORK

The motivations for individuals undertaking interdisciplinary scholarly activity have not been widely explored in previous studies. An Australian study argues that while there is a strong conceptual justification for interdisciplinary research in the literature, surprisingly few studies analyse the reasons individual researchers have for becoming involved in interdisciplinary projects (Shrimpton & Astbury, 2011). This study went on to identify individual influences and motivations using qualitative data collected from several interviews. This work resulted in the suggestion that researcher motivations fell into four broad categories: the desire to solve complex problems; the drive to produce relevant and useful outcomes; opportunistic motives; and intrinsic motives.

Other studies exploring the motivations of individual researchers have a topic-specific focus. For example, Milman et al. (2017) consider motivations for engagement in interdisciplinary climate change research. Three main motivations are identified: the challenge of such work; the importance of the research for solving a significant problem, and the enjoyment of engaging with an interdisciplinary research community. These motivations broadly align with other studies, for example a study conducted by the UK Energy Research Centre found that researcher motivations centred around personal interest in novel approaches, and enjoyment in working across different disciplines (Winskel et al., 2014).

A small number of studies have looked at other factors influencing participation in interdisciplinary research. For example, Carayol and Thi (2005) attempted to measure the 'degree of interdisciplinarity' across more than 900 researchers and then to correlate the factors associated with this measure. This study suggests that the context of interdisciplinary work is important, and that factors such as the size of a research group, and colleagues' status, age, and affiliations have a strong influence on researcher interest in interdisciplinary work. Interestingly, Carayol and Thi (2005) note that "Researchers undertake more interdisciplinary research when their colleagues are less promoted and older. This might indicate that researchers benefit from more 'openminded' interactions with older and unpromoted colleagues" (Carayol & Thi, 2005, p. 76).

Carayol & Thi also note that "as expected we find that the traditional academic career incentives do not stimulate interdisciplinary research" (Carayol & Thi, 2005, p. 70). To date, only a very few studies attempt to understand motivations for undertaking interdisciplinary work across large populations and multiple disciplines.

Even though the motivations for undertaking interdisciplinary careers being only lightly explored, there are suggestions in the literature which indicate that "scholarship is breaking out of the 'discipline within a department' structure" (Martin & Pfirman, 2017, p. 586). As a result, there is a need to consider how best to provide intentional support to interdisciplinary scholars and identify specific strategies that can help individual academics wishing to work in this way.

There are strategies proposed in the literature, for example by the Committee on Facilitating Interdisciplinary Research (National Academy of Sciences et al., 2005) which focused on how to address barriers to interdisciplinary work. This study indicated that changes were needed in several areas, including changes to policies related to hiring and promotion, that prospective interdisciplinary scholars should immerse themselves in other cultures, and changes to both the financial and funding models of institutions. Given that these issues are still considered relevant by Martin & Pfirman (2017), it is arguable that little real progress in terms of providing institutional support and incentives has been made, let along eroding barriers. Taking a single example, the topic of changing institutional policies regarding promotion is still actively being discussed in the literature (Klein & Falk-Krzesinski, 2017; Knapke et al., 2021; Tarrant & Thiele, 2017). As well as discussing the issues related to promotion, Tarrant and Thiele (2017) talk more broadly about supporting interdisciplinarity and propose seven strategies to assist, all of which broadly align with those proposed by the Committee on Facilitating Interdisciplinary Research (National Academy of Sciences et al., 2005).

Whilst this lack of progress seems disheartening, there is evidence in the literature that does indicate potential successes. For example, Bolger (2021a) indicates that the creation of research institutes that bridge multiple discipline-based schools have a positive impact on engagement with interdisciplinary scholarship. Similarly, McDonald et al. (2018) identify that real-world problems that are shared across different disciplines provide a good focus for interdisciplinary teaching experiences, an idea that can easily be extended to research teams. Supporting such initiatives in an institution may lead to an increased motivation from academic staff to engage in interdisciplinary work.

Much of the literature on support and incentives for interdisciplinary work focuses on removing barriers as opposed to novel initiatives. For example, Blythe and Cvitanovicargue that there is an opportunity to "transform institutional barriers into enablers of innovative interdisciplinary research for more sustainable, desirable, and equitable futures" (Blythe & Cvitanovic, 2020, p. 1) and propose several strategies to pursue this. A discussion of barriers is therefore relevant to understand generally what barriers exist to interdisciplinary scholarship.

## BARRIERS TO INTERDISCIPLINARY SCHOLARLY WORK

The potential barriers to interdisciplinary work are more widely discussed in the research literature and there are more studies that address barriers than motivations. Early work identified barriers that are related to differences in disciplinary cultures and languages (e.g. Matthiasson (1968). For Bradbeer (1999), interdisciplinary study is difficult because the disciplines have very different cognitive structures and cultures. Similarly, Lélé & Norgaard (2005) argue that the very different values, theories and epistemological structures of each discipline form a major barrier to interdisciplinary work. As MacKinnon, Hine and Barnard (2013) point out, disciplinary boundaries are erected very early in the education of scientists, and the boundaries can easily become barriers to collaboration.

Boden & Borrego (2011) discuss the institutional barriers to interdisciplinary work, focusing in particular on the academic reward system and the different disciplinary cultures. For them, "institutional barriers to interdisciplinary research are largely manifestations of the constraints of the current departmental organizational structure" (Boden & Borrego, 2011, p. 56). The academic reward system plays a role in both motivation and barriers in the sense that if they reward disciplinary approaches then this reduces potential motivation to interdisciplinary work. These structures therefore have a profound impact on individuals, so that, as Boden and Borrego note, "newer faculty members are often discouraged altogether from engaging in interdisciplinary

activities too early in their academic careers" (Boden & Borrego, 2011, p. 57). Waldman (2013) takes this idea further and writes:

> We are conditioned early on as graduate students to work on specialized projects. After graduation, we are then encouraged to gradually make a name for ourselves in particular, focused streams of research. Rarely does the thought of interdisciplinary activities take hold. Indeed, the networks that we form, conferences that we attend, and so forth, center around unidisciplinary work. In short, we can get by just fine in our careers without becoming interdisciplinary. So why bother? (Waldman, 2013, p. 2)

Given the focus on specialisation that emerges from the structural organisation of the university, how then do academics see themselves and form an academic identity?

## ACADEMIC IDENTITY

Disciplinary distinctions are common in modern universities and are used to define organisational structures, elaborate on differences in knowledge construction and dissemination, and effectively establish the norms, practices, and traditions of academic cultures (Poole, 2009).

The idea that academic identity is strongly influence by discipline and is also significant in terms of reinforcing academic subcultures was briefly discussed earlier, but should be revisited in the context of interdisciplinary scholars. There are a growing number of staff that wish to embrace interdisciplinary thinking, but given that those that do often experience a sense of exclusion (Hagoel & Kalekin-Fishman, 2002) even when undergoing 're-socialisation' in a discipline, then crossing boundaries is not as easy as might be imagined.

Meyer and Land suggest that the gaining of new insights on the world through a process of change may also involve the loss of one's old self or known (disciplinary) identity (Meyer & Land, 2005, pp. 374–375), so facilitating change in the university around disciplinary identities could be thought of as a positive erosion of so-called 'disciplinary egocentrism' (Connor, Karmokar, et al., 2015; Richter & Paretti, 2009) which has the potential to be a catalyst for much needed change in the academy. However, letting go of disciplinary identity is also a challenge. Simula and Scott (2021) undertook a study on how academic identities are formed noted that most academic staff located in departments that would be considered interdisciplinary in nature overwhelmingly held and asserted traditional disciplinary identities.

Furthermore, Simula and Scott (2021) noted that even those staff that acknowledged the value of interdisciplinary approaches expressed concerns about doing interdisciplinary work, fearing that it would diminish their disciplinary identity. In an environment where the organisational structure is

deeply coupled with discipline, and as such the socialisation of new staff is inherently discipline-based, it seems unlikely that many established staff would be prepared to let go of their own certainties in terms of identity. It is likely that any initiative that attempts this at scale would be resisted for the reasons that accompany all potential change initiatives. Given that it may be hard to 'undo' the formation of a discipline-based academic identity, it is worth considering how then early career academics may be guided towards interdisciplinary work and the development of an interdisciplinary academic identity.

Whilst some studies show that experienced academics develop identities that are not limited by the constraints of the notion of a discipline (Brew, 2008), the perspectives of early career academics (Bridle et al., 2013) indicates that such academics tend to not have a well-established network of contacts from outside their disciplinary specialism and as a result have a lower exposure to different ways of thinking that lead to developing an identity that spreads beyond that discipline.

## EARLY CAREER ACADEMICS

The challenges facing early career academics are well discussed in the literature (Hollywood et al., 2020; McKay & Monk, 2017) and there seems to be a general consensus that academic life necessitates trying to meet expectations and maintain a work/life balance. The challenges associated with this are increasing (Bell et al., 2012; Kinman & Jones, 2008; Noor, 2011; Strong et al., 2013), with such observations are consistent across multiple studies in different disciplines and cultures, so can be considered close to being universal. It has also been noted that "academic life is more difficult than most anticipate because the responsibilities are time-consuming, diverse, and conflicting" (Toews & Yazedjian, 2007, p. 113). This is no doubt true for all academics (Houston et al., 2006; Ylijoki & Mäntylä, 2003), but institutions seem to expect more of early career academics than ever before (Pitt & Mewburn, 2016). Early career academics often receive conflicting messages about how to split their time and focus their efforts (Sutherland, 2017) in order to balance their teaching, research and service obligations (McKay & Monk, 2017; Toews & Yazedjian, 2007).

These pressures are indicated in a body of literature that suggests that early career academics need to be supported and helped in their development using a variety of approaches (Cox, 2013; Good et al., 2013; Price et al., 2015; J. D. Thomas et al., 2015). The implications that arise from for an on-going lack of support include anxiety, chronic stress, insecurity, insomnia, exhaustion, and rapidly increasing rates of physical and mental illness which have been termed the 'hidden injuries' of academia (Gill, 2010).

In the context of these pressures, and when immersed in discipline-based organisational units, it is not surprising that there is little focus on interdisciplinary approaches amongst early career academics. Indeed, in their study on the formation of academic identities, Simula and Scott noted that only "a small minority of faculty - all of whom were tenured, white, male full professors - construct question-oriented identities that resist disciplinary boundaries" (Simula & Scott, 2021, p. 384). In their sample of 99 interviewees, only 4 such individuals were discovered. In countries where tenure is a concept, it has been seen that junior academics narrow their research and over-emphasise performance to secure tenure (Acker & Webber, 2016). These authors also note a significant change in the last twenty five years is the "the introduction of national schemes for assessing research or research productivity, often discursively defined around the concept of quality" (Acker & Webber, 2016, p. 234). It is not surprising that most early career academics choose to immerse themselves in their discipline, which can be seen in a recent study, where the authors report that the conflicting messages and competing priorities experienced by early career academics put strong pressure on them to carve out a pathway "that connects these academics to their disciplines and their regions in powerful ways" (Aprile et al., 2021, p. 1142). This leaves little room for discussion of interdisciplinarity. Arguably, the pressures on early career academics could be seen to be adding to an organisational inertia that reinforces the concept of discipline.

In addition, early career academics face an increasingly challenging work environment that tends to include demanding workloads as well as increased stress related to pressure to publish and secure funding (Andrews et al., 2020). It is no surprise that in a study of interdisciplinary academics that a clear majority of participants were at a senior level (Shrimpton & Astbury, 2011). This lack of engagement with interdisciplinarity sits amidst a steady call for more interdisciplinary learning experiences (Arthur, 2008; Shadinger & Toomey, 2014) and approaches to research, with some authors going as far as to say that interdisciplinary research is the only plausible approach for tacking contemporary challenges such as climate change (Bromham et al., 2016).

Pursuing interdisciplinary work is inherently risky for an early career academic. The observation from Clark that the "discipline rather than the institution tends to be the dominant force in the working lives of academics" (Clark, 1983, p. 30) has if anything intensified in recent years and the notion of discipline is often tightly bound to academic reward systems (O'Meara, 2011). To step outside of the confines of a discipline is challenging, particularly when "career promotions, funding decisions and scientific publishing are based on peer-review procedures that tend to favor monodisciplinary research" (Woiwode & Froese, 2021, p. 2230). And yet, despite these challenges, academic staff around the world continue to succeed in the pursuit of interdisciplinary research and

teaching. Yet, as already noted, this often appears to be a luxury that only established academics can afford.

## LEADERSHIP IN UNIVERSITIES

There is a large body of literature related to leadership in universities that touches on a wide range of issues potentially of relevance to this research. This includes the competencies for leadership (Spendlove, 2007), the attitudes and experience of leaders (Ozkanli et al., 2008), the role of leaders in change (Bystydzienski et al., 2017), and the relationship of leadership to governance and management (Shattock, 2013). The breadth of this existing research precludes a complete review, instead this section focuses on the important distinction between leadership and management, and how this impacts the adoption of interdisciplinary practices.

In a study that investigates successful interdisciplinary academic leaders, Kandikonotes that "a major barrier to inter-disciplinary work is the challenge of fitting in with disciplinary-based recognition and reward schemes" (Kandiko, 2012, p. 197) and also observed that successful leaders "spoke of the challenge of getting individuals from different disciplines working together in a new interdisciplinary way" (Kandiko, 2012, p. 195). Here it is important to distinguish between academic leaders and managerial leaders, a difference that Yielder and Codling (2004) define as being 'an authority' rather than 'in authority'.

This distinction speaks to the difference between leadership and management, and further still of the distinction between the academic and administrative domains. McMaster (2005) argues that universities can be conceived of as a diarchy, a system governed by two independent authorities relating to the academic and administrative domains. Each of these authorities maintains different assumptions around the nature of the working environment, organisational structures and processes, and the basis of authority. Del Favero (2005) reviews a number of sources that all support the claim that "institutional cultures are fragmented into academic and administrative domains" (Del Favero, 2005, p. 71). Similarly, Bolden et al. (2012) also suggests that much of what is described in both scholarship and practice as 'academic leadership' is in fact thought of as 'academic management', and indicates the existence of a problematic relationship between these two domains. Indeed, the divide between administrative and academic dimensions of a university are well documented (Bess & Dee, 2014).

It is clear that many institutional roles that traditionally have had an academic basis are becoming more managerial in nature (Arntzen, 2016) and some authors suggest that managerial leaders reinforce established academic values, norms, and routines (Boffo, 2010). In addition,

interdisciplinarity in institutions comes with additional complexity and overhead. For example, Newell argues that:

> When faculty are appointed to one unit, team-teach with faculty from other units, and contribute to informal as well as formal activities crossing other units inside and outside the institution, every administrative procedure in the institution requires reassessment. Decisions that used to be made by a single administrative unit and passed up or down a simple hierarchy now require input from diverse locations within the institution, move across as well as up and down administrative lines, and have consequences that reverberate throughout the institution. (Newell, 2004, p. 182)

In this context, it is clear that embracing interdisciplinarity is a specific case of the more general challenge that faces universities in trying to reconcile 'managerial logic' and 'professional or academic logic' (Winter, 2009). A growing emphasis on managerial logic and using professional administrators is often referred to as managerialism which places cost-benefit thinking at the core of decision making (Bok, 2009; Giroux, 2014; Newfield, 2018). When viewed through the lens of cost effectiveness, the additional complexities that Newell (2004) associates with interdisciplinarity would not be considered acceptable as they increase the 'cost', whilst at the same time the benefits are reduced as a result of interdisciplinary academics being seen to be less productive in terms of their research (Leahey et al., 2017).

These issues are discussed in detail in the literature but are not the focus of the data collection for this research, which instead focuses on the lived experience of interdisciplinarians in universities. The implications for leadership that emerge from the analysis of this lived experience are revisited in Chapter 6.

**SUMMARY**

The interplay of disciplines, organisational structures, people, roles, identity and interdisciplinarity is complex and intertwined. Arguably, a university can be thought of as an autopoietic system capable of producing and maintaining itself by creating its own parts and this provides a useful viewpoint for integrating the literature in this area. As early career academics become socialised in their disciplines, coupled with the pressure to perform, and demonstrate cost-effectiveness, this ensures that the future of the university is very much likely to be like its past.

In this context, new fields of study that emerge and become successful are almost destined to become disciplines, because change is difficult to implement. The role of leadership in implementing change (Shanker & Sayeed, 2012) is not to be underestimated as good leaders make a

difference (Fullan, 2011; Miller, 2001). But at present, most senior leaders in any given university will likely have developed their own academic identity based on discipline. And because those identities are difficult to change, their implicit beliefs will shape their decisions as will the wider policy environment in which they operate.

Structural changes, such as introducing interdisciplinary research institutes or more radical changes will not break this cycle. Immediately, such initiatives create a feeling of 'losing something' in discipline-based staff, and the change will be resisted. Ultimately, when they fail, the senior academic leaders will default back to discipline-based views, arguing the tried and tested methods of the past produce the best cost benefit trade off.

As pointed out earlier, Branson (2008) believes that the first step in any process that seeks to change organisations should start by changing people. The long-term solution to interdisciplinarity could therefore be changing the socialisation of early career academics in a way that promotes interdisciplinary practices. As these academics progress through their careers into leadership positions it creates a more fertile opportunity for interdisciplinarity to succeed. For this to succeed there needs to be clear guidance to support this journey. This is the aspirational goal of this research.

For this research, no attempt has been made to define interdisciplinarity in a way that constrains the interpretation of the data and participants have been free to work in the confines of their own definitions of being interdisciplinary. This is a purposeful choice that emerges from the confusion of terminology seen in the literature, as any attempt to constrain the definition has the potential to alienate alternative viewpoints.

# Chapter 3: Methodology

This section provides an overview of the methodological choices, research design and approach used in the study. It broadly discusses the research objective, the research philosophies and research design that underpin this study.

## RESEARCH OBJECTIVE

The overall purpose of this research is to provide guidance on how early career academics can develop interdisciplinary careers. This research attempts to do this in several ways, firstly by identifying what barriers exist to interdisciplinarity in universities, and then by reflecting on the experiences of established interdisciplinary scholars to determine what strategies have been used to navigate those barriers. Whilst not directly related to the research objective, the study also seeks to identify what motivates academics to undertake interdisciplinary research, though of course providing insight to motivations can also inform how to support early career academics.

However, this research does not directly involve early career academics and does not attempt to consider whether the guidance will be useful through a process of observing how it influences and actions of those that adopt it. Instead, it focuses on understanding the context in which interdisciplinary scholars operate and attempts to determine insight to success in this context by considering more experienced interdisciplinary scholars. The underlying research question of this research can be stated as:

**RQ:** *What strategies have been used by established scholars to navigate the barriers to interdisciplinary scholarship?*

As this question could be approached in several alternative ways, the next section outlines the philosophical stance that has informed the research design.

## RESEARCH PARADIGM AND PHILOSOPHY

This section outlines the paradigmatic, ontological and epistemological framing of this research in order to provide the context in which the methodological choices sit.

### Research Paradigm

A research paradigm should simplify the process for other choices that need to be made in terms of the philosophy and design. In light of this, it is important to realise that research design is not a linear process, and this research has gone through several cycles that have refined the choices made

in terms of methodology and method. However, to some extent, these choices are potentially discordant with the ontological and epistemological framing. As a result, this research has adopted a pragmatic paradigm to explain and justify the choices made.

A pragmatic paradigm, normally referred to in the literature as pragmatist research philosophy, suggests that researchers should use the methodological and philosophical approaches that produce the best outcomes for any given research problem (Tashakkori et al., 1998). Pragmatism as a research paradigm does not engage in the contentious metaphysical concepts such as reality or truth. Rather, it acknowledges that there can be single or multiple realities that are open to inquiry (Creswell & Plano, 2007).

A pragmatic paradigm is therefore an approach for researchers to accept certain paradoxes and adjust, change and combine perspectives to produce research projects that sit outside accepted conventions. Such projects could be considered risky as they reject the notion of paradigms as 'proven solutions', yet such projects also offer the potential for different insights to be found. The adoption of a pragmatic paradigm demands greater depth of justification for the overall research design.

**Ontological Framing**

In the context of research, ontology is concerned with claims about the nature of being and existence and there are several main schools of thought: objectivism, constructivism, realism, and subjectivism. In simple terms, objectivism is the view virtually all humans understand reality (or can understand reality) in the same manner. It effectively removes the concept of perception as a layer of understanding the world around us. An implication of adopting an objectivist stance would be the assumptions that all people would taste the same flavour for a cup of coffee, see the same colour of blue on a flower, and so forth.

Subjectivism rejects this view and assumes that knowledge is entirely subjective and that there is no external or objective truth at all. Implicit within this view is that it is not possible for our experience or understanding of the world to be shared with others, as every person's perception and experience is unique. Constructivism sits in the middle ground between subjectivism and objectivism. Constructivists assume that knowledge of the world is constructed by individuals and given sufficient time and opportunity it is possible for an understanding of the world to be shared amongst members of some community or in a certain context. Constructivist researchers reject the notion that there is an objective reality that can be known and as such the researchers aim is to understand the multiple social constructions of meaning and knowledge.

Realism claims that at least a part of reality is ontologically independent of human minds. This view that "entities exist independently of being perceived or independently of our theories about them" (Phillips, 1987, p. 205) is often interpreted as meaning that there are some objective truths, however our understanding of them is incomplete at best.

The research in this thesis has been conducted from the stance of constructivism. It adopts a variation, called social constructivism, which asserts that human development is socially situated, and knowledge is constructed through interaction with others. Therefore, considerations such as language, culture, and context all influence the process of constructing an understanding of the world.

### Epistemological Framing

The ontological framing of this work through social constructivism rejects the potential for an epistemological framing of positivism, which essentially refers to research conducted with the belief that observable evidence is the only form of defensible production of knowledge. A positivist epistemology would therefore assume that only 'facts' derived from the scientific method can make legitimate knowledge claims. The adoption of the scientific method would also involve a separation of the researcher from what is being researched. One of the distinctions between positivism and interpretivism is that the latter can considers facts and values to not be distinct.

In an interpretivist epistemology, the researcher is not separated from the research and interprets the data that is collected. As such the researcher can never be fully objective and removed from the research. Interpretivists focus on particular, contextualised environments and recognise that knowledge and reality are not objective but influenced by people within that environment. This is highly relevant for this research given the ontological framing through social constructivism and adopting an interpretivist approach informs the methodological choices.

## RESEARCH DESIGN

A research design is the "procedures for collecting, analyzing, interpreting and reporting data in research studies" (Creswell & Plano, 2007, p. 58). A research design involves both the selection of a methodological framing as well as the choice of specific data collection methods. In this context, a method is more a specific instrument that is used to collect data for analysis whilst a methodology is a justification for the use of those instruments in conjunction with a description of the analysis techniques to be used. The methodology is a way of ensuring that the data collection aligns with the research philosophy.

## Methodology

The methodological framing for this research is the adoption of multimethodology. This approach differs from mixed methods, which focuses on the collection of both qualitative and quantitative data, and is based on the view that:

> In order to make the most effective contribution in dealing with the richness of the real world, it is desirable to go beyond using a single (or, on occasions, more than one) methodology to generally combining several methodologies, in whole or in part, and possibly from different paradigms. (Mingers & Brocklesby, 1997, pp. 489-490)

Mingers and Brocklesby go on to note that:

> Mixing methodologies, particularly from different paradigms, does present serious problems--philosophically in terms of paradigm incommensurability, theoretically in terms of effectively fitting methodologies together, and practically in terms of the wide range of knowledge, skills and flexibility required of practitioners. (Mingers & Brocklesby, 1997, p. 490).

The incommensurability aspect has largely been addressed by making clear and consistent ontological and epistemological choices for this research. This concern is further addressed in this study by establishing clear phases of the research with in which each methodology will be applied.

The distinction between mixed-methods and multi-methodology needs to be clarified, as there is often confusion. Creswell, Fetters and Ivankova offer a definition of MMR as being applicable to a study that:

> involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially, [both kinds of data] are given a priority, and [interpretations] involve[s] the integration of the data at one or more stages in the process of research (Creswell et al., 2004, p. 7)

In contrast to mixed-methods research, multi-method research may use two or more research methods unified within a single methodology and paradigm as a form of methodological triangulation (Mingers & Brocklesby, 1997; Teddlie & Tashakkori, 2009; Venkatesh et al., 2013). The distinction between multi-methodology and multi-method research is that the former employs two (or more) methodologies across two paradigms.

The notion of a research paradigm is also confusing with multiple definitions. For this research, a research paradigm is defined through analogy with software design patterns. Just as software design patterns "describe proven solutions to recurring software design problems" (Tichy, 1997, p. 1), a

research paradigm describe a proven solution for a particular type of research that prescribes particular choices in terms of epistemology, ontology, methodology and method. This work is multimethodological because the methods used do not fit together as an established pattern that sits within a single paradigm.

The methodology chosen for the main phase of this research is phenomenology. According to Creswell, a phenomenological study "describes the meaning for several individuals of their lived experiences of a concept or a phenomenon" (Creswell, 2007, p. 57). The aim is therefore to describe a phenomenon that all the participants have experienced. Phenomenological research tries to "reduce individual experiences with a phenomenon to a description of the universal essence" (Creswell, 2007, p. 58). It is worth noting that the phrase 'universal essence' does not imply some objective reality, so this does not conflict with the ontological stance of constructivism. A 'universal essence' can be thought of as a common, shared perception of the lived experience.

Creswell (2007) indicates that there are five major steps in conducting a phenomenological study. The first step is determination of whether a phenomenological approach suits the research problem. If the intention is to understand the common experiences of several individuals about a phenomenon, then a phenomenological study is appropriate. The second step is ensuring that there is alignment between the phenomenon being studied and the research question. For this study, the research question can be seen to be related to identifying commonalities in strategies used by established interdisciplinary scholars with the lived experience of being immersed in a discipline-centric environment. The third step involves the collection of data. Normally, this would involve in-depth and multiple interviews (Creswell, 2007) though other forms of data such as observation or reviews of journals can be included as well (Creswell, 2007). The fourth step of a phenomenological study is the coding of the data and the ensuing thematic analysis. The themes that are developed provide the basis for the final stage, namely a description that presents the essence of the phenomenon.

If the purpose of phenomenology is accepted as to identify the 'essence' of an experience, and that "phenomenology generates theories which will provide descriptive data of a phenomenon which can be used to guide wider-and larger-scale studies from an informed starting point" (Jasper, 1994, p. 313) then the question is about whether the captured essence of the experience is sufficiently representative of all possible experiences to fully inform any subsequent research. In relation to this study, with a population of roughly 10,000 academic staff in the eight universities of New Zealand, there does need to be some context to the essence of the experience to use it appropriately. If nothing else, there is a need to recognise that there may be more than a single lived experience in

what is a complex environment. As this research is pragmatic in nature it adopts additional methodological choices that complement the core phenomenological choice, namely the use of a survey to collect a broader spectrum of responses as context. This survey is embedded in the first phase of the research study.

Survey based research is often characterised as a quantitative methodology. For example, Pinsonneault and Kraemer indicate that "the purpose of the survey is to produce quantitative descriptions of some aspects of the studied population" (Pinsonneault & Kraemer, 1993, p. 73) and Glasow argues that "the researcher must predicate a model that identifies the expected relationships among these variables. The survey is then constructed to test model and observations of the phenomena" (Glasow, 2005), a view that would generally be considered associated with a positivist epistemological stance.

Despite this, some authors argue that qualitative surveys "remains underutilised, and there is little in the way of methodological discussion of qualitative surveys" (Braun et al., 2020, p. 641). This research therefore adopts the concept of an exploratory survey which rejects the positivist implications of more commonly used survey approaches. Exploratory research aims to investigate an issue that has not been previously studied or thoroughly investigated. Exploratory research is typically conducted to have a better understanding of the issue, but usually doesn't necessarily lead to a conclusive result. The value of exploratory surveys is to reveal and examine important issues prior to more thorough studies (Wohlin et al., 2003) and as such the survey complements the stated aims of phenomenological study. A survey can also help in determining how the 'essence' of the experience captured by a phenomenological study is representative of a complex environment. Whilst exploratory surveys can be analysed using statistical models, their value as qualitative research techniques is to help probe and ponder conjectures as a first step to inform future observations and interviews to investigate these issues and themes in detail (Mahoney & Goertz, 2006).

**Methods**

As well as being multimethodological in nature, this research is also multimethod in that it combines the collection of qualitative and quantitative data using a variety of methods. The specific methods used in relation to the methodologies and phases of the research are shown in

Figure 3.1 , which is helps visualise the completed overall research design for this study.

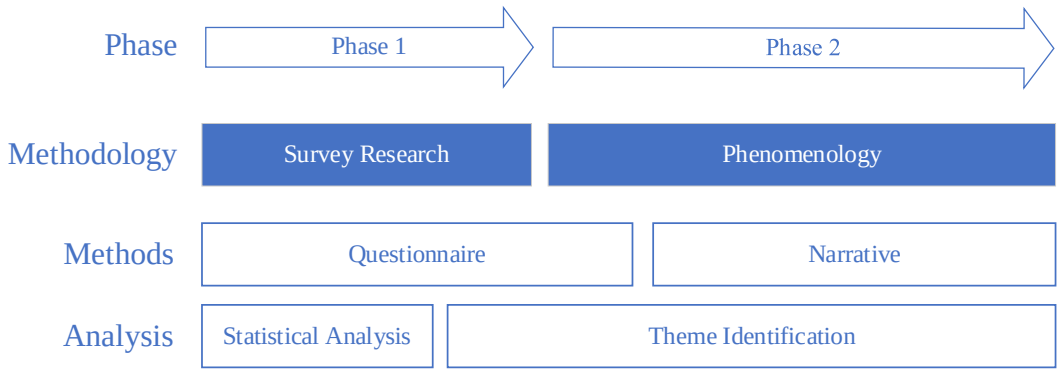


Figure 3.1 Research Design and Methods

It is worth noting that whilst the methodologies chosen cleanly map into each phase, the methods used for data collection and analysis span both phases. For example, the questionnaire used in the survey phase of this research collects both quantitative and qualitative data. The quantitative data is analysed using statistical methods whereas the qualitative data provides insight into the lived experience using theme identification. The theme identification analysis method is applied differently to the questionnaire data and that collected through the narrative method.

***Questionnaire***

As well as capturing demographic data, the questionnaire utilises a variety of question styles to capture participants perceptions and opinions. These question styles include multi-choice, multi-answer, Likert scale and open-ended textual responses. In particular, the questionnaire captures the career stage of the respondents to help identify whether there is a distinctly different lived experience for early career researchers.

The survey was developed in Qualtrics and was distributed using several mechanisms with the intention of reaching academic staff at all universities. The potential population of participants at the time of distribution would have been around 10,270 according to data from the Ministry of Education on the number of academic staff employed in Universities (Education Counts, 2022). This roughly aligns with data from the 2018 PBRF exercise where than the number of academic staff who submitted for assessment was 7408.

The distribution methods included direct email contact within known professional networks, posters around campuses of two of the institutions, the utilisation of social media channels, circulation through members of the Higher Education Research and Development Society of Australasia, and finally distribution through internal communication channels at all the Universities other than AUT. Despite such a broad attempt to reach the widest pool of potential participants, it is unlikely that this

would have been achieved, especially given that some authors suggest that trying to develop effective communication in academia is like "trying to make waves by throwing a pebble into a tar pit" (Azziz, 2014, p. 32). To ensure the maximum uptake, survey participation was completely open with self-selection against the eligibility criteria left to the individual participant to judge. The distribution of the survey was not limited to individuals with a record of interdisciplinary work, though it is likely that such individuals would be more likely to respond to the survey invitation and motivation to participate for disciplinary scholars may have been lower.

A response to the survey was considered incomplete if the respondent did not progress through all the questions. Such responses were automatically removed from the data by the survey software. In total, 93 participants agreed to participate in the survey, however only 77 responses were recorded. There were therefore 14 incomplete responses that were removed. A response to the survey was considered a blank response if the respondent progressed through all the questions but did not answer any questions other than the demographic questions. Only 2 such responses were received, which resulted in 75 responses for further analysis.

A response to the survey was considered a partial completion if the respondent reached the end of the survey but did not provide answers to all questions. 33 of the 75 responses were partially complete, though the majority of these were where respondents had chosen to not answer a few of the open-ended questions. Only 12 of the 33 partial responses left one or more of the Likert scale questions unanswered, though generally most respondents answered most of the questions resulting in a sparse distribution of missing values.

***Narrative***

Narrative as a research method is a broad term that encompasses a wide range of options. For this research, the narrative method is grounded in the notions of performative writing which "features lived experience, telling, iconic moments that call forth the complexities of human life" (Pelias, 2005, p. 418) which fits well within the methodological context of phenomenology.

Participants that met the eligibility criteria for the second phase of the study were invited to write a letter to their younger self, sharing information that they would feel would have been useful as they embarked on such a journey. Here the eligibility was determined from their survey responses, namely that they were either mid- or late-career academics and had self-reported that their scholarly activity was interdisciplinary as either or 4 (a lot) or a 5 (a great deal) on the Likert scale on which it was evaluated. This phase of the study bears some similarity to the work of Enright, Rynne, and Alfrey (Enright et al., 2017), where they focus on supporting staff who wish to change from being disciplinary academics to inter- and trans-disciplinary academics.

The use of a narrative-based approach does need to be justified in the context of a phenomenological study, as the usual method of data collection would be interviews. The general approach of a narrative inquiry is focused on discovering and attempting to understand experience through collected descriptions of storied events. These collected descriptions are synthesized by way of a plot into a story or stories (Clandinin, 2006; Clandinin & Connelly, 2004; Polkinghorne, 1988). A narrative method therefore does more than describe an experience, it attempts to understand it and conceptualise it through a narrative mechanism. In this study, participants in the second stage are simply writing their story themselves rather than having it exposed through an interview.

The particular narrative method used in this study is creative non-fiction which attempts to bring together empirical material and fiction (Kotišová, 2019). The final output of this research is some advice to early career academics that draws upon all of the data collection methods utilised and presented as a set of dictums that will later be expanded in to a fictional letter, similar to that produced by Enright, Rynne, and Alfrey (Enright et al., 2017).

### *Statistical Analysis*

Much of the quantitative data collected lends itself to simple visualisation using appropriate charts. However, one of the motivations of the study was to see whether differences arose across different career stages. To identify whether any statistically significant differences were seen between early-, mid- and late-career academics, Kruskal-Wallis tests are applied and Dunn post-hoc analysis was used to determine which groups show any differences. The Kruskal-Wallis test is used because methods such as ANOVA examine variance based on means. These are somewhat nonsensical when applied to ordinal data, where the concept of a mean value has no useful interpretation. Whilst the Kruskal-Wallis test is intended for continuous data, many argue that it is a suitable method for ordinal data (Mangiafico, 2016) and it is commonly used for this purpose.

### *Theme Identification*

The identification of themes is a method used in the analysis of all the qualitative data collecting, which includes both the responses to the qualitative questions in the questionnaire used in the survey phase and the data collected using the narrative method, although the exact application differs slightly in the two instances. However, both utilise the principles of the general indicative approach proposed by Thomas (2006) and utilised repeated readings of the data.

For the qualitative data from the survey these repeated readings of the data were accompanied with an iterative clustering of concepts and identification of potential themes. During repeated close reading of the responses, aspects were highlighted as being relevant and interesting, and these

marked segments used to propose themes. Responses were then assigned themes, noting that the general inductive approach allows text to be coded in multiple themes. The close reading and clustering approach was repeated multiple times until new themes emerged, all relevant text was coded and assigned to at least one theme, and the uncoded text could be considered as not being relevant to the study. This simple and iterative approach is suitable because the volume of data was quite small and is highly structured because of the survey design. These themes are what Husserl (1970) would consider features that were commonly perceived by individuals who had experienced a given phenomenon. These commonly perceived features are known as universal essences and can be analysed to develop a robust description of the lived experience (Neubauer et al., 2019).

In a practical sense, the narrative data is analysed in a similar way with an additional step, though given the nature of the data and the role of the researcher, a reflexive thematic analysis (Braun & Clarke, 2021b) was formally used as it recognises the agency of the researcher in developing the themes. Firstly, the data is coded using the a priori themes from the thematic analysis of the data from the survey phase. This allows the qualitative data from the narrative method to be checked for consistency with the broader set of qualitative data which provides confidence that the essence of the lived experience is at least reasonably representative of the first stage participants. Once this initial coding has been completed, the same cycle of close reading and theme identification is undertaken to ensure that any addition themes that were developed are not lost.

### Methods, Data and Outputs

The adoption of a multimethodology approach, with multiple methods of data collection produces a degree of complexity in the research design. As an attempt to illustrate how the various components of this design fit together, Figure 3.2 shows how the various methods produce data, and how this data is processed to produce a specific insight or output.

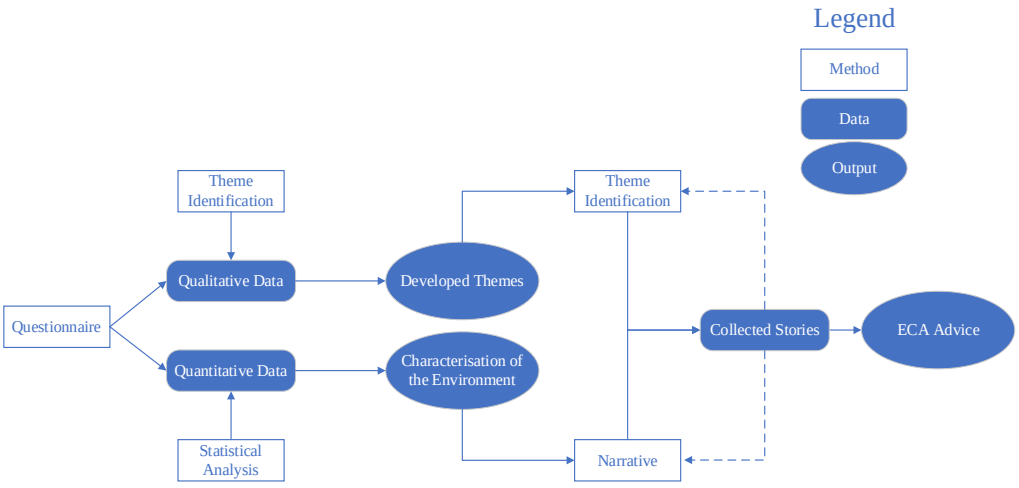


Figure 3.2 Method, Data and Outputs

This diagram shows how all of the methods are unified into a coherent whole. The questionnaire used in the survey phase produces both qualitative and quantitative data. Through the use of statistical methods, the environment is characterised which also involves identifying whether the lived experience is consistent across different groups of participants. Similarly, through the use of thematic analysis, the qualitative data produces an initial set of essences of the lived experience that can be used to gauge how representative the stories collected through the narrative method may be. These stories are collated in a manner informed by the both the qualitative and quantitative data to provide a creative non-fictional output that is intended to be useful to early career academics wishing to navigate the complexities of being interdisciplinary in a discipline-centric environment.

# Chapter 4: Survey Results and Analysis

This chapter describes the analysis of the data from the survey conducted as the first phase of this research that was distributed to academic staff at all eight New Zealand universities. In addition to collecting demographic data, the survey was designed with three sections that focused questions on the individual, their institution and the wider context. Institutional affiliation was collected as part of the consent process in a way that precludes comparison across institutions as the intention of the study was to determine the national picture. The results from the survey and associated analysis are presented in the following sections related to the demographics, individual motivations, perceived barriers, institutional, and the wider context.

## DEMOGRAPHICS

This section presents the data that characterises the respondents, along with factual commentary on these results in the context of the study. In total, there were 75 valid responses to the survey with responses from most of the universities in New Zealand. The number of responses across the institutions is shown in Figure 4.1.

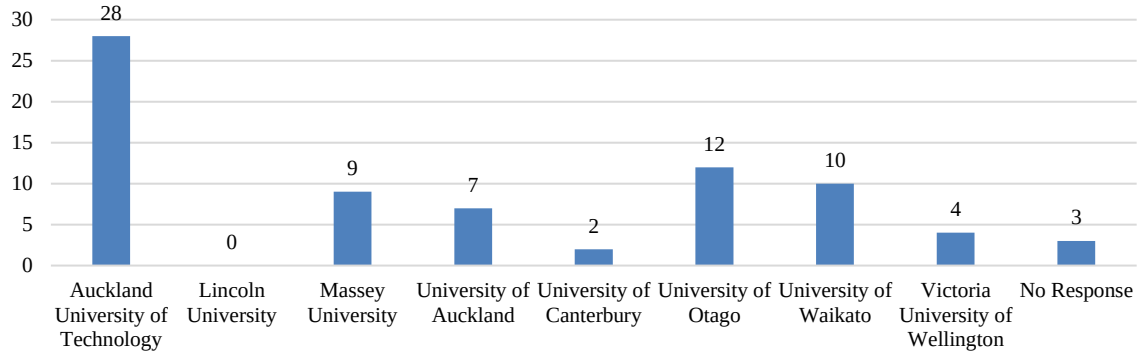


Figure 4.1 Number of Responses by Institution

Seven of New Zealand's eight universities are represented, Lincoln University being the exception. Whilst details of this study were circulated to staff at Lincoln, this was done in a way without a direct link to the survey and this has impacted the number of responses received. Three participants chose to not reveal their affiliation.

Figure 4.2 presents the self-declared gender of the participants, with just over half of the respondents being male.

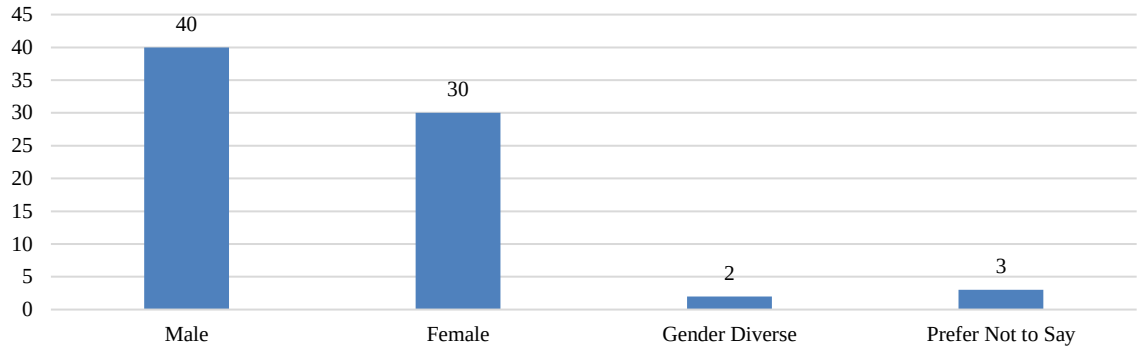


Figure 4.2 Gender of Respondents

This pattern is consistent with submissions made to the latest national research evaluation activity in New Zealand, the 2018 Performance Based Research Fund (PBRF) round in which 59% of the submissions were from male researchers. The responses to this survey broadly reflect the gender distribution of academics in the country (TEC, 2019).

In terms of the age of the respondents, a slightly different picture emerges when compared with the 2018 PBRF data. The age of respondents is shown in Figure 4.3.

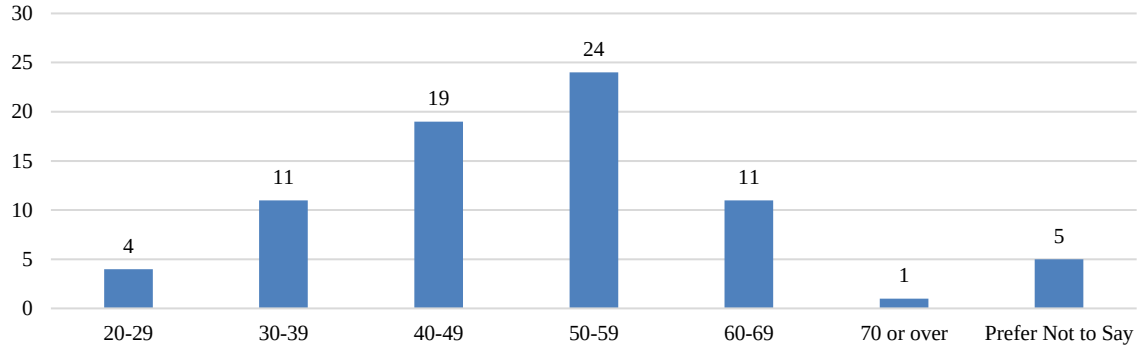


Figure 4.3 Age of Respondents

The overall trend is similar when compared with the 2018 PBRF data, with most respondents being considered middle aged, with smaller number in the younger and older age brackets. In this case, the specifics are slightly different, as the 2018 PBRF data shows more researchers in the 40-49 age bracket in comparison to the 50-59 age bracket. However, these differences are relatively small and unlikely to significantly impact this study's representation of the population of academics in New Zealand.

Figure 4.4 shows the ethnicity of the respondents, which is very clearly dominated by those of European descent. During the data collection phase, several respondents contacted the researcher in relation to the survey's requirement to only select one ethnicity. Two respondents specifically

indicated that they were of mixed Māori and European descent and did not feel comfortable choosing just one ethnicity.

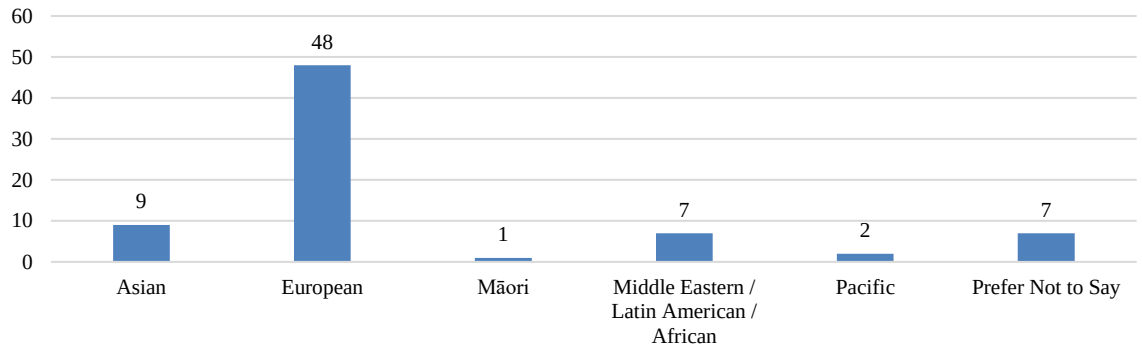


Figure 4.4 Ethnicity of Respondents

Whilst on reflection the decision to restrict ethnicity choices to a single category is questionable, it does mirror the data collection constraints used in the 2018 PBRF round. The PBRF data shows most researchers to be of European descent (55%), with 7% Asian ethnicities and fewer identifying with the remaining three named categories. Interestingly, over 25% of researchers in the 2018 PBRF round chose not to state their ethnicity (TEC, 2019).

Figure 4.5 presents the job titles of the respondents, which also reflects the data presented in Figure 4.3 in the sense that most of the respondents were relatively senior academics.

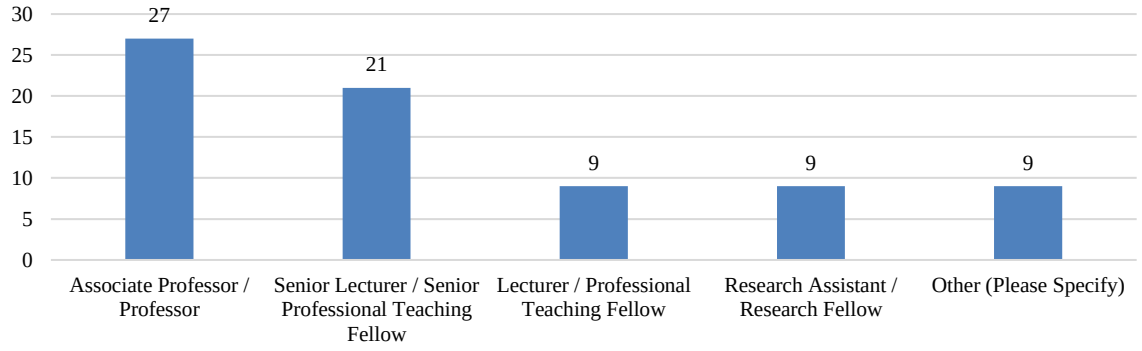


Figure 4.5 Job Title of Respondents

The respondents in the ‘Other’ category specified their job titles as Tutor (x3), Associate Dean, Head of School, Learning Advisor, Research Active Academic Developer, Independent Researcher and Honorary Associate Professor. Respondents were also asked whether they held a substantive leadership position, such as Dean, Head of School or Head of Department. In total, 21 individuals indicated they held such a position, which was 28% of the total number of respondents.

Respondents were also asked to self-identify their career stage, though no specific guidance was given as to how to do so. The distribution across career stages is shown in Figure 4.6.

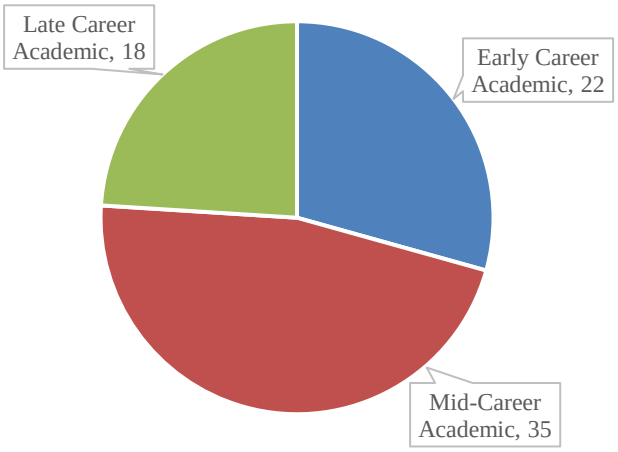


Figure 4.6 Career Stage of Respondents

Much of the analysis of the data in this research is based on this self-identified career stage as it bridges different ages and job titles. Just under half of the respondents considered themselves to be mid-career.

Respondents also chose their discipline using the first two tiers of the bepress taxonomy of disciplines (bepress, 2021), with the option to self-report their discipline. The first tier of the responses is shown in Figure 4.7.

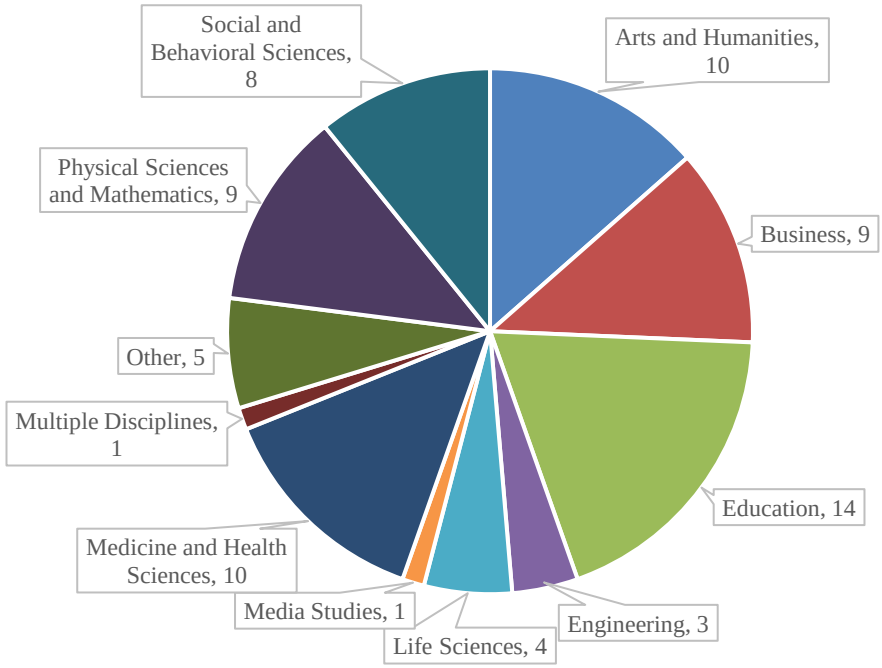


Figure 4.7 Discipline of Respondents

Generally, there is good coverage across a range of disciplines. One respondent indicated that they had competence across several disciplines, including history of science, public engagement with science, and creative nonfiction writing practice. Five respondents chose to self-identify their disciplines as built environment, creative technologies, design studies, design sociology, and health informatics.

The focus of this study is to consider the plight of early career academics, and demographic data was primarily collected to determine how representative the survey data might be of the population of academic staff in New Zealand. The subsequent statistical analysis is primarily addressing differences in the data based on career stage to support the aim of the research. Whilst further analyses could have been conducted, for example considering differences across other demographic factors such as age or gender, these have been precluded from this study as they do not directly support the research objective. Potentially these analyses could provide an insight into how these factors influence the lived experience of being interdisciplinary based on age, gender and ethnicity, however these analyses are deferred to further work.

## INDIVIDUAL PERCEPTIONS OF INTERDISCIPLINARITY

Respondents were asked to self-identify the extent to which their scholarly work was interdisciplinary in nature, and to give their view as to how important interdisciplinary work was for the future of the University. The distribution of responses is shown Figure 4.8.

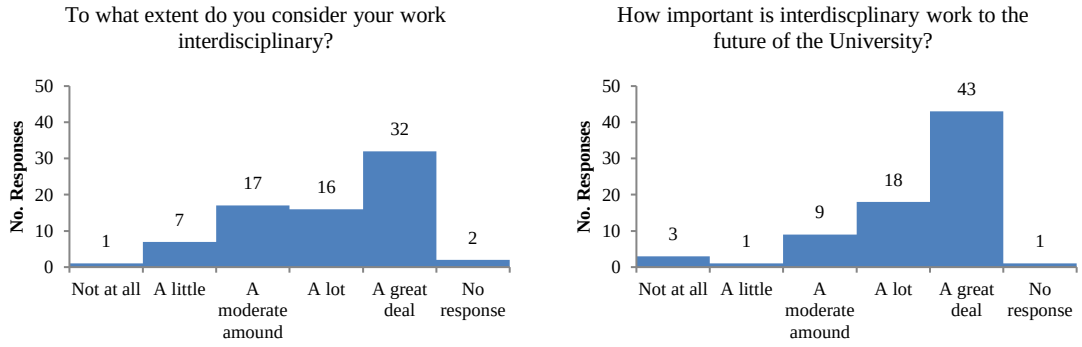


Figure 4.8 Individual Perceptions of Interdisciplinarity

Most respondents considered their scholarly activity to have some degree of interdisciplinary focus, with a few outliers who consider their work to be either not at all interdisciplinary, or only a small amount. Interestingly, even though some respondents do not see their work as interdisciplinary, most respondents believe that interdisciplinary work is important to the future of the University, with the distribution of responses heavily skewed in this direction.

To facilitate these analyses, the first step of the process has been to transform the Likert scale labels to numeric values as shown in in Table 4.1.

Table 4.1 Mapping of Likert Scale to Numeric Score

| Numeric Value | Likert Response |
|---|---|
| **5** | A great deal |
| **4** | A lot |
| **3** | A moderate amount |
| **2** | A little |
| **1** | Not at all |

The data for these two questions was divided into three groups according to career stage. The distribution of the responses for the three groups to these two questions are shown as box-whisker plots in Figure 4.9.

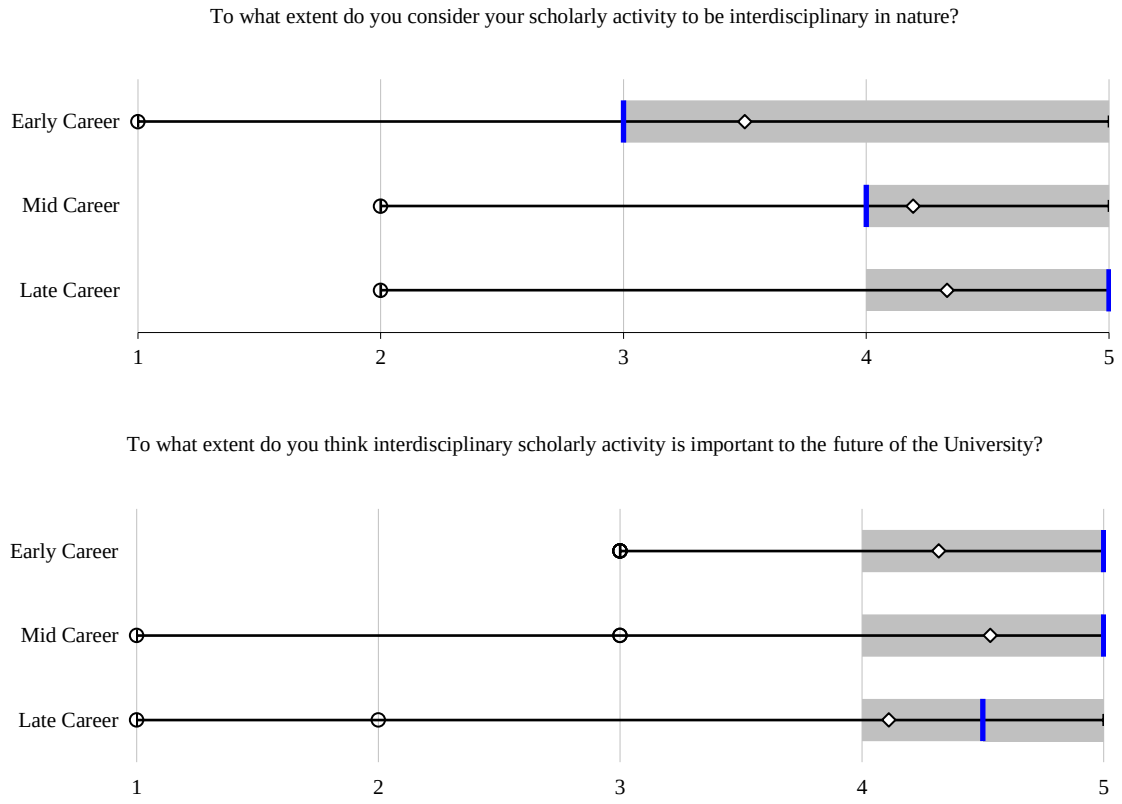


Figure 4.9 Individual Perceptions of Interdisciplinarity by Career Stage

In relation to their views on the importance of interdisciplinary work for the future of the university, the three groups are more similar. Most responses in all three groups indicated a high degree of importance. Whilst mean values as standalone pieces of data are somewhat nonsensical when considering ordinal data, the impact of the outliers (as represented by the circles) on the distribution is visible in how the means (represented as diamonds) have been shifted because of the outliers in the lower ratings.

A Kruskal-Wallis test was performed to see if there were any statistically significant differences between the three groups with regards to these two questions. For the first question relating to how respondents consider their work to be interdisciplinary, the *p*-value of the Kruskal-Wallis test is 0.059 with an $\alpha = 0.05$. This suggests that the groups do not show statistically significant differences, although it is arguably borderline. Given that the relatively small sample would be sensitive to even a single response, Dunn's post-hoc test was still applied to gain some insight. The post-hoc test indicates that the early career group is different from the late career group, and again borderline in terms of differences with the mid-career group. The post-hoc test shows that there is no statistically significant difference between these two latter groups. This reinforces the interpretation of the plots in Figure 4.9. The responses across the three groups to the question related to the importance of interdisciplinary work for the future of the University show no statistically significant differences.

Analysis has also been undertaken is to see whether there is a relationship between the extent to which the respondents viewed their work as being interdisciplinary and whether they viewed interdisciplinary work as being important to the future of the University. The partial responses noted earlier have been subject to an imputation strategy to facilitate this correlation analysis. The strategy used has been to replace incomplete values with the median value of the numeric score. Whilst this strategy is relatively naïve, analysis of the mean, median and standard deviation of the distributions shown in Figure 4.8 before and after imputation shows little change and as such the naïve imputation strategy is sufficiently robust in this instance. The data is shown plotted in Figure 4.10.

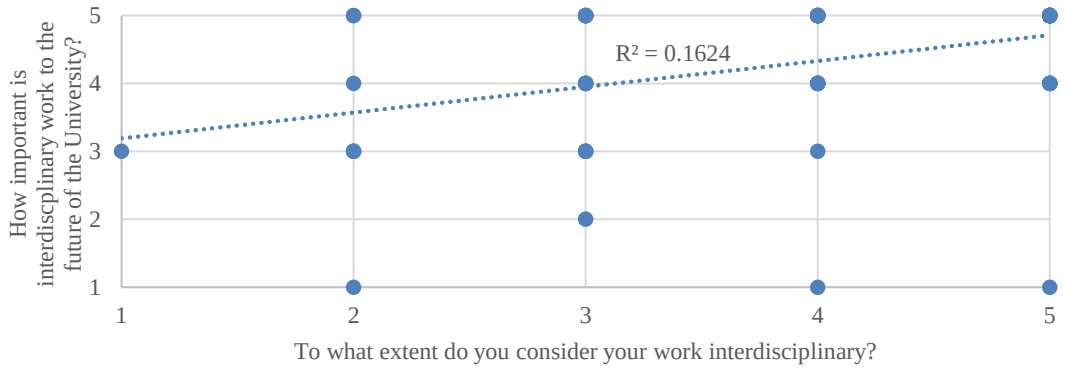


Figure 4.10 Correlation of Degree of Interdisciplinarity with Future Importance

The degree of correlation can be determined by considering the calculated value of Pearson's correlation coefficient, *r*. In this case the value of *r*=0.40 which suggests at best a relatively weak correlation. However, as the underlying data is ordinal in nature and not distributed normally, the use of Pearson's correlation coefficient is not as applicable as other measures and is only included as a baseline reference. To further analyse the correlation, the non-parametric Spearman's rank correlation has been calculated, with *rho*=0.43 suggesting a slightly more moderate correlation. The lack of strong correlation suggests that even respondents who do not consider their work to be particularly interdisciplinary still consider it an important aspect for the future of the University.

## INDIVIDUAL MOTIVATIONS FOR PURSUING INTERDISCIPLINARY SCHOLARLY ACTIVITY

Respondents were also invited to identify their motivations for undertaking interdisciplinary scholarly work, with the option to select multiple answers as well as writing their own reasons. The intention of this is to identify individual drivers for pursuing interdisciplinary work. The responses are shown in Figure 4.11.

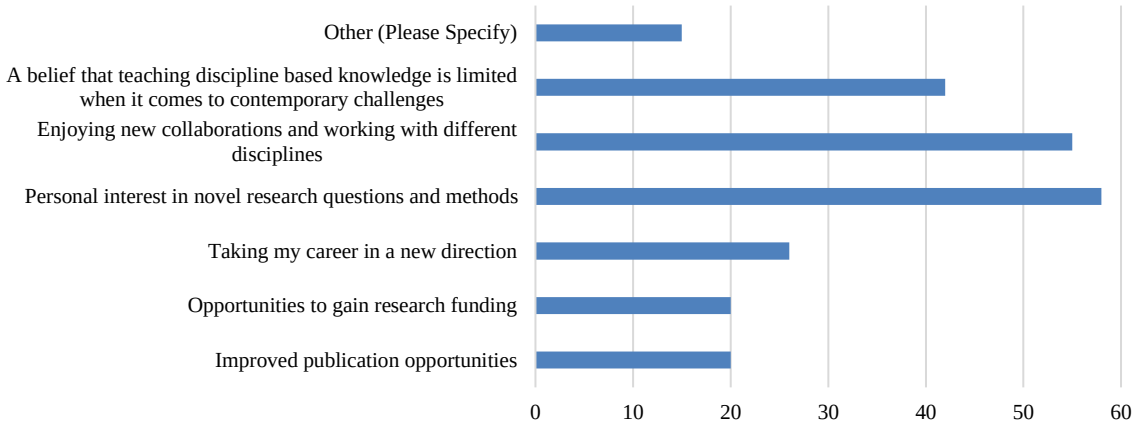


Figure 4.11 Motivations for Pursuing Interdisciplinary Scholarly Activity

The response options for this question, with the exception of the teaching focused option, were derived from the literature (Winskel et al., 2014). Whilst this previous work has a narrower scope, the responses are similar as a large number of respondents indicate that their motivations centred around personal interest in novel approaches and enjoyment in working across different disciplines (Winskel et al., 2014, p. 12). This mirrors the data in Figure 4.11. These findings link with the literature, where it has been argued that "to successfully embark on interdisciplinarity, individuals should have a curious and inquiring mind, and be willing to incorporate perspectives from other disciplines" (Bridle et al., 2013, p. 30) and also that "interdisciplinarity encourages a researcher's curiosity, openness to new ideas, and intellectual flexibility, and thus their general ability to learn and adapt" (Szostak, 2013, p. 4). Arguably, taking the first step through personal motivation may lead to further interest in interdisciplinary work.

Fifteen respondents took the opportunity to provide more detailed responses to this question and these additional comments received through the open-ended response to this question provide further insight into motivations, though as relatively few additional comments were received there has been no attempt to undertake a thematic analysis. Several short excerpts are included here to illustrate the nature of the comments.

In some cases, the responses are entirely pragmatic (e.g. "This was the only job available to me"). Other responses simply replicated the options that were available in the multi-answer question (e.g. "Most of the interesting work is to be done on the boundaries of disciplines, and bringing knowledge from one field into another"). Broadly speaking, the remaining responses all focus on the necessity of interdisciplinarity in terms of research, and to some extent echo the need for teaching beyond disciplinary knowledge for addressing contemporary research challenges. There was one response of note, where the participant commented:

> Universities will increasingly need to pursue twin track approaches to research. On the one hand very traditional and often conservative methods of extremely narrow focus will still be important and useful, but on the other hand it is my belief that such approaches are only complementary to the increasing need to find new theoretical and practical solutions to problems that require the fusing of broad ranging skill sets and methodologies. This is what does and has always motivated me to cross fields of study.

Comments such as these certainly support the evidence in the literature that suggests that contemporary problems may be a driver that brings together interdisciplinary teams.

## PERCEIVED BARRIERS TO PURSUING INTERDISCIPLINARY SCHOLARLY ACTIVITY

Respondents were also asked to identify what may prevent them from undertaking interdisciplinary work by selecting all the relevant options as well as defining their own. This data is shown in Figure 4.12.

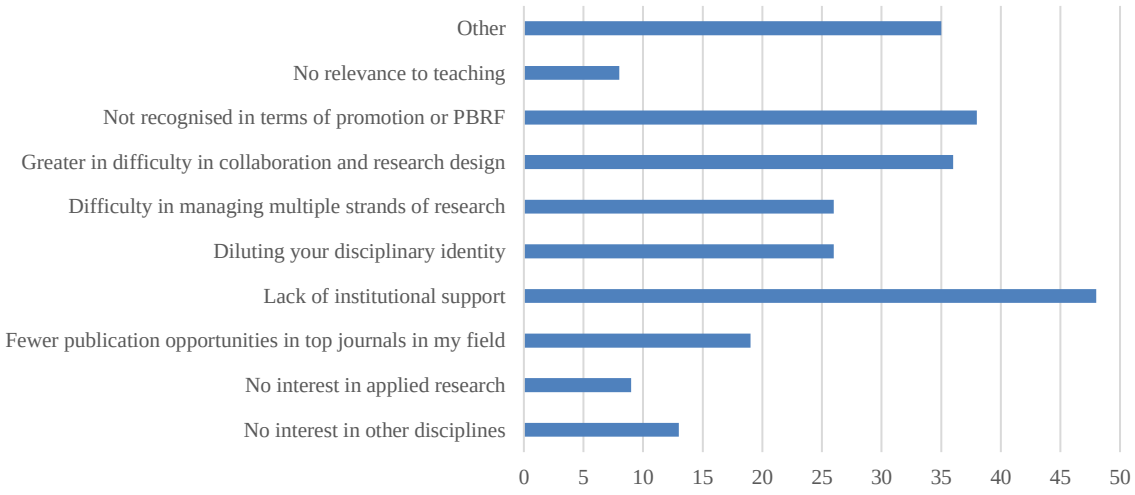


Figure 4.12 Barriers to Undertaking Interdisciplinary Scholarly Activity

As with the motivations, many of the options offered here have been used in previous work, however the data from this study show differences in the barriers considered significant (Winskel et al., 2014, p. 13). In the current study, lack of institutional support was identified frequently as the main barrier to an individual interested in pursuing interdisciplinary work, with lack of recognition in promotion mechanisms and research evaluations (PBRF), and increased difficulties in collaboration and research design also being significant factors. These differences suggest that whilst there is some overlap with international studies that there are also distinct regional variations.

In contrast to the question relating to motivations, a much larger group of respondents took the opportunity to highlight additional barriers, a total of 24. In this case there was less overlap in comments and the options available in the question. There was also a larger number of comments which makes a thematic analysis more useful. The full set of comments are included in the appendices.

There are several key themes that emerge from these comments, for example a lack of time is noted by three respondents, of which the following example is typical:

> There is often no time to investigate partnerships in another discipline, let alone in my own discipline.

Several research studies have investigated the changing demands on academic roles, and as a result it is not surprising to see this issue arising here. It is difficult to argue that this is a situation unique to academics pursuing interdisciplinary work and rather a shared experience as academics continue to have increased demands placed upon them, reduced support and eroded professional autonomy (Kinman, 2014).

Constraints that arise due to funding are also noted by ten of the respondents. The funding issues seem to be an issue in terms of both how research funding is awarded in the first place, but then also how internal structures allocate funding, particular in terms of student derived income. For example, one respondent commented:

> University funding model, in particular when it comes to innovations in interdisciplinary teaching. The question where EFTS go dominates the discussion, rather than what is best for the students, and potentially interesting contributions to teaching practice and research.

It can be argued that this is a symptom of a wider issue that it is also commented on, how status and authority is distributed both between disciplines and by individuals in a system that encourages competition rather than collaboration. Issues related to authority and status were noted by ten of the respondents, referring to both status imbalances related to disciplines as well as how authority figures within the institution created obstacles rather than helping to remove barriers.

The nature of academic promotion and reward was also highlighted as a barrier by four of the respondents, and here the interconnected nature of the themes emerges:

> It is impossible to build in time with the current funding & promotional models. Anything that makes publication more complex or slower is not just discouraged, it is actively punished through the promotional system.

This comment touches on all the themes that have emerged from the analysis of the comments, including the increased difficulty of publication of interdisciplinary work which was commented on by four respondents.

## INTERDISCIPLINARITY AND INSTITUTIONS

Respondents were asked to reflect on how interdisciplinarity is perceived at their institution. Figure 4.13 shows how respondents see the terminology around interdisciplinarity being used, as well as their views on the extent to which interdisciplinary work is supported and valued at their institution.

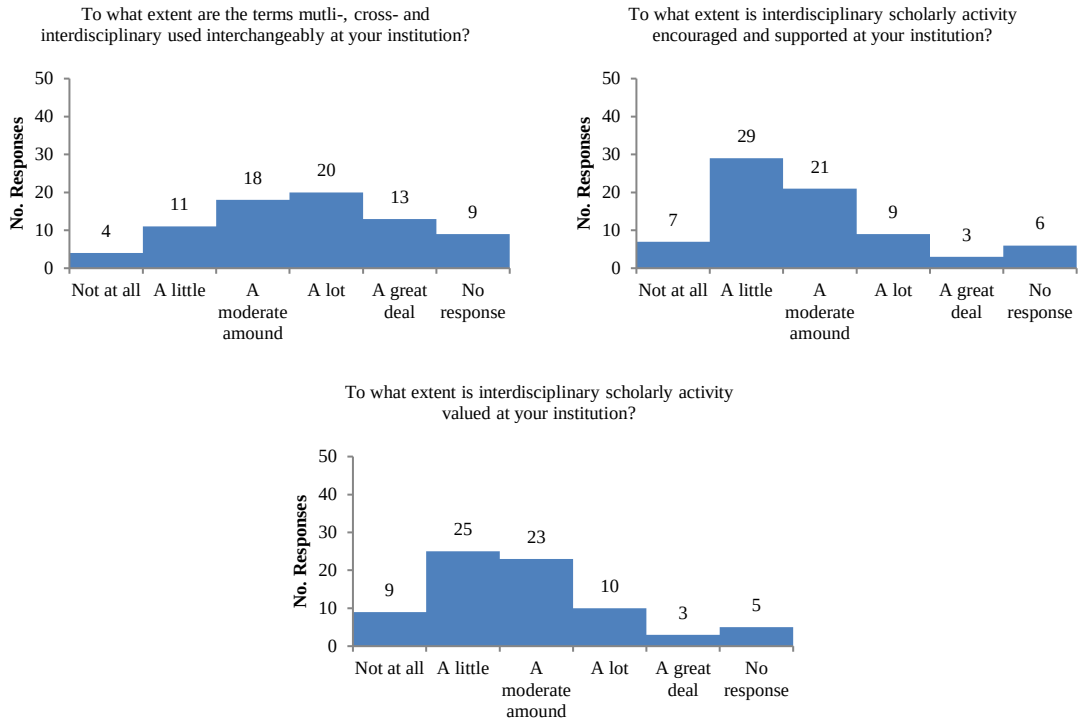


Figure 4.13 Interdisciplinarity at Institutions

In comparison to the data provided in Figure 4.8, there were more partial responses to these questions. It is interesting to note that most respondents felt that the terms multi-, cross- and interdisciplinary were used interchangeably at their institutions. Formal definitions of the different terms exist in the literature dating back to the 1970s, but, interestingly, these do not seem to have been widely adopted or understood.

The questions relating to institutional support and valuing of interdisciplinary work demonstrate similar distribution of responses, though examination of individual responses indicates that respondents did distinguish between these two concepts. Some respondents indicated that at their institution such work was encouraged, but not valued. Other respondents indicated the opposite.

As with the earlier Likert scale questions, the responses have been separated based on career stage of the respondents. The split data is again shown as box-whisker plots in Figure 4.14.

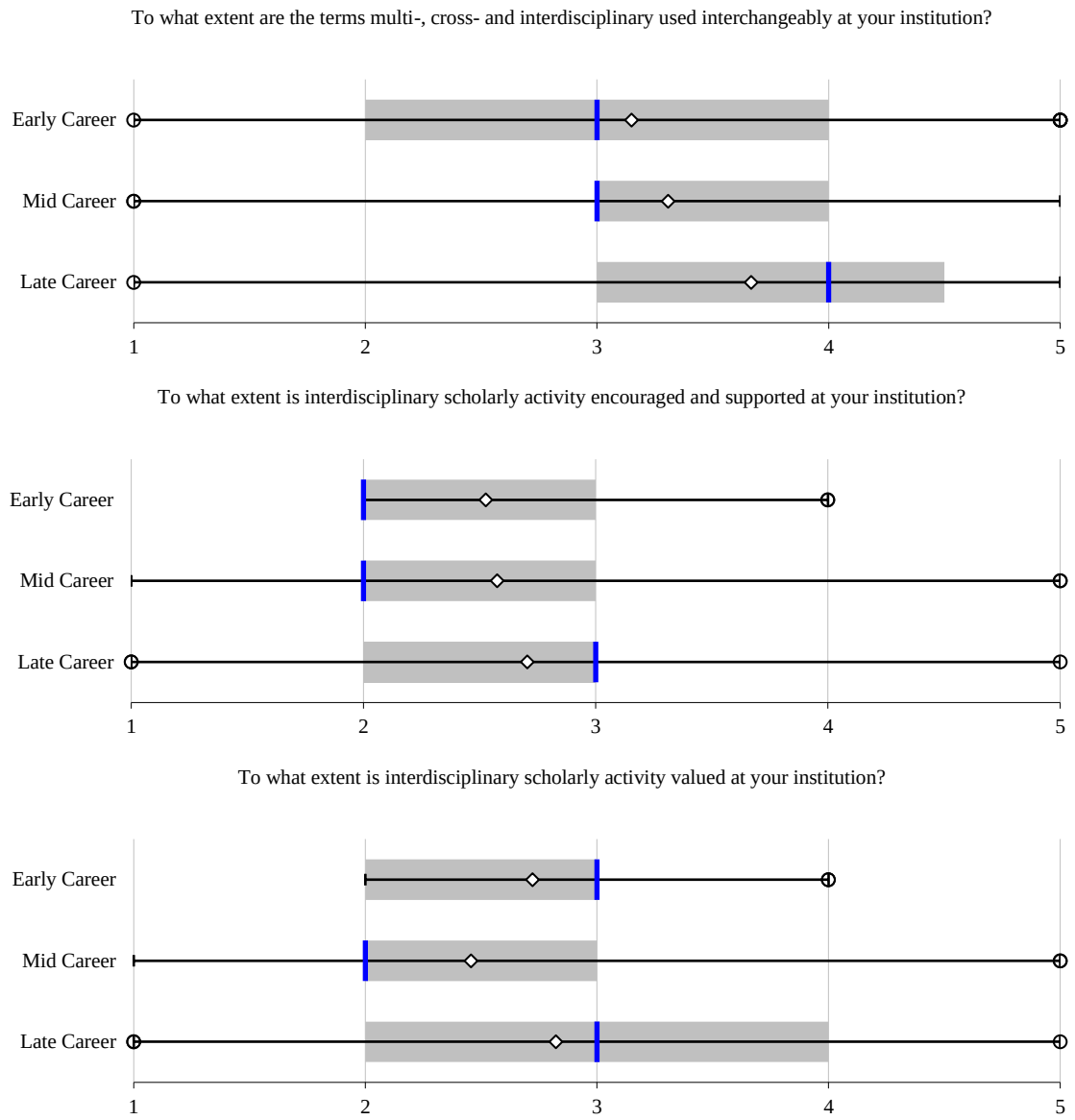


Figure 4.14 Interdisciplinarity at Institutions by Career Stage

The responses of early career academics in relation to how terminology is used at their institutions shows a near normal distribution with a median value of 3 and spread across the full range of possible responses. For the mid-career group that distribution shifts more to the right, before leading to a higher median value for the late career group. Whilst these differences may not be significant, they may reflect how growth within a career makes an individual more attuned to factors that are not directly within the sphere of their disciplinary expertise.

There are again more similarities in how the mid-career and late career groups see the support and encouragement for interdisciplinary work at their institution, though generally mid-career academics see less support than the late career group. The early career group show a more distinct

focus on the middle ground, a pattern that is repeated in terms of how these groups view the way interdisciplinary work is valued. Whilst the data presented in Figure 4.14 is limited by the sample size, it does suggest that the perception of most academic staff is that interdisciplinary scholarly activity is neither strongly encouraged nor highly valued.

Kruskal-Wallis tests have been applied to the segregated data, and for all three questions there is no statistically significant difference between the responses in the three different career stages. This is very likely to be influenced by the small sample sizes, the high number of partial responses, and the consequential sensitivity of the samples to changes in individual responses.

As a follow-up question, respondents were asked to comment on the major institutional obstacles or constraints that limit or hinder interdisciplinary research and the pursuit of funding for interdisciplinary research at their institution. As there was no associated multi-answer question, a large range of responses were received from 62 of the participants. Only a small sample are quoted in this thematic analysis of the comments, with all comments available in the appendices.

One of the main themes that emerge from the comments is related to how Universities are structured, which mirrors taxonomies of disciplines and hierarchically structured into Faculties, Schools and Departments. Twenty-six respondents, over one third of the respondents, made comments related to institutional structures, organisation and silos of knowledge that are difficult to overcome. One participant comment specifically also indicates that the level of perceived support for interdisciplinary endeavours is low:

> My experience is and has always been in all of the universities I have visited that a great deal more discussion about encouraging interdisciplinarity is voiced than is supported through actual structural change that would lead naturally to interdisciplinary research groups and outputs.

Another theme that emerged was the issue of funding, both the gaining of external funding and the internal financial models that govern how organisational units function. Eighteen of the respondents specifically identified that finances and funding issues were considered a barrier, with three of those identifying concerns over the design of the Performance Based Research Fund, the primary mechanism for research funding. Two respondents particularly indicated that their work did not fit into the predefined categories of research assumed by PBRF with the comments:

> PBRF also requires people to pick the right box and craft a narrative that fits that box.

> PBRF is an issue as well. My particular research foci are not explicitly represented by a PBRF category and I float from one to another trying to find which works best for my outputs.

Throughout the responses there is clear indication of the interlinked and overlapping nature of the barriers to interdisciplinary work. Take for example the following comment:

> I have found I have to explain my work over and over again to different people in management and administrative roles. I am very persuasive and a high achiever, so I 'get away' with the sort of work I do, but I feel there is an extra hard sell needed for this sort of work. The PBRF system does not deal well with interdisciplinary scholars. In all sorts of classification categories both at the university and nationally I find that my disciplines are not represented, so I need to select categories that have relevance but don't really reflect what I do.

Not only does this refer to the specific issues of the PBRF system but also indicates the challenge of working in a system laden with perceived status imbalances and the necessity to justify particular directions of work to individuals in authority. Status and authority issues, either through the roles of particular individuals or between disciplines was identified by ten of the respondents with comments such as:

> Decision-makers or managers can have fairly rigid ideas about disciplinary identity and what research activity and outputs can and should look like.

> There are individuals scattered throughout the institution with specific beliefs and values, which, often due to their specific disciplinary backgrounds, counter this narrative. The problem arises when these individuals are in management or gatekeeping roles.

> There is also a secondary problem of there being preconceptions and assumptions about how interdisciplinarity should work out in research, particularly between social science and humanities. The often unspoken assumption is that the quantitative disciplines have greater weight and value than those that have a the qualitative core.

Again, whilst these themes are being considered in isolation, the comments often overlap different themes and link them together. Here, for example, the comments make reference to disciplinary identity, and specifically how this relates to disciplinary egocentricism (Richter & Paretti, 2009). This describes the lack of readiness to engage in education or practice beyond an established disciplinary confine, and this is something that often becomes established as a direct result of the way that universities are structured in silos.

Another linkage can be seen between the existence of individuals in authority not promoting different approaches, as well as imbalances in status across disciplines. Both factors were seen to be instrumental in terms of encouraging competition over collaboration. In total, nine of the

respondents indicated that some form of competition was an issue, either at an individual level or between disciplines. These views are typified by the following comments:

> There is often a snobbery from the hard sciences, engineering, etc, about the value of other disciplines, particularly social sciences. There is also a fear of engaging with indigenous scholars.

> Disciplinary silos still exist in the minds of many who have the authority to enable interdisciplinary collaboration, keeping it a very low priority in some departments.

As with other comments, the interrelationship of themes is drawn out here with the concept of disciplinary egocentricism (Richter & Paretti, 2009) again arising and with reference to the internal structures of the university. The significance of the role of internal structures in limiting collaboration should not be underestimated, with it also playing a role in another theme that emerges from the comments which is related to communication, access and awareness. In total, eight respondents made comment related to these issues and two comments from different participants are given here as examples:

> The internal structures of the University and how they are tied to the financial model make it difficult to collaborate across disciplines. It's not impossible, but it takes a lot longer to build relationships that can work across those structural divisions.

> The main budgetary driver for Unis is EFTS. EFTS are degree specific so middle layer academic management are incentivised to concentrate staff time in disciplinary silos that relate to teaching. The side effect of this is that staff miss out on opportunities to mingle with other disciplines informally and can sometimes be unaware that the answer to their research questions is sitting in the office down the hall.At its worst this budgetary model extends to postgraduate supervision, making it hard to supervise across disciplines, and even FTE allocation from grant funding.

As the distribution of the survey was not limited to interdisciplinary scholars, it is not surprising that some comments reflected support for the notion of disciplines and to some extent suggested that interdisciplinary work was not as relevant as work in the established disciplines. Whilst only three respondents made such comments, it is important to recognise these comments and their implications. For example:

> It is asinine to frame monodisciplinary study as something to overcome, rather than the essential super structure of the entire enterprise of higher learning which allows conversations like this to take place.

Overall, there is a degree of thematic alignment between the issues noted as institutional barriers and the individual barriers noted earlier.

An additional meta-analysis has been conducted across all the responses in focused on barriers, as the qualitative data on motivations was limited in comparison. This further analysis allows the data to be coalesced into coherent and useful themes that incorporated both the individual barriers, which technically should be considered as disincentives, and the institutional barriers. For a theme to be labelled as such, it required at least two comments in the context of that section, though a single comment in one section was often noted to a theme in the other section The original and combined themes are shown in Table 4.2. Following the development of the combined themes, the data was re-interpreted using the new themes to determine the number of comments that related to these themes.

Table 4.2 Combined Themes

| **Individual Barriers** | **Institutional Barriers** | **Combined Themes** |
|---|---|---|
| Time and effort | Structures and silos | Siloed organisational structures (34) |
| Funding | Funding | External research funding (17) |
| Financial models | PBRF | Authority and status (17) |
| Promotion | Communication and awareness | Workload (10) |
| Authority and status | Administrative support | Organisational culture (30) |
| Difficulty in publishing | Competition over collaboration | Governance (20) |
| Academic identity | Time | Recognition (25) |
| | Authority and status | |
| | Pro-discipline comments | |

Several decisions were made by the researcher in finalising the themes. For example, internal financial models were collapsed into governance along with administrative support, even though finance and funding were often used interchangeably. The recognition theme incorporates difficulty in publishing, promotion and academic identity. The other groupings are relatively intuitive, though it is worth noting that there is a certain degree of overlap between status and authority, which includes both inter-personal and inter-discipline elements, and organisational culture.

The number of comments attributed to each theme can be used to approximate the relative importance of the themes. This makes it clear that the siloed nature of organisational structures is one of the biggest barriers to overcome to allow interdisciplinarity to flourish in universities, followed by organisational culture, recognition and governance. It is, however, worth noting that other research has suggested that structural change is only possible if issues such as publication recognition and promotion are first addressed (Mosey et al., 2012).

## INTERDISCIPLINARITY AND NEW ZEALAND

Respondents were also asked to address specifically three questions related to the external environment. The responses to these questions are shown in Figure 4.15.

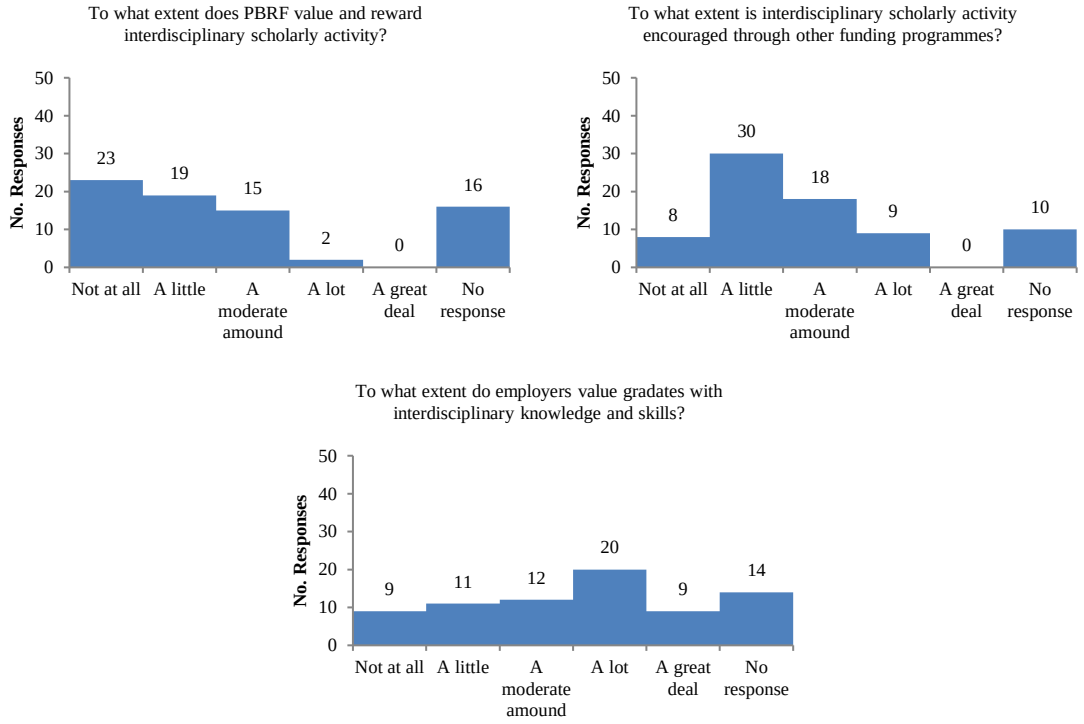


Figure 4.15 Interdisciplinarity in the Wider New Zealand Environment

The number of partial responses for these questions are the highest in the survey which perhaps suggests that some respondents were not sufficiently familiar with the matter to feel confident in their response. Despite this, it is apparent that respondents had the view that the PBRF evaluation does not value or reward interdisciplinary scholarly activity, and this has already been noted in the previous section. Whilst other funding mechanisms are perceived to better support this type of work, there is potential to reconsider how funding mechanisms can be improved. Finally, there is a very broad view on the extent to which industry values interdisciplinary skills and knowledge in graduates, though the distribution is slightly skewed towards the more positive.

As with previous questions, the responses have been analysed across the three career stages of the respondents. The distribution of responses for each of the questions across the three groups is shown in Figure 4.16.

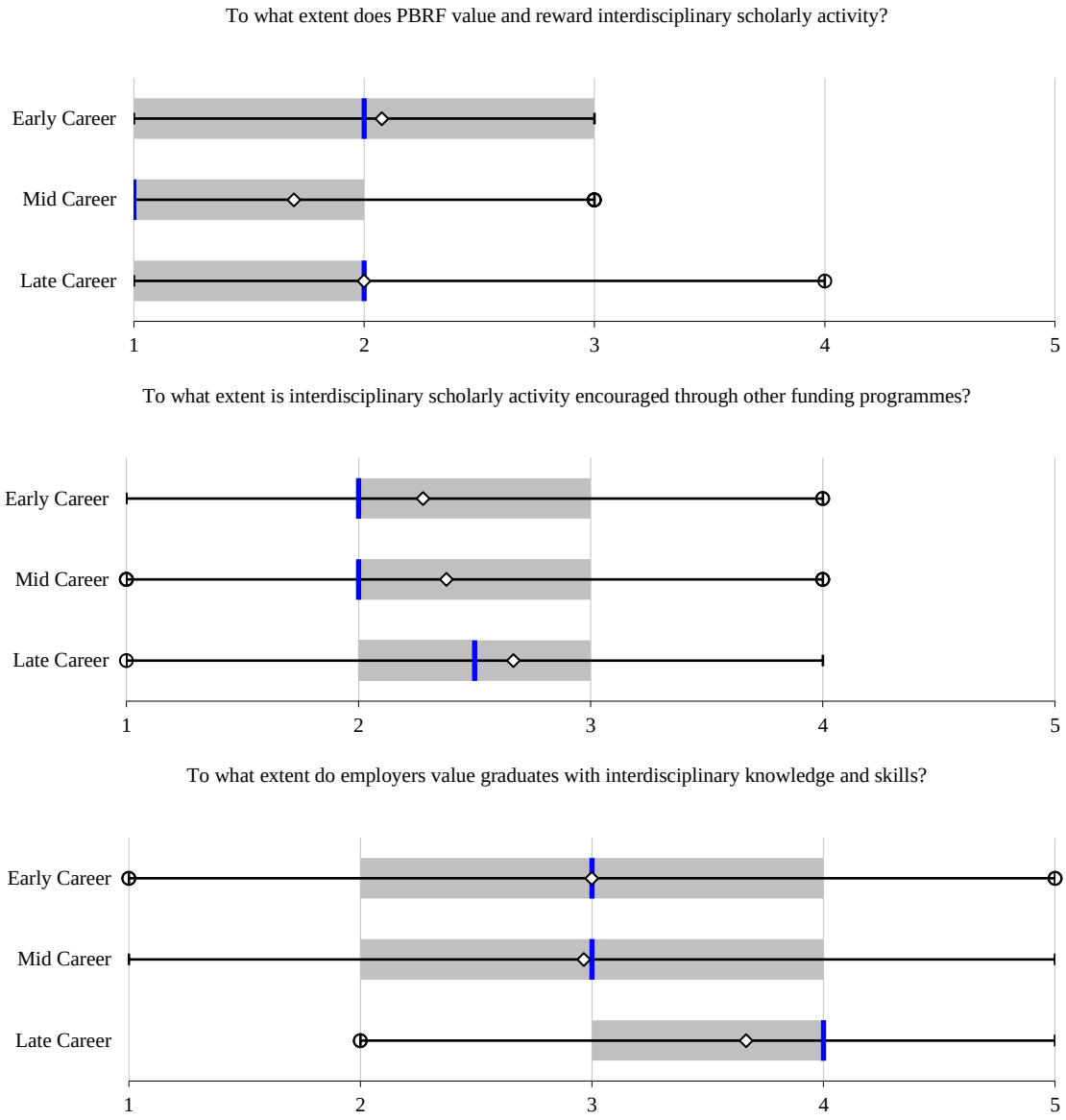


Figure 4.16 Interdisciplinarity in the Wider New Zealand Environment by Career Stage

Of all the questions in the survey, the responses to these three questions show the least variation between the three groups. This may be due to the low number of complete responses to these questions in comparison to those analysed in Figure 4.9 and Figure 4.14. Speaking generally, neither of the three groups see the PBRF system as valuing or rewarding interdisciplinary work, though the early career group are slightly more positive overall. The groups share similar views on how interdisciplinary work is framed in other funding mechanisms, and whilst this may be seen as an improvement on the PBRF system, it is hardly a ringing endorsement.

In terms of how the groups see the usefulness of interdisciplinary skills and knowledge to employers, both the early and mid-career groups have a normally distributed view. Late career academics are perhaps slightly more positive as a group, though there are a very small number of responses (15) by this group to this question. For all three questions, a Kruskal-Wallis test has

indicated that there are no statistically significant differences between the responses of the three groups.

## SUMMARY

This chapter analyses data from a national survey of academic staff to identify their motivations for undertaken interdisciplinary scholarly activity, and any perceived barriers that prevent such work. Results from the survey indicate that the perceived barriers in New Zealand are similar to those identified in the international literature for which many solutions have been proposed, though few implemented successfully. The thematic analysis in this paper has highlighted the potential reasons why these solutions have not been successful, namely the complexity and interlinked nature of the barriers. There are clearly some systemic issues with the way that universities are structured and governed that can be barriers, however these extend beyond the university and are imposed upon academic staff and institutions by the wider policy and funding landscape. As such they are difficult for an institution to influence, particularly as it was noted by several survey respondents that middle managers and senior leadership in universities are often not fully supportive of change. Rather than address the barriers directly, this research suggests that there is a need for specific career guidance on how individual academics can undertake interdisciplinary scholarship in a discipline-centric institution that align with the motivations stated for undertaking interdisciplinary scholarship.

# Chapter 5: Letters to a Younger Self

This chapter presents the data collection and analysis relating to the narrative methods used in the second phase of this research which leads to the formation of advice for early career academics.

## OVERVIEW

The notion of writing a letter to a younger self has gained considerable traction in recent years, and examples abound on the internet of individuals, including high profile celebrities such as Victoria Beckham, using the method to trigger a process of personal reflection, celebrating one's past and sharing advice with others. This approach has also been utilised in academic research, for example with established academics reflecting on how they learned to handle rejection (Reid, 2021) and sharing strategies and guidance for the benefit of early career workers in various industries such as social work (Bennett, 2018) or sports science (Szedlak et al., 2021) to name just two.

The work presented in this chapter was inspired by the work of Enright, Rynne and Alfrey (2017) and utilises a similar method grounded in narrative research. Josselson argues that narrative research is "rooted in interpretive hermeneutics and phenomenology, strives to preserve the complexity of what it means to be human and to locate its observations of people and phenomena in society, history and time" (Josselson, 2006, p. 3). This research utilises the concept of a letter to a younger self to capture the lived experience of academics who have undertaken interdisciplinary scholarly activity. The goal is to identify strategies that could be useful for early career academics wishing to pursue interdisciplinary scholarly activity. Each participant was simply asked to write a letter that outlined to their younger self what they knew now about their career that they wished that they had known whilst starting out.

A thematic analysis was used to interpret the letters that would allow the generalisation of any specific strategies proposed by the participants. The approach to the thematic analysis used in this work was the reflexive thematic analysis (RTA) proposed by Braun and Clarke (Braun & Clarke, 2006, 2021b). This approach to thematic analysis was chosen as it embraces the researcher's active role in knowledge production. In addition, codes represent the researcher's interpretations of patterns of meaning across the dataset. RTA is therefore considered a reflection of the researcher's interpretive analysis of the data conducted at the intersection of the dataset, the theoretical assumptions of the analysis, and the analytical skills/resources of the researcher (Braun & Clarke, 2019).The reflexive approach to thematic analysis was chosen over coding reliability approaches such as those presented by Jofe (2012) and Boyatzis (1998). These approaches focus on accuracy

and reliability when coding data through the use of multiple coders, and assume that themes are identified by the researcher rather than generated by the researcher through an interpretation of the data (Braun & Clarke, 2021a). Similarly, the reflexive approach was used in favour of codebook approaches to thematic analysis as the relatively small corpus of data is easily analysed without a highly structured approach and hierarchically organised codes and themes.

The analytic approach for a reflexive thematic analysis is an organic process that starts with familiarisation of the data, then continues iteratively and recursively through coding and recoding, theme development, revision and refinement. The coding process is also an organic and evolving process that involves noticing potentially relevant meaning in the dataset, tagging it with a code, and ultimately building a set of codes from which themes are developed.

Given the relatively small corpus of letters, no attempt was made by the researcher to develop an explicit text segmentation strategy. In addition, several a-priori codes were used as a starting point of the thematic analysis that were determined as a result of the analysis of the qualitative survey data presented in Chapter Four. Those themes and associated codes were: siloed organisational structures, external research funding, status and authority, workload, organisational culture, governance, and recognition.

The a-priori codes were used as the research specifically aimed to find strategies for dealing with the barriers to interdisciplinary work that had been identified, though the analysis was not restricted to these codes. An iterative approach of reading, tagging and coding was employed as the letters were read. When data could be coded then this was done, however other interesting statements were tagged with a generic code. Once all letters had been read, this corpus of tagged text was examined to determine any commonality that were significant enough to become formal codes. Once new codes had been determined the letters were again read and re-coded. This process was repeated until no new codes were developed and the final themes identified as a result. The thematic analysis is therefore based on a combination of deductive and inductive coding. Similarly, the coding process used both semantic and latent coding but neither were prioritised over the other. Given this lack of prioritisation, semantic codes were developing when meaningful semantic information was interpreted, and latent codes were developed when meaningful latent information was interpreted.

Participants for the study were recruited through the survey that identified the barriers that interdisciplinary academics. The inclusion criteria were that academics needed to consider themselves as mid- or late- career academics and that their work would be considered mostly interdisciplinary. In total, seven letters were received that were used in the analysis.

## DATA AND THEMES

The seven letters used for the analysis in his paper differed significantly in terms of style, focus and length. Given the very open brief for writing the letters, this variety is not surprising. Most of the letters focused on general topics, however all included specific reference to key events or circumstances that had clearly been significant in the development of the participant's career. The length of the letters varied from 523 to 2380 words, with an average length of around 1200 words.

The thematic analysis led to the development of additional themes in the text of the letters: curiosity and open mindedness, collaboration and networking, patience, methodological flexibility, and identity. It was noted that in many cases a given piece of text in the letters may have been coded to align with multiple themes. Each of the themes and associated strategies for success are discussed in the next sections, noting that neither the governance nor workload a-priori codes were utilised because no aspects of these themes were identified in the letters.

### Siloed Organisational Structures

The quantitative survey data from the first phase of this research indicated that siloed organisational structures were considered to be some of the most significant hurdles to overcome when undertaking interdisciplinary scholarly activities. Interestingly, there was not a strong focus on this in the current thematic analysis. Only two participants made any reference to this issue, and in both cases provided direct advice on how to manage the issue. For example, one participant noted:

> The most unhelpful thing you will encounter is where specialisations and subject areas are used as walls. Where they seem to provide a certain sense of safety if you stay within them and block yourself off towards other disciplines or ways of thinking.

This participant goes on to encourage their younger self to simply step beyond the walls and find new people and new ways of working. Similarly, a second participant implicitly acknowledges the presence of siloes in their letter but focus on a specific strategy to navigate them whilst talking about university committees:

> But you can use them to find people that otherwise you wouldn't meet. I found that getting involved with programme reviews was the best option – it gets you past the committees and into the departments you wouldn't otherwise be invited, and you'll find the people you want to meet.

Both comments reflect a certain level of acceptance to the status quo of institutional structures and instead suggest that interdisciplinary researchers need to navigate around the barriers rather than try to overcome them.

**External Research Funding**

External research funding was mentioned by four participants and typically their comments reflected the same level of acceptance of the issues. To provide context to the importance of managing research aspirations, one participant comments on the national research quality evaluation:

> Yes, they are ******** exercises designed to keep putting the research income where it has always gone. But you can't avoid them, and perhaps thinking about coherence in your research earlier will be one way to build a better perception of what you do.

Later in their letter, the same participant also comments:

> There isn't much you can do to influence the ones outside of your institution, the funding mechanisms are hardly ever going to support the work you would choose to do.

They then go on to discuss the importance of collaboration in developing funding proposals, which is also touched on by another participant who expands on their previous commentary about siloed organisational structures:

> Yes, you will get annoyed by institutional boundaries and administration constructs trying to put you back into the silos where you seemingly belong. You will get frustrated by funding models that rely on those silos. But just ignore them. Truth is: you will have a hard time finding people who are good at attracting money, and at the same time seem to be happy and content with their work in a good way. Work with the people you like on the stuff that you like. And the rest will follow.

This comment shows the themes are highly interconnected, touching as it does on organisational siloes, external funding and the important of networking and collaboration. More interesting is the insight regarding happiness and productivity that speaks intimately to how aspirations can often be lost in the pursuit of funding and perceived successes.

The role of the national research evaluation exercise was commented on by several participants, rarely in a favourable light. For example, one participant indicated:

> It is also important to carefully place your work within the PBRF framework. Not all disciplinary panels recognise educational research in that discipline as valid (something that HERDSA has protested), so make sure that neither you nor your research partners are disadvantaged by the 'features' of the research metrics that we are all beholden to.

Another participant noted that the exercise is one of having to conform to preconceived constructions:

> Many people will say they value difference whilst challenging and questioning that your PBRF should be specific to one field. The ones from the one field you pick, will find your work weird, because is not quite fitting in A, or B, or C. And as your ideas will likely look different from mainstream, you will need to be patient and search hard to find the people that will value what you can offer.

The strategy proposed here for dealing with this again is intertwined with other themes, namely networking and patience. As with organisational silos, throughout the letters there seemed to be a degree of acceptance of the fact that external funding was problematic but again something to be worked around rather than addressed face on. Those workarounds included looking for funding sources that were targeting perhaps more applied research, with one participant indicating:

> Interdisciplinary research is not easily 'pigeon-hole-able', either by funders or by the PBRF. Funding will be difficult, in particular because the novelty aspect is hard to show when you're bringing different fields together, but use known knowledge and methodologies from each. The (valid) argument that known methods and results in one field can be novel in another is hard to sell. I've found that obtaining funding is easier for funders who look for 'research-to-practice' type of work (e.g. the Earthquake Commission), for (in education) for research-based educational change projects (e.g. Ako Aotearoa).

**Status and Authority**

The existing of problematic issues relating to status and authority were noted in six of the letters. These included comments that to the behaviour of, and relationships with, individuals in authority as well as aspects related to perceived status issues across disciplines. On participant notes the first of these with the suggestion that their younger self should avoid taking positions where managerialist characteristics are observable at the interview stage:

> Pay a lot of attention to the few individuals in the top leadership positions in any place that makes you a job offer. Right now you simply have absolutely no idea how crucial it is who that person is. They don't have to be geniuses; in many cases they are rather average but they understand that their role as leaders is to remove obstacles and support their people do great things and have fun. Run away as fast as you can from academic leaders whose job is to "optimise" the organisation, reduce costs, increase revenue, and micro-manage everyone. It's relatively easy to spot them, just look at who they surround themselves with. If their teams are full of incompetent and obedient people, say no to the job offer or find an exit strategy earlier rather than later.

Whilst this strategy may help avoid issues relating to dysfunctional relationships with managerial leader, given the growing dialogue around the neoliberalisation and the rise of managerialism in the academy it is perhaps not viable in the longer term. Another participant also notes the existence of problematic relations that arise when dealing with individuals in management positions:

> At some point you will butt heads with someone in a so-called leadership position. They have their own agendas, and as much as they have the power to change things around you it is important to recognise that they benefit least from change. There will be threats, I am sure. There will be commands and edicts to do certain things, with rewards if you do and punishments if you don't. You have to choose which battles to fight here. But none of these people really see the value of being interdisciplinary. Think about it, departments, schools and faculties are all discipline based power structures and everything you stand for essentially erodes those power bases.

This commentary echoes some of the points made about silos and funding, that the institutional gatekeepers will exist and the way to deal with this involves patience and prioritisation of what issues should be tackled. Another participant also noted that:

> I was often told by professors, mentors etc that I needed to do a lot of communication work to ensure other disciplines would understand the work I did and how it was relevant as it was 'soft' work.

Combining these two insights suggests that it is not just communication that is important, but also how communication occurs. Being confrontational or dogmatic is likely to be counter-productive, whereas consideration and thoughtfulness would not.

Whilst most of the commentary related to the theme of status and authority were focused on the behaviour of individuals, some comments were made around how disciplines themselves seem to have

> Interdisciplinarity, when promoted in relation to the humanities, is often code for a perspective that suggests that humanities research is inherently 'soft' and needs rescuing to achieve relevance by becoming more directly intertwined with social science or the 'hard' natural sciences.

### Organisational Culture

The culture of an organisation was commented on in several of the letters, in some cases just as a statement of what the culture is. For example, one participant noted:

> You will notice that many scholars (particularly those with an 'old mind set') struggle with interdisciplinarity. They still have the image of the lone scholar – who works alone in his office, publishes alone and has personal insights that at the end of the day reflect their standing in the field.

Interestingly here, the comment also touches on the recognition theme by indicating that the perception of standing in a given field is related to individual work. In a similar vein, another participant touched on the perception of leading collaborations and how successful collaborations can be developed because of a collegial culture:

> Everyone brings their specialty to the table to tackle the research question. You will be criticised for not 'leading' your own research programme, where in fact you are co-leading a lot. I found that Shulman's concept of Pedagogical Content Knowledge works well as a metaphor. The colleague brings the disciplinary knowledge, I bring the educational knowledge, and together we work out how to do teaching and learning in the discipline. Neither of us can do that without the other.

Another participant notes the importance of individual actions and behaviour in the establishment of good organisational culture:

> The last thing that I want to talk about is attitude. There is a lot that I've already said about being patient, being mindful of coming across belligerent and stubborn, and not picking fights. There is a reason for this. If you go down this path then it impacts everyone around you, it changes the feel of the office when you go to work. It actually reinforces the divides that you are wanting to overcome. Your behaviour influences everything around you, and if you want to enjoy being at work then you need to remain positive. It is hard choosing the interdisciplinary path, but remember the first line of the snow code – respect gets respect. Do things that help people out, even if it means you don't always get your stuff done. Put grease on the wheels of the organisation every day. In the long run, not only does this mean that your ideas get judged on their merit (as opposed to the fact they came from you!) but it is the best way to build the community of support that you are going to need to survive.

This commentary indicates not only that individual behaviour influences culture, but also that it is almost a prerequisite for effective networking and collaboration building.

**Recognition**

Issues related to recognition were present in most of the letters received, in many cases overlapping with themes such as external research funding, but also in relation to internal processes such as promotion, and the process of moving between positions. For example, one participant noted:

> Some of your best work is either not going to get published at all or will be in less prestigious outlets. You will still have to play the game and show a long list of publications when you apply to jobs and grants, but better to realise earlier that you can produce great work in projects that have no funding or are published in small venues.

The strategy presented here relates to both focusing on the most appropriate outlet for research rather than journals that are perceived to be the best journals, and also promoting a more entrepreneurial approach. In this context, entrepreneurial is used to mean the adoption of effectual thinking as opposed to new venture creation. Recognition of research outputs was a common topic, with two participants promoted similar strategies for this. The first participant indicates that:

> Besides my own interdisciplinary work, I have a number of projects that I would call more 'traditional', single-subject (academic development in my case) research. This helps me ward off some of the criticisms that I mentioned above (not having my 'own' research agenda, and the issues with funding and PBRF). I found it helpful to think of interdisciplinary research as one piece of my overall research portfolio. A colleague of mine introduced me to the 'concept of the research portfolio' years ago. He treats his research as if it were an investment portfolio. You want to have some 'cash investments', things that you know are going to get you steady publications. However, you also want some higher risk, higher return projects ('stocks'), the ones that have the potential to make a splash, and the ones where you will once again have no real clue about what is actually happening, which is where all the excitement is. Just like with an investment portfolio, what is right for you depends on where you are in your career and where you want to go.

Whilst the specifics of the strategies are different, the second participant comments:

> One strategy to consider is keeping one leg in a disciplinary camp, that keeps you out of the arena as you aren't suggesting that disciplines need to be replaced but that interdisciplinary approaches are something that extend the disciplines. You can't alienate these people, they generally hold the keys to the door of promotion and with house prices these days you are going to need to get promoted. Keeping a disciplinary stream of research is – like everything – a double edged sword. It keeps a lot of doors open, you can publish in recognised journals more easily, you can apply for funding with more chance of success. But if you do too much of it then the momentum of that work will override everything else. You need a plan to balance the work that you do, and also help you decide what not to do. Mine is based on having different layers – like an onion. There are only three layers, the core, the middle and the fringe. The middle layer includes things that have some relationship to the core, though perhaps a bit loose. And the fringe is the weird and wacky stuff that is outside. Using a Kanban approach, you can only work on a certain number of projects in each layer at one time, so when something new comes up you

> need to decide where it fits and how much capacity you have. Think about how you use postgraduate students here – I often choose to supervise Masters students that are in that fringe because it is an opportunity to explore different things without taking too much time away from what is in the core. Over time, things will move from one layer to another, and some will disappear completely. Don't fight that, it is natural and as long as you stay curious then everything will work out.

Whilst this participant recommends maintaining a cap on the number of projects they are working on, another participants suggests otherwise:

> In the next work environment, I was again seen as an HCI researcher—perception—I did the people testing stuff. I was invited into lots of projects by colleagues. I always said yes. I travelled to see things, I learnt a lot. I built rapport with colleagues and with participants I invited in as 'users' for trials, one in a museum.

In this example, recognition can be interpreted as how potential collaborators view a person. By cultivating a presence in a particular field, in this case HCI, this potentially allows collaborations to emerge and networks to expand.

**Curiosity and Open Mindedness**

The necessity for maintaining an open mind and remaining curious was present in some form in all the letters. Some, for example, note that maintaining an open mind can be a transformational experience:

> But keep an open mind. Find out how these people tick. How they think. How they create. It might, no, it will change your way of thinking. Yes, it will also challenge your whole world. But it's worth it.

Similarly, others note that engaging with others can be challenging, but at the same time exceptionally rewarding:

> It will be hard at times, and you will need to be receptive to what is new and different. You should approach each topic and encounter with others, with an open mind and be prepared to get surprised, intrigued or to be challenged in your own perspectives. But you will see there is beauty on the difference, and the contributions that heterogenous groups of people can bring to a project in terms of innovation. You will learn that all perspectives have value and that together these multiple ways of seeing the world help us with a more holistic view of why things are how they are.

As all of the participants were relatively senior and established academics, it is possible to highlight some of the longer-term rewards that are associated with open mindedness. One participant indicates that over time the keeping of an open mind opens up the ability to communicate and navigate effectively across different disciplines, which leads to being seen as central to the whole collaboration process:

> It is great to be curious and to have multiple areas of interest. In time, you will see, you will be able to navigate different universes and you will sit in rooms where you will be the one bringing ideas together, facilitating connections which will contribute to create new knowledge and innovation.

**Networking**

As with open-mindedness and curiosity, all the letters dealt with the importance of networking as a means to develop connections and projects. One participant suggests that the central theme to the emerging network should be people who are passionate about what they do:

> Surround yourself with people from other disciplines. Talk to them. Listen to them. Work together with them. Work together with the people who you like, who do the stuff that's interesting. Who radiate passion through their work – regardless of the discipline.

Whilst less specific in how to network, another participant notes that effective collaborations can lead to long term relationships and productivity:

> Seek out those who wish to collaborate with you, they can often be found in or around your home discipline if you have one outside education. For me, the fact that I had an MSc in astronomy helped me a lot to gain the trust of the colleagues in science and engineering. To this day, science education work is a reasonable fraction of my work, though I have branched out to other disciplines now as well. I found colleagues my age and roughly my academic rank, and worked with them in first instance. I still work with some of them 12 years on.

Interestingly, the reflection that this participant worked with people of similar age and position in the organisation would contradict the ideas held by many that mentoring from more senior academics is the only way to build effective collaborations. This focus on peers also extends into a comment from another participant, who encourages people to extend their network as widely as possible:

> Try to expand that diversity as much as possible, go out of your way to collaborate with your peers' collaborators if possible, engage in as many talks and projects as possible because after your PhD you realise how rare these opportunities are.

As with much of the content of the letters, there is considerable overlap across themes, with one participant indicating that open-mindedness is important when to comes to networking and potential collaborations:

> Otherwise, good luck, - and be open to a variety of potential collaborations no matter how unlikely or unanticipated they may be.

Similarly, another participant speaks of networking as a solution to the challenges of recognition:

> Recognition and value will be hard at times, because not too many people are able to see what you see. You will need to find your own crowd.

**Patience**

Several of the letters indicated that that the interdisciplinary path is not without challenges, however encouraged people to have patience and enjoy both the process of becoming interdisciplinary and to see the challenges as opportunities:

> Overall, life will be fun and you will learn. You will meet amazing people, have so many incredible conversations and overall you will have brilliant outcomes. Life will be fun. And you just need to be patient and enjoy the many hurdles on the way.

One participant also brought together curiosity with patience, and advised towards simply being interested in what other people are doing and allowing them to propose potential collaborations once a certain level of trust has been established:

> Be curious about what they do and when you see an opportunity then ask them questions that might help them see other ways of looking at their interests. Metaphors and similes are a great help, if you see a pattern between what they are doing and something else then ask them, don't tell. A simple "is that a bit like…..?" is a powerful question. Be patient, let them be the ones that suggest collaborating and trying something new. There is a real element of power and control when it comes to knowledge – read Foucault if you don't believe me! But the power is just perception and the control is irrelevant, so leave it with your colleagues to have. It takes time, but when they trust you aren't trying to take something from them then you can start building productive relationships.

**Methodological Flexibility**

The ability to work in different ways and be familiar with different approaches was highlighted as an important aspect in several letters. One participant commented in a way that suggests such flexibility is strategy for being involved in the most interesting types of research:

> As for the positive aspect, I would suggest that some of the best and most interesting forms of research are indeed those that meaningfully combine methodologies from a broad array of approaches.

Another participant highlights that the ability to think in different ways is an important skill in developing the competence and ability to communicate across disciplines:

> Equally important, diversify your skills methods-wise. Otherwise, it's going to take you more than 15 years to finally realise that "all models are wrong" and "all methods are bad". That grad course you are taking on research methods? Pay attention and do more with it now because very few grad students have that kind of exposure to a variety of methodologies and the complementary ways of thinking across disciplines. Grow the language and the openness to other research paradigms and cultures, it will save you some headaches.

The value of that ability is reinforced by another participant, who identified that disciplines often have a set way of working and that to work collaboratively in the best way does require a certain ability to understand the ways in which this discipline works as well as to influence the mindset to allow access to different ways of working.

> Each discipline has its own ways of doing things and its own epistemology and ontology. Those academic micro-cultures, as Mårtensson and Roxå coined them, are very well established. You will have to navigate that, in particular convincing scientists and engineers that not doing a true experiment (randomised control, randomised effect group) is valid, and in a lot of cases in education, the only (ethical) option. You will often encounter people who have a set methodology, and will tackle any research question with that methodology, or only tackle research questions that can be approached with that methodology. There is great fun in going out of your methodological comfort zone. The research question drives the methodology, not the other way around.

Interestingly, all the participants that referred to methodological flexibility also indicate that in some way there is value in this, particularly in terms of research novelty and enjoyment of the research work.

**Identity**

Issues that related to identity were not as common as other themes, such as open-mindedness and networking, but still came up sufficiently for the theme to be developed. One participant noted that their interdisciplinary journey had never resulted in feeling they were in the right place:

> I chose to go into postdoc positions for a while, and they were certainly fun times. If you decide to go into academia, you will do well at it. But you will be faced with a lot of choices. What I

> found is that I never quite found a home, I always felt a little out of place. That was hard to deal with to begin with, but once you accept it then it becomes a fantastic opportunity to explore different ideas and do things in different ways.

The sense of identity is also linked to networking by another participant, who notes:

> The first thing to realise is that you are not alone. The person sitting next to you might not feel the same way, but somewhere in the University you work at there will be many who feel the same disconnectedness that you do. So find them. The quicker you build that network of people, the easier it will be to come to terms with that feeling of being out of place.

This quote indicates again the interconnectedness of the themes, but also shows that some of themes are actually solutions to other themes that could be considered problematic. This is explored in more depth in the next section.

## THEMATIC SYNTHESIS

The letters and associated thematic analysis have reinforced findings from the survey phase of this research, there is clear evidence that the participants in this phase of the research are motivated to undertake interdisciplinary work for similar reasons as identified in Chapter Four, namely enjoying collaborations across different disciplines and personal interest in novel research questions and methods. Whilst the letters certainly acknowledge some of the barriers highlighted in Chapter Four, some of these are either not present at all or simply accepted as the status quo and something to navigate around rather than address head on. The most obvious of these is the siloed nature of the institutions, which in Table 4.2 was the most prevalent barrier to interdisciplinarity. In other cases, the barriers were noted but specific suggestions were made on how to address these.

Most interestingly, in many cases the themes developed during the analysis indicate how particular strategies can be deployed to address many of the barriers and negative aspects of interdisciplinary work. The most notable of these is the theme of networking, which was used as a way of providing assurance over a sense of identity, to resolve issues related to the challenges of external funding, and to address institutional siloes.

The purpose of the thematic analysis was to determine specifically what strategies could be useful for early career academics who might choose to pursue interdisciplinary work. The collection of letters, the thematic analysis, and the specific strategies can all be coalesced into a set of suggestions for early career academics. Whilst future work may frame this as a letter back to early career academics, the approach used by Enright, Rynne and Alfrey (2017), the current suggestions are framed as a set of dictums that can apply in many situations.

Those proposed dictums are:

**Don't sweat the big stuff.** Yes, the structure of the University might seem like it is creating problems that make it hard to do the work you want to, but this is a big issue to change. Start small, any collaboration across disciplines is a big win.

**Don't let your ego get in the way.** Be prepared to be second fiddle on funding applications, or aim for small applied grants in the first instance. But do think about how you develop a coherent narrative around what you do and maybe focus on the research itself rather than the funding.

**Tread lightly.** Not everyone is going to be supportive of what you want to do and being confrontational or dogmatic isn't going to make the journey easier. Be prepared to back off and find another way to communicate and engage. Sometimes the more circuitous path is the fastest.

**Respect gets respect.** Being interdisciplinary doesn't mean you have to think that disciplines are somehow bad or not needed. Take time to work out how people think and be prepared to help someone with their research and teaching, even if it is not directly related to what you want to do. You'll learn some of their language which will make it easier to work with them in the future.

**Balance is key.** Try to keep a good balance of everything, for example between research, teaching, and service. But also think how about in each of those there is an internal balance. With your research, think about how can keep a range of activities going that help you establish credibility without shutting yourself off to new ideas.

**Stay curious.** Don't think of your research and teaching as static and unchanging. Keep asking what else is out there, what can be done differently? Whilst you will be challenged along the way, you will find new ideas to work with and learn more about other disciplines.

**Find your people.** You will thrive if you work with people who share your passion for working in different ways and are excited by the work they do. Look beyond your discipline

**Learn, adapt and evolve.** There always different ways of framing and tackling research problems, take some time to understand how other people might view the problems you want to tackle and be prepared to try it their way. You will learn something new and can add it in to your toolbox.

**Home is where you hang your hat.** It is more likely than not that you will end up in a part of the university that makes you feel a bit like a fish out of water. But whilst you can see this as a problem it is also an opportunity. When the people around you think and work in different ways it is an opportunity to ask questions and find out more. You don't need to be in the direct vicinity of likeminded people to feel a sense of belonging.

Whilst this collection of advice may seem both glib and obvious, it is often the simplest suggestions that can have the biggest impact. It is worth noting that not all of the dicta will apply to all individuals in all circumstances and any advice they contain needs to be appropriately

contextualised and operationalised. The proposed dictums are clear, easy to understand, and coalesce the experience of established interdisciplinarians in an accessible way.

## SUMMARY

This chapter has presented the results of a thematic analysis that utilised the concept of a letter to one's younger self to capture the experiences of established interdisciplinary academics and explore common themes and strategies for how to survive the challenges of an interdisciplinary career. This process has produced a condensed set of suggestions for early career academics to help them on their journey.

The work is limited in the sense that the number of participants in the data collection was relatively small, however they do cover a varied set of disciplinary perspectives. Similarly, the current level of advice is offered at a relatively high level of abstraction that still needs to be contextualised and made concrete for any given individual.

# Chapter 6: Discussion

This chapter further discusses the findings of this research and puts them into a broader context. Given the complexity of presenting the findings across both phases of the research, a summary of the findings is presented first, followed by a discussion of the direct implications of the results, and then a discussion of the wider implications for leadership. The chapter concludes with a grounded speculation that discusses how the barriers to interdisciplinarity could be addressed.

## SUMMARY OF FINDINGS

The results of this study have been presented in the preceding two chapters that correspond to the two phases of the research, the national survey of academics and the building of some initial advice for early career academics based on the curation of experience used by established interdisciplinary scholars. This section briefly summarises the results of each phase and then discusses the findings in a broader context.

### Survey Findings

Broadly speaking, the results of this survey confirm and align with similar studies already published. For example, the quantitative survey data shows that the main motivations for undertaking interdisciplinary scholarly activity include personal interest and enjoyment related to working in new ways with different disciplines. This finding is similar to that of Winskel et al. (2014). Whilst some similarities in the barriers to interdisciplinary work was noted, the current study differs somewhat from the work of Winskel et al. (2014) in that a lack of institutional support was identified frequently as the main barrier to an individual interested in pursuing interdisciplinary work, with lack of recognition in promotion mechanisms and research evaluations (PBRF), and increased difficulties in collaboration and research design also being significant factors. This suggests that whilst there may be some ability to draw on the international literature in this area that there are issues that are locale specific that are worthy of continued study.

One of the main insights that arises from the quantitative data is the relatively weak correlation between how participants viewed their own degree of interdisciplinarity and how also viewed interdisciplinary scholarly activity as being important for the future. The lack of correlations suggests that even those academics who would consider themselves as undertaking discipline-based work still see interdisciplinary work as being important for the future.

Whilst the potential for biases in the survey are acknowledged, for example the inclusion of specific questions related to the PBRF research evaluation exercise, to not include such questions would not capture any of the specific locale insight. Certainly in regards to the PBRF exercise the findings of this study support existing in literature in the area that argues that PBRF can have a significant impact on academic identity (Waitere et al., 2011) as well working conditions and culture (Cupples & Pawson, 2012). More generally, the issues in the literature such as the siloed nature of organisational structures (Davison et al., 2012; Hannon et al., 2018), the challenges associated with recognition (Klein & Falk-Krzesinski, 2017; Martin & Pfirman, 2017), and difficulties with external research funding (Bromham et al., 2016) are all present. This again suggests that whilst the New Zealand context has some unique factors, there is still some potential to draw upon the international literature in further work.

Whilst not statistically significant in this study, potentially an result of the sample size, early career academics tend to view their work as being less interdisciplinary than their more senior colleagues. This is not surprising given Waldman (2013)'s observation that postgraduate study reinforces early specialisation, and the later mirroring of this emphasis in both internal promotion processes and the external funding landscape. The respondents' view of the PBRF as discouraging interdisciplinary research is key here, as institutions are incentivised to emphasise good PBRF outcomes, even though the PBRF only contributes 8% of the universities' funding.

What is clear from the qualitative data is that the barriers to interdisciplinarity are inextricably linked in many cases. For example, the hierarchical structuring of universities would appear to play a role in creating fiefdoms and authority-based structures that reinforce the importance of discipline. Resolving this, say by redesigning internal structures of a university in an innovative way, can also only be achieved by revisiting the way both internal and external funding is distributed. This is likely to run into challenges when considering not only how authority is distributed within the organisation but also the status between the disciplines, and as such institutional and individual factors are in play at the same time which further complicates the matter. The complexity of the linked barriers makes it hard to understand the whole situation, so in many cases looking at a single element, rather than the whole system, leads to trying to address the issue with linear cause-effect thinking that is unlikely to lead to successful outcomes. Highlighting the need to address interdisciplinarity in universities as a complex, distributed system with nonlinear causal processes is one of the main contributions of this research.

The intertwined nature of the themes is clearly apparent even from the shortest of comments. For example, one participant commented *"*Difficult to co-supervise across departments given the EFTS

structure. HoD won't be pleased for instance if the EFTS have to be shared*"* which was counted in three themes, namely status and authority, governance, and siloed organisational structures. Similarly, the comment *"*Siloisation of disciplines. Not easy to pigeonhole interdisciplinary research in pre-defined funder categories. Difficulty with publishing in disciplinary journals*"* relates to three categories, external research funding, siloed organisational structures, and recognition.

The present study has some limitations. The most obvious of these are its small sample size and the possibility that its findings are skewed by the participation of individuals who are especially interested in interdisciplinary work. The number of respondents (75) is small compared to the number of academic staff who submitted for assessment in the 2018 PBRF evaluation round (7408). Noting that this latter number also includes submissions from other tertiary institutions, it is likely that the number of respondents is less than 1.5% of the academic workforce and this is hardly representative. However, it is worth noting that a recent major review of the PBRF funding system (Larner et al., 2020) relied on 60 interviews and 51 submissions from individuals and organisations to recommend a set of changes that will have far-reaching effects on the sector. When compared to this, the present study's sample size seems reasonable. The potential bias of the respondents towards interdisciplinary work is acknowledged, though one of the study's aims was to identify and recruit individuals with knowledge of and experience with interdisciplinarity to participate in the second phase of this study.

**Narrative Findings**

The second stage of this research involved the curation of advice for early career academics from the insight offered by established interdisciplinary academics. The challenges for early career academics are well documented, both internationally (de Niro et al., 2020) and locally (Sutherland, 2018). There is an emerging body of literature that comments on the specific challenges for early career academics aims to provide advice for early career academics wishing to pursue interdisciplinary careers (Trinh et al., 2021; Vipond & Vipond, 2016). The current work shows some overlap with the work of Kelly et al. (2019) that again suggests that to some extent the localised situation in New Zealand is similar enough to the international arena to allow emerging interdisciplinary academics to draw upon the wider body of knowledge in this area, however there are differences. In part, this arises because the advice offered by Kelly et al. (2019) intertwines both advice to the institution and the individual researcher, whereas the advice suggested in this current work is entirely focused on the individual. Similarly, the work of Trinh et al. (2021) also attempts to balance the fostering of interdisciplinarity across both the individual and the institution.

Whilst the synthesised advice may seem both glib and obvious, it is often the simplest suggestions that can have the biggest impact, particularly when the literature notes strongly that embarking upon an interdisciplinary journey as an early career academic involves a number of clear challenges (Haider et al., 2018). The advice distilled from these letters aligns with the relatively limited amount of other research in this area. For example, Kelly et al. (2019) developed ten tips for how to develop interdisciplinary researchers drawing on the opinions of range of international experts. In their work, they concluded that the main suggestions should be to 'Develop an area of expertise', 'Learn new languages', 'Be open-minded', 'Be patient', 'Embrace complexity', 'Collaborate widely', 'Push your boundaries', 'Consider if you will engage in interdisciplinary research', 'Foster interdisciplinary culture', and 'Champion interdisciplinary researchers'.

**Discussion**

The possibility of a complete 'interdisciplinary revolution' is remote, and whether it is even desirable is even arguable. Nevertheless, the barriers to interdisciplinary work could be reduced in ways that do not erode disciplinary knowledge. One possible strategy could be to promote forms of postgraduate training that allow and embrace interdisciplinarity. While interdisciplinary PhD programmes have some challenges (Adkins, 2009), there are some simple changes, already suggested in the literature (e.g. Green & Usher, 2003; Matthiasson, 1968), such as introducing supervisors from different disciplines to doctoral students, that could offer viable spaces for early career academics to consider interdisciplinary work.

Such approaches would be unlikely to be successful without other supporting changes. Most obviously, changes to the universities' internal promotion policies are needed to allow interdisciplinary work to be acknowledged and encouraged. Such changes are entirely within the remit of individual universities themselves. Changes to wider funding mechanisms like the PBRF are also necessary, and possible, but must be longer-term goals. Linked to this are broader discussions about the changing nature of academic publication in the 21st century, the recognition of 'non-traditional' publication outlets, and so on.

The complexity of the university as a system, and the interlinked nature of the barriers, raises questions about the extent to which real change could be successful. Many of the themes identified are not entirely in the control of an institution, so policy or structural changes in a single institution will be limited because of the constraints in the wider sector. For example, recognising interdisciplinary scholarly work in terms of promotion practices would have limited value and benefit if the external funding environment prioritises discipline-based work. This illustrates the

true importance of the role of leadership in developing the internal and external environments that are required for interdisciplinary work to flourish.

Future work will therefore focus on an exploration of the potential of interdisciplinary socialisation to facilitate a long term solution for helping interdisciplinarity flourish will be undertaken. The data collected in this research certainly shows some potentials, for example one participant noted “There aren't any communication channels designed to facilitate interdisciplinary research (i.e, a space online where researchers could identify each other’s research interests and willingness to cooperate with others)”. The creation of an interdisciplinary social network is something that is achievable with little or no institutional support and potentially would help navigate the barriers that exist because of faculty, school and departmental divides.

The success of many attempts to foster interdisciplinary work arise from the inter-relationship between top-down and bottom-up influences in an institution (Barringer et al., 2020). To enhance the chances of success it would seem that academic staff, academic leaders, and managerial leaders need to have effective working relationships and good communication. The next section focuses on the implications for leadership that are important for institutions wishing to foster interdisciplinary scholarly activities.

## IMPLICATIONS FOR LEADERSHIP

The results of this study provide insight for both institutions and individuals wishing to promote interdisciplinary approaches to teaching and research. However, the discussion of these insights needs to be with reference to beliefs, theories and models of leadership.

### Leadership Theories

Universities tend to be relatively complex organisations (Denman, 2009; Mora, 2001) which can create a range of challenges when it comes to academic leadership. Szekeres (2011) notes that “Universities have become extremely complex organisations” (Szekeres, 2011, p. 689) and it is this complexity, along with multiple goals and traditional values, that makes the nature of leadership in higher education both ambiguous and contested (Petrov, 2006). This is certainly the case when different beliefs around leadership are present in a single organisation. Studies that focus on leadership in tertiary environments have seen some examples where leaders exhibit transactional and transformational styles (Pihie et al., 2011) which focus on the role and capabilities of the leader.

Longsworth (2010) provides a classification of established leadership theories based on three dimensions, how, what and who, as shown in Table 6.1.

Table 6.1 Classification of Leadership Theories (Longsworth, 2010)

| Focus | Description | Theories | Summary |
|---|---|---|---|
| ***Who*** | The leader is central to the achievement of the organisation. Intrinsic qualities make leaders effective. | Great person<br>Charismatic<br>Transactional<br>Leader member exchange<br>Least preferred co-worker<br>Transformational | I-Leadership |
| ***What*** | Behaviours, skills and attitudes can be acquired and taught. Effective leaders can choose skills and approaches to use based on follow needs and characteristics. | Attributional<br>Behavioural<br>Behavioural complexity<br>Integrative Leadership | You-Leadership |
| ***How*** | Leadership is a construct of processes. Effective leadership rests in the way in which leadership is exercised. | Adaptive leadership<br>Servant and steward leadership<br>Distributed leadership<br>Hybrid leadership<br>Complexity leadership theory | We-Leadership |

Using this classification, both transactional and transformation leadership can be considered as I-Leadership theories in Table 6.1, despite calls for more shared leadership approaches (Bolden et al., 2015). These are a limited set of examples from which no real conclusion can be drawn, but the potential for different leadership beliefs and styles to exist within a single organisation cannot be denied, particularly in large and complex hierarchies.

The parallels between current University structures and the medieval feudal system were briefly discussed in Chapter Two. These parallels emerge most clearly when considering the hierarchical nature of the organisation, where capital (both intellectual and financial) is generated and where organisational and political power is held (Holligan, 2011). Hierarchical leadership is generally considered a downward process (Crevani et al., 2007) that is authoritarian in nature (Sirman, 2008). This is supported by Yielder and Codling (2004) who observe that "Managerial leadership positions in academic institutions reflect organisational hierarchy and are therefore appointments made from above. This aspect of leadership is vested in the position, and as such involves a person being 'in' authority" (Yielder & Codling, 2004, p. 320).

As a result of the hierarchical structures in the University, and the perception that individuals in formal leadership roles exist have authority, the behaviour of managerial leaders can lead to dissatisfaction and dysfunctional circumstances (Bedeian, 2002; Zepke, 2007). This is enhanced as

a result of the diarchy identified by McMaster (2005) and further complicated due to the observation that "the self-perception of academics as successful professionals who are committed to excellence means that they dislike being managed" (Berings et al., 2010, p. 3).

### Managerial Leadership

The findings of this study show that academic staff consider that interdisciplinary work is important to the future of universities in New Zealand, even if the individual staff involved do not consider themselves to be particularly engaged in interdisciplinary scholarly activity. This would suggest that those in managerial leadership positions in the institutions should therefore be focused on how to foster interdisciplinary capacity. A wide range of literature has already been published that describes various attempts and strategies to achieve this goal over a long period of time (M. Harris, 2010; M. S. Harris & Holley, 2008; Jantsch, 1972; Tarrant & Thiele, 2017; Townsend et al., 2015). The findings of this study show that there is some alignment between the situation in New Zealand and the rest of the world, but potentially with some need to localise the strategies and ideas appropriately.

Much of the research in this area focuses on structural issues. For example, Bordons et al. (1999) report on whether a programme specifically intended to facilitate interdisciplinary collaboration across schools and departments was successful, with useful insight as to whether traditional measures are the best way to determine 'success'. The role of interdisciplinary centres and institutes are also discussed by many authors (Bolger, 2021a; Stahler & Tash, 1994) and could be considered the typical approach to interdisciplinarity. Whilst such structural changes are welcomed, their successes are often questionable. For example, Jantsch (1972) proposed a sweeping change to the way universities are structured that not only supports interdisciplinarity but still rewards and praises the disciplines themselves, but these ideas seem to have been overlooked.

One possible explanation for this emerges when considering the extent to which any institution can influence key issues related to change. A full analysis of how educational policy influences institutions is beyond the scope of this research, but an initial attempt has been made to order the themes that emerged from the qualitative survey data so that it is clear which may be easier to address and how the themes are influenced by each other and this is shown in Figure 6.1.

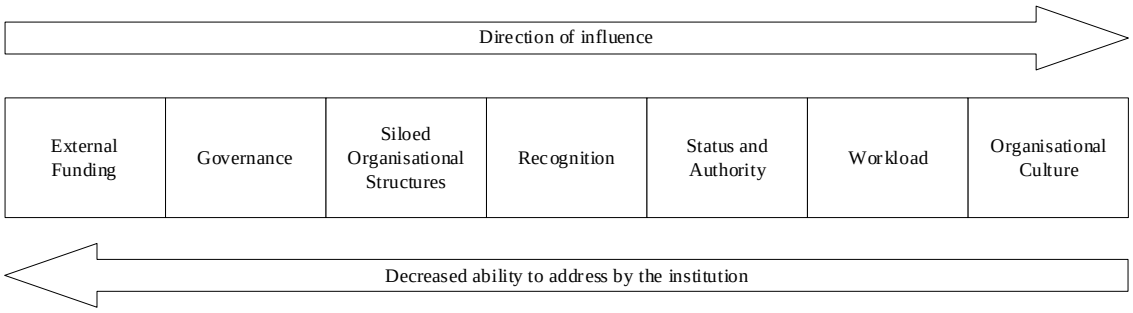


Figure 6.1 Ability to Influence

Issues related to external funding are clearly the hardest for any single institution to address, as funding mechanisms and priorities are generally determined by government policy or industry priorities. And yet this this strongly influences all of the other themes through a cascade effect. Whilst governance would seemingly be something that an institution could influence, the fact that university funding, in New Zealand at least, is partly determined by student numbers with different attributed value based on discipline is a limitation. Whilst a university may try to develop alternative internal financial models, this is more challenging that may first appear due to the external funding allocation. Internal policies and practices are something that can be influenced as can the appointment of leadership teams that can positively influence the reception of interdisciplinary initiatives.

In part, the siloed nature of organisational structures is determined by the internal financial model, which has already been indicated is influenced by the way student derived income is received. Recognition is where the ability to influence starts to become significant, however there is still a reliance on external factors and themes that are less easy to influence. Publication of interdisciplinary work needs suitable outlets to exist in order for them to be recognised, and whilst a number of such outlets do exist, there is a certain reliance on the traditional publishers whose business models are closely linked to using bibliometric based recognition metrics such as impact factors. Considerations such as academic identity are also reliant on the structures within the university, and the long-standing socialisation traditions of the disciplines. Reconsidering appointment and promotion practices are entirely addressable at any institution. This blends into status and authority issues, which on an individual level can be addressed by an institution through suitable monitoring and review, particularly of those in managerial leadership positions. However, the pervasive view that some disciplines have more intrinsic value than others is more difficult to address, and this is not helped in that both external research funding mechanisms and student derived income methods show considerable bias against particular disciplines. Even workload is not entirely within an institutions ability to address, as ultimately workload expectations relate back to

external research funding and student derived income. The only issues that are seemingly entirely within an institutions control is that of its organisational culture, but this is still directly influenced through its interrelationship to all the other themes. It is, however, the logical best starting place for leadership whom wish to develop an environment in which interdisciplinary work can be undertaken. This conclusion is reflected in the work by Kezar (2005) who indicates that changing structures and rewards is the third phase of redesigning for collaboration, with the first phase being focused on communicated values to influence individuals in the organisation that change is needed. Interesting, Kezar also notes that:

> An element that emerged that is unique from other models is a campus network, which was critical across all three stages. The network was most important in stage one for helping to communicate the ideas from the new values, external messages and learning. (Kezar, 2005, p. 845)

This observation clearly aligns with the findings of this study over the importance of creating networks.

The extent to which these themes are not fully influenceable by an institution is perhaps one of the reasons why the same concerns are addressed in the literature over many years, with the same strategies being suggested but rarely ever implemented successfully. Therefore, there is a need to focus on leadership practices, specifically the behaviours that can influence and change organisational culture and allow a university to become more receptive and supportive of interdisciplinary scholarly activity.

Key to this approach is managerial leaders in universities changing their messaging around the value and meaning of aspects of academic life. Taking the PBRF research evaluation exercise as an example, it has been noted that the PBRF has "fostered a culture of relentless production, pushing academics who may for various reasons (including heavy teaching loads or substantial service commitments) have had modest publication records to 'lift their game' as writers and researchers" (Roberts, 2019). Roberts goes on to state:

> The language of 'outputs' dominates research discussions in universities subject to performance-based research funding, and in the end academics can begin to think of themselves in this light: they become 'outputs' of a system that manages and measures them and determines their worth as researchers on the basis of a six-yearly grade. This dehumanizes academics, reducing them, symbolically at least, to fodder in a giant revenue-generating machine. (Roberts, 2019, para. 14)

Whilst Roberts may be considered to be voicing a personal opinion, the institutional rhetoric in many institutions is shifting and will generally demonstrate some pressure to 'perform' (Dugas et al., 2020). This "inevitably influences the ways in which academics establish their identities, and strive for legitimacy, in their work roles" (Aprile et al., 2021, p. 1132). A change in rhetoric from managerial leaders does not necessarily mean a reduction in productivity, and a shift to focusing on career development, academic identity, collaboration, wellbeing, and job satisfaction have the potential to reap longer term rewards.

This pressure to perform, whether explicit or implicit, displays what Goleman (2000) would consider to be a 'pacesetting' leadership style, which his research has shown has a negative impact on organisational climate, or culture. Shifting the rhetoric towards how individuals develop within the organisation and respond in a constructive way to the PBRF is a shift towards more of what is called a 'coaching' style. This style of leadership has a positive impact on organisational culture, and research clearly shows that a positive organisational culture leads to higher productivity (Nzuva & Kimanzi, 2022). Here, not only would this change in rhetoric allow for interdisciplinary academics to focus on their identity and work but would likely lead to a positive change in terms of productivity for discipline-focused academics.

Given that this discussion is focused specifically on how the behaviour and leadership practices of managerial leaders can influence organisational culture, and by doing so foster interdisciplinary scholarly activity, Goleman's (2000) research on leadership styles provides a useful lens to analyse the data collected in this study. Here the intention is to search for evidence of 'pacesetting' and 'coercive' leadership behaviours, both of which have a negative impact on organisational climate.

The qualitative data collected generally shows that the participants in the survey did not feel strongly that interdisciplinary work is either encouraged, supported, or valued (see Figure 4.13). Complementary to this are several qualitative comments in the data collected in this research that suggest that in cases there is evidence of the 'coercive' leadership style by managerial leaders. These comments from participants include observations such as "Decision-makers or managers can have fairly rigid ideas about disciplinary identity and what research activity and outputs can and should look like", "There is also a secondary problem of there being preconceptions and assumptions about how interdisciplinarity should work". Other participants noted:

> When an institution (with the best of intentions) 'overly encourages' and prescribes how the interdisciplinary matches need to be/must be made, it prevents the natural organic formations that perhaps take more time to occur but would in the long term lead to more fruitful research

and:

> The institution is very keen on interdisciplinary research collaboration but rather than supporting what's already happening, there are clumsy attempts at matchmaking e.g. though funding RFPs that require people to put together an interdisciplinary team around fixed criteria such as a requirement to work with people outside your department or school, and giving people a matter of weeks to find partners and put together proposals around predetermined themes.

These and other comments tend to suggest that managerial leaders may have good intentions in terms of fostering interdisciplinary work, though they tend to work on the assumption that this is something that needs to be controlled and directed through the hierarchy of the institution.

Given that some participants indicated that there was a "lack of an understanding by faculty and departmental gatekeepers (doctoral boards, etc.) of the nature of interdisciplinary work, particularly in faculties/departments where interdisciplinary work is not commonplace" and "a poor understanding of the benefits of interdisciplinary research and a general lack of experience with disciplinary border crossings" then not only are these leadership behaviours potentially coercive, but also not fully informed. Using Goleman's work on leadership styles, an 'authoritative' leadership style has the biggest positive impact on organisational culture, and he defines this style by stating "an authoritative leader states the end but gives people their own means" (Goleman, 2000, p. 8). If managerial leaders adopted a more authoritative approach to fostering interdisciplinarity, this would involve simply indicating that the end was more interdisciplinary work but allowing the freedom of how that is achieved to be devolved to the people undertaking the work. Such an approach would go a long way to not only building a positive organisational culture, but also build trust. Studies have shown that individuals are more likely to accept change when they perceive a higher quality relationship with their superiors (Smith, 2018). Whilst this seems obvious, it emphasises the importance of trust which has been established as vital to effective governance of universities. Kezar (2004) argues that "leadership, trust, and relationships supersede structures and processes in effective decision making*"* and also that governance can "operate with imperfect structures and processes, but if leadership is missing and relationships and trust damaged, the governance system will likely fail" (Kezar, 2004, pp. 44–45). The corollary of this is that if relationships and trust are improved, then governance systems are more likely to succeed. In this case, if managerial leaders provide the opportunity for autonomy and use this to build trust, then the result is they receive more support as well as improving organisational culture.

In terms of autonomy and trust, Nancarrow et al. (2013) identify the ten characteristics of successful interdisciplinary teams that are shown in Table 6.2.

Table 6.2 Characteristics of Successful Interdisciplinary Teams (Nancarrow et al., 2013)

| Theme | Description |
|---|---|
| Leadership and management | Having a clear leader of the team, with clear direction and management; democratic; shared power; support/supervision; personal development aligned with line management; leader who acts and listens. |
| Communication | Individuals with communication skills; ensuring that there are appropriate systems to promote communication within the team. |
| Personal rewards, training and development | Learning; training and development; training and career development opportunities; incorporates individual rewards and opportunity, morale and motivation. |
| Appropriate resources and procedures | Structures (for example, team meetings, organizational factors, team members working from the same location). Ensuring that appropriate procedures are in place to uphold the vision of the service (for example, communication systems, appropriate referral criteria and so on). |
| Appropriate skill mix | Sufficient/appropriate skills, competencies, practitioner mix, balance of personalities; ability to make the most of other team members' backgrounds; having a full complement of staff, timely replacement/cover for empty or absent posts. |
| Climate | Team culture of trust, valuing contributions, nurturing consensus; need to create an interprofessional atmosphere. |
| Individual characteristics | Knowledge, experience, initiative, knowing strengths and weaknesses, listening skills, reflexive practice; desire to work on the same goals. |
| Clarity of vision | Having a clear set of values that drive the direction of the service and the care provided. Portraying a uniform and consistent external image. |
| Quality and outcomes of care | Patient-centered focus, outcomes and satisfaction, encouraging feedback, capturing and recording evidence of the effectiveness of care and using that as part of a feedback cycle to improve care. |
| Respecting and understanding roles | Sharing power, joint working, autonomy. |

Whilst these characteristics have been derived specifically in a healthcare context, they may be easily re-interpreted in any setting and can be used as the basis of a framework to evaluate team performance. More importantly, they also offer a framework for managerial leaders to reflect on their leadership practices and behaviour. If managerial leaders considered themselves part of the team, as opposed to managing the team, then reflecting and adjusting leadership practices and behaviours taking into account how they lead towards these characteristics in conjunction with changes in leadership style will likely lead to a much more positive organisational culture.

The potential implications for managerial leaders outside of the focus on organisational culture is acknowledged, certainly the data collected as part of this research would suggest that there is a need

for significant change in terms of recognition, structures, governance, and funding. However, for such changes to be successful, there truly needs to be an organisational culture that is open to change.

### Academic Leadership

The implications for managerial leadership that arise from this study are easily characterised by changes in attitude and behaviour, an improved understanding of their own leaderships styles, and understanding what characteristics are needed to develop successful interdisciplinary teams and initiatives. But what of academic leaders?

The distinction between managerial leaders and academic leaders is made by Yielder and Codling (2004) and articulated in Table 6.3.

Table 6.3 Characteristics of Managerial and Academic Leadership in Tertiary Education (Yielder & Codling, 2004)

| **Mode 1 Leadership Academic** | **Mode 2 Leadership Managerial** |
|---|---|
| Leader is '**an**' authority, based on<br>• discipline knowledge<br>• experience<br>• peer and professional recognition<br>• personal qualities<br>• expertise – teaching, research, programme development<br>Leadership context: Collegial<br>Formalisation: Bestowed from below<br>Leadership is vested in the PERSON because of their personal characteristics, and perceived expertise | Leader is '**in**' authority, based on<br>• position in hierarchy<br>• job responsibilities (e.g. financial management, human resource management, planning)<br>• control (e.g. budgets, resources, accommodation)<br>• delegated authority<br>• power<br>Leadership context: Corporate<br>Formalisation: Appointed from above<br>Leadership is vested in the POSITION and the person may or may not have the capabilities to exercise this leadership |

In the context of this study, academic leaders are likely to be experienced interdisciplinary academics looking to foster a greater focus on interdisciplinary scholarship, yet do not hold a position of authority in the organisation. This effectively constitutes trying to effect change within an organisation. Much of the literature relating how academic institutions implement change is focused upon the role of managerial leaders, though some studies suggest that meaningful change is best implemented at the grass-roots level (J. Thomas & Willcoxson, 1998). However, some authors argue that change or innovation at the grass-roots level is often opposed by leadership (Edmonds & Stolk, 2018). This puts academic leaders in a difficult position where attempts to build capacity for interdisciplinary scholarship can lead to conflict. Academic leaders therefore need to be mindful of

how their actions may be perceived and work with tact to not only support those around them directly, but also influence managerial leaders and the institution towards a better direction.

Both academic leaders and managerial leaders should share a common interest in organisational culture, and as has already been noted a better organisational culture is potentially the foundation on which more significant change could be built. In many respects, the implications for academic leaders in terms of building more positive organisational culture mirrors the implications for managerial leaders, particularly in terms of promoting a conversation around interdisciplinarity. Academic leaders also have the potential to guide and support career development, academic identity, collaboration, wellbeing, and job satisfaction. Similarly, academic leaders can also utilise the suggestions in Table 6.2 to guide how they choose to influence those around them.

However, academic leaders have the ability to do more as they are not constrained in the same way as managerial leaders, particularly when it comes to supporting early career academics. For example, if a managerial leader were to attempt to mentor an early career academic on how to navigate around organisational silos or attempt to suggest liberal interpretations of promotion policies or other institutional documents, then to some extent this undermines the authority of their position because their actions contradict the directives of the institution that bestows that authority. Academic leaders, as noted in Table 6.3 have a different type of authority.

The lens through which the findings of this research are analysed is therefore how can academic leaders provide support and guidance to early career academics, or indeed any academic wishing to develop interdisciplinary scholarly work. This mentoring is complementary to the changes in leadership practice recommended for managerial leaders.

The qualitative and quantitative data collected in all the stages of this study provide insight as to where such mentoring could be useful. For example, whilst the most significant barrier to interdisciplinarity is a lack of institutional support, as seen in Figure 4.12, addressing this directly may create conflict between academic and managerial leaders. Both the lack of recognition in terms of PBRF and promotion, and the increased difficulty in collaboration and research design are areas where academic leaders can share their experience and provide guidance without necessarily giving rise to conflict. For example, providing suggestions on how to align an academic identity with research interests can be useful as means to how to present a coherent narrative for both PBRF and promotion purposes. Such advice could include suggestions on how to publish interdisciplinary work (Pohl et al., 2015) or looking for methodological coherence as opposed to coherence that emerges from focusing on a single topic. Certainly, it would seem that there is a need for this that emerges from the qualitative data, as one participant noted:

> The PBRF system does not deal well with interdisciplinary scholars. In all sorts of classification categories both at the university and nationally I find that my disciplines are not represented, so I need to select categories that have relevance but don't really reflect what I do.

Whilst not perhaps a major focus, the quantitative data shown in Figure 4.13 indicates that the terms multi-, cross-, and interdisciplinary are deemed to be used interchangeably. Figure 4.15 also indicates that early career academics believe this to a greater extent, which may be an indication that they have a better understanding of the meaning of the terms, or it indicate the opposite. Either way, promoting an understanding of the terminology of interdisciplinarity throughout an institution is an area where academic leaders can help develop understanding across disciplines.

Some of the themes that emerge from the thematic analysis in Chapter Four also provide indications of where academic leaders can influence and change engagement with interdisciplinary work. In particular, facilitating networking and collaboration seems to be a key aspect here, as several comments in the qualitative data suggest that the perceived challenges of building collaborations can make it less likely to happen. Comments from participants such as "There is often no time to investigate partnerships in another discipline, let alone in my own discipline", "Not knowing who potential collaborators are within own institution", and "Finding out who is doing what is really challenging. At a recent meeting, people on climate change were asked to participate - I had no idea all those academics were working on climate change" certainly indicate the challenges in this area. Academic leaders are well placed to initiate activities that cross the boundaries of siloed departments and schools, in some cases very easily. For example, an established interdisciplinary scholar may often co-supervise Masters and PhD students across several institutional units. Helping others build those connections could be as simple as hosting a social event whereby all co-supervisors are invited along with the invitation extended to bring other co-supervisors or a junior colleague.

Whilst an initiative such as this doesn't specifically address the challenges of interdisciplinary PhD candidates, which one participant noted explicitly when they indicated that they had "written on how difficult it is for interdisciplinary doctoral candidates to find supervisors willing to work outside of their own areas of expertise; write crossing epistemological differences; find examiners; find academic jobs after graduating....", and certainly an authentic networking event held frequently could stimulate conversations that assist in this area. Similarly, it doesn't directly address the established norms of scholarship, which was commented on by a participant who wrote:

> Generally speaking, the education field is averse to innovation. There is also a very old fashion way of seeing scholarship - for example, emphasising the need for single authorship. In my

> view, this is a contradiction. On the one hand, we are told to collaborate, develop partnerships, but then we are told to write-up ideas by ourselves.

By role modelling collaboration and networking, there is a subtle change in organisational culture than normalises collaboration over single authorship. Whilst this may not directly impact the belief that "Everything about the individualisation of activity in a university setting is an impediment to working across any perceived boundaries of discipline - or any field of activity really!" by focusing on a positive culture it establishes the possibility of change in the future.

Methodological flexibility is also an area where mentoring from established interdisciplinary scholars can help build capability. Comments from participants in this study indicated that "Research is harder to do and publish because you have to familarise yourself with a whole new area of research" and:

> I think the challenges aren't necessarily institutional - the universities encourage it, it's just that the outcomes are difficult because of effort required around learning a new discipline area and publishing in an interdisciplinary teams. It's much easier to work in your discipline in terms of efficiency and outputs.

Established and successful interdisciplinary academics will likely sympathise with this view, having lived this experience directly themselves. But their experiences in doing so and familiarity with ways of working can also be of great use in helping others start the same journey as well as starting to counter the view that there is a "Lack of respect for different disciplines and their genealogy, traditions and methods" as such respect only comes from working with those methods and traditions.

Whilst the focus on academic leaders as mentors seems obvious, the value that it offers should not be underestimated.

## FROM 'WHAT IS' TO 'WHAT IF…?'

Generally speaking, the purpose of the discussion of a thesis is not to speculate, but to tie together the findings in relation to the theory, review of the literature, and rationale of the study. However, there is great potential in considering the role of imagination and speculation in creating new, imaginable futures.

The findings of the study, and the implications for leadership outlined in the previous section, certainly go some way to laying a foundation for the future fostering of interdisciplinarity in tertiary institutions. But is it enough? Rob Hopkins, the author of the book '*From What Is to What If:*

*Unleashing the Power of Imagination to Create the Future We Want*' (Hopkins, 2019) documents and records a number of instances where real change has been imagined and adopted. Rather than accept the necessity of slow and gradual change using the strategies discussed earlier, this section of the discussions asks whether it is possible to imagine what a university might be like in the future that was fully interdisciplinary and then develop strategies for getting to this point. The following subsections outline these potential strategies as a form of grounded speculation that vary from the immediately achievable, and already discussed, to the more adventurous and challenging. Grounded speculation is not a well established research practice, though is sometimes used in future focused research and futurism in general. For example, Törnroth et. al (2022, p. 3) observe that grounded speculation "encourages paying attention to both how things are right now, and that they could be otherwise". Other authors support the need for empirically grounded speculation in research with the observation that "hypotheses that outrun the available evidence can also serve as useful investigative pulleys and levers" (D. Turner, 2019, p. 3) and it is from this stance that the speculation is undertaken. Whilst unconventional in a thesis, these sections are proposed as questions for future activists and proponents of interdisciplinarity to consider and take on.

**Socialisation of Interdisciplinarity**

Delamont, Atkinson and Parry (2000, p. 4) indicates that "there is no doubt that doctoral research produces and reproduces not only knowledge, but social identities as well", and that "evidence from the international research [shows] that identities are discipline-specific". This combination of knowledge and identity in parallel is known as socialisation, and this process develops the competence to carry out the relevant tasks of teaching, research, and administration in that discipline. It promotes the production of relevant research, the process of peer-review, and a system of rewards related to these activities (Beyer & Lodahl, 1976; Reich & Reich, 2006). Beyond this, it has been noted that "What individuals learn during their doctoral education may lead them to understand their role as supervisors in ways which perpetuate the traditional culture of their discipline" (McAlpine & Norton, 2006, p. 9). Arguably, the fact that "Doctoral research is largely carried out in or in academic departments" (Parry, 2007, p. 26) in conjunction with the fact that "The doctorate largely remains a disciplinary-based endeavor" (Holley, 2020, p. 271) leads to the condition that is noted by Turner (2000) whereby disciplines could be viewed to predominantly exist to perpetuate themselves.

What if? What if this was not the case? What if a significant proportion of doctoral programmes were conducted outside of departments? What if doctoral programmes embraced interdiscipinarity at their core? Certainly there is growing interest in interdisciplinary doctoral programmes (Holley, 2020). Whilst such programmes are not without challenges, not least of which is the development of

an interdisciplinary identity (Holley, 2015), these challenges can be overcome as the experiences of PhD candidates in such programmes would suggest (Demharter et al., 2017). It is also worth considering whether the challenges of trying to undertake interdisciplinary work in a traditional PhD programme (Golde & Gallagher, 1999) are in fact greater than the challenges of an interdisciplinary programme?

The implementation of interdisciplinary PhD programmes could take a variety of forms, ranging from gentle encouragement to have supervisors from multiple disciplines (Nisselle & Duncan, 2008) through to the creation of new, interdisciplinary graduate schools (Lindner & Taddei, 2007). Interdisciplinary PhD programmes offer the opportunity to socialise interdisciplinary practices for the future, are easily achievable and will have long term benefit in terms of the preparing future leaders that will be well placed to support interdisciplinarity.

**Reimagining Managerial Leaders**

Yielder and Codling (Yielder & Codling, 2004) note that managerial leaders may or may not have the capabilities to exercise the leadership requirements bestowed on them from above. It has been suggested in the literature that "most institutions of higher learning pay little attention to either the preparation of department leaders or their succession into the position" (Sessa & Taylor, 2000). Despite studies that investigate what departmental leaders should need to be prepared for leadership (Wolverton et al., 2005), recent studies show that academic researchers are still generally under-prepared for future leadership (Haage et al., 2021).

Acknowledging the differences in academic positions and titles across countries, it would seem that individuals coming into lower-level managerial leaderships positions learn leadership in the 'school of hard knocks'. Managerial leaders have been quoted as saying this in a number of studies (Lesser, 2021; Polmear et al., 2022), but it should be asked whether such experiential training is the best option? It would certainly seem that holding a lower-level managerial leadership position is a prerequisite for more senior positions such as Heads of School, Dean, or senior executive positions. It seems rather questionable to accept the status-quo of an institutions leadership positions filled by individuals who have 'learnt on the job'.

What if? What if it were different? What if leadership skills were developed in all academic staff? Indeed, what if leadership skills were embedded in the aforementioned interdisciplinary PhD programme? What would this mean for the future of the university and how it could foster interdisciplinarity?

Studies have shown that the role of managerial leaders, specifically in this case Deans, has "changed dramatically over the past couple of decades" and:

> Deans nonetheless must respect many persistent, deep-seated academic norms and values in order to provide effective leadership. But, for most, this appears to be more than acceptance – they too embrace the key canons of academe along with their faculty colleagues." (Meek et al., 2010, p. 50)

It is difficult to see how those deep-seated academic norms can be truly changed as long as those in positions to change them not only accept them, but embrace them. Yes, the long term potential for socialising interdisciplinarity through new PhD programmes may one day result in the appointment of managerial leaders who are prepared to challenge these norms. But how likely is that if the gatekeepers to promotion and appointments to lower-level managerial leadership roles are not prepared to understand or support interdisciplinary work other than at a superficial level? The most likely scenario is that as long as middle level managerial leaders believe in the primacy of disciplines, a strong disciplinary bias will be perpetuated.

What if? What if this were different? What if Deans were appointed based on their understanding of the foundations of interdisciplinary practices? An example from an Australian university shows that when Deans have goodwill towards interdisciplinary research that effective collaborations and initiatives can be achieved (Brandenburg et al., 2022). Other studies have also shown that higher level support for interdisciplinary research is associated with structural commitment to this work (Barringer et al., 2020), where this structural commitment is a reflection of the number and interdisciplinary nature of both research centers and departments (Leahey et al., 2019). Put simply, structural changes that are interdisciplinary in nature seem unlikely to ever be successful as long as departmental, school, and faculty managerial leaders remain discipline focussed.

**Cross-Functional Teams**

Siloed departments and highly hierarchical organisations are not unique to the tertiary sector, and arguably would be the norm for the vast majority of larger organisations, and indeed there is a large body of literature that deals with issues related to governmental and corporate silos (Bannerjee, 2021; Scott & Gong, 2021; Serrat, 2017; Stuart, 2008).

One common approach in industry for dealing with issues that spread across multiple departments is the cross-functional team, defined as a group consisting of people from different functional areas of the company. Cross-functional teams certainly do not guarantee successful outcomes, but the issues of cross-functional teams are well documented along with strategies to make them work effectively

(Gobert, 2019; Proehl, 1996; Webber, 2002; Zalpuri & Hamlin, 2020). Certainly, there is potential to look to the commercial sector for ideas and inspiration as to how to integrate across organisational divides.

What if? What if we did learn from the commercial sector? What might a cross-functional team look like in academia? The most obvious answer is of course the interdisciplinary research institute or centre, and the successes and failures of these are documented in the research literature (Biancani et al., 2018; Bolger, 2021b; Leahey et al., 2019; Yonezawa et al., 2020). Perhaps more successes could be achieved by considering what the obstacles are to success in commercial teams? Parker (1994) notes that typical obstacles that need to be addressed for cross-functional teams to succeed include, amongst others, confusion about the team's authority, ambiguity about the team's goals, lack of rewards and recognition, troublesome interpersonal dynamics among members, lack of "credit" for team participation, and lack of management support. Designing an interdisciplinary research institute that addresses these issues from the outset would certainly improve the chances of success, but again it is worth noting that key factor that is the degree of support from managerial leaders. If individuals in these positions do not support interdisciplinary scholarly work, then this will negatively impact the chances of success.

But what about teaching? The term 'interdisciplinary scholarly activity has been used throughout this research as an attempt to not make a distinction between research and teaching, though at times the narrative has firmly become entrenched in the research aspect. The formal decoupling of programmes of study from organisation units, such as departments and schools, is discussed in the next section. However, there are alternatives to this that can be implemented easily within the constraints of organisational structures and internal funding mechanisms. For example, one possibility is to simply co-locate undergraduate capstone projects in a shared space and encourage students from different disciplines to work together on shared interests and projects, of course with support from staff across those disciplines. Some attempts have been made to this end at both undergraduate and postgraduate levels (Coker & Gatti, 2017; Sirinterlikci, 2014; Taajamaa et al., 2013). Some examples of successes go as far as to say that "For the most part, the students agree that the multidisciplinary capstone is a positive experience for them and is better than other single discipline capstones" (Rabb et al., 2010, p. 8).

Such approaches cause no issues with internal funding as students can remain enrolled in their capstone course and so all student derived income is proportioned to the respective department or school. The students simply need to be collocated and supported. And yet personal experience in attempting this has consistently received resistance from academic staff who are concerned that the

students ‘won’t do the right type of work for this discipline’ or the initiative has not been supported by managerial leaders. This lack of engaging jointly is also notice in terms of research, where Bruhn argues that:

> A culture needs to be fostered so that interdisciplinary questions can be asked, and researchers must be encouraged to jointly pursue the answers. Collegiality needs to be encouraged to help refine research problems and assemble appropriate teams of experts to work on these problems.” (Bruhn, 1995, p. 335)

Given that both interdisciplinary teaching and research share similar issues in resistance to joint initiatives, one of the suggested foci of this research is on developing an improved organisational culture.

**Decoupling Programmes of Study and Research from Organisational Units**

In the wider education context, the “need to maximize student derived income has led to an increase in inter-institution competition” (Fityus et al., 2012, p. 220) and certainly competition between institutions would be considered typical (McKinlay et al., 2020) with collaboration rare. However, there is little research that focuses on the intra-institutional competition for students that emerges from the proportioning of student derived income to faculties, schools, and departments. The fact that programmes of study are typically ‘wholly owned’ by an organisational unit leads to the scenario where these units may turn in on themselves and oppose student choice across a broader set of curriculum options. Not only does this impact student choice, but by doing so limits the options for staff from across departments to co-teach and by doing so learn from each other.

What if? What if this were different? Decoupling programmes from organisational units is not without challenges, but perhaps easier than either changing the funding model or radically changing the structure of the university. To some extent, this decoupling is already occurring in some instances. Undergraduate engineering programmes, for example, often have a common first year that is taught jointly by staff from the various departments, such as mechanical and electrical engineering. Within a school of engineering, is there perhaps this degree of cooperation between departments because the programme is somehow shared across them, and collaboration supported by the managerial leaders that sit above the department level? Why could this model then not work to facilitate shared teaching across faculties? The degree of speculation is increasing here, and there is less research evidence to support potential assertions, but is possible that such collaboration and sharing of resources in engineering programmes is because the various departmental and school level managerial leaders see themselves ‘all as engineers’ and sharing a common culture and set of values.

Collaborating across more diverse schools and faculties is perhaps more challenging because managerial leaders focus on the differences rather than the similarities, and in doing so effectively block the prospect of collaboration and resource sharing in teaching? Specific studies have look at resourcing sharing, for example in the health disciplines, where it was noted that "educators believe interprofessional resource sharing to be beneficial and appropriate. However, concerns that resources are of insufficient quality or will be incorrectly attributed surfaced as barriers to sharing" (Maloney et al., 2013, p. 811). It is not that much of a stretch of the imagination to believe that the same attitudes would flow into the sharing of human resources and to question the quality of teaching that would occur in other disciplines.

It is not an insurmountable challenge and various institutions have achieved this goal, an example being the 'Common Core' concept at Hong Kong University (Kochhar-Lindgren, 2017). Such initiatives are likely successful because they have the support of the senior executive of the institution. Assuming such support were available, it is not inconceivable to imagine how a variety of initiatives could be implemented. Entire programmes could be delivered both outside of and across organisational units, such as the Bachelor of Climate Change at the University of Waikato, or conjoint programmes such as the Creative Intelligence programme at the University of Technology Sydney (Baumber et al., 2020). Alternatives could include a common major that focuses on current global challenges such as are defined by the UN Sustainable Development Goals.

Key to all such initiatives is recognising by necessity that the delivery team should be transient. The historical imperatives of disciplinary momentum will likely come into play with a permanent teaching team and housing the programme within a department creates an imperative to start thinking of the field as a discipline and essentially cause it to stagnate. There are examples of several 'in-disciplines' that have followed this path, for example tourism studies, cognitive science, and neuroscience (Parrinello, 2012; Tribe, 1997).

**Decoupling Student Derived Income and Operational Costs**

Decoupling programmes from institutional units can be achieved without any significant changes to the internal financial structures of an institution. A programme that was jointly delivered by three different organisational units could simply proportion the student derived income accordingly. Yes, there are practical challenges here that are purely administrative, but easily overcome. But this begs the question of why student-derived income is proportioned at all?

Historically, various universities have been considered to run where the organisational units can be considered as 'fiefdoms' focused on themselves rather than focused on the purpose of the university (Ehrenberg, 1999; Greenwood & Levin, 2001). In Australia, it has been noted that the financially

inefficient and arcane model of funding based on disciplinary fiefdoms is not sustainable (Gardner & Tellefsen, 2002) and this is likely to be similar in other countries. It is again important to note that the degree of 'groundedness' in this speculative discussion is again decreasing, and there is little evidence that confirms that the existence of disciplinary fiefdoms is explicitly related to the distribution of student derived income. However, the majority of Deans see themselves as financial managers as a result of role expectations shifting and "their traditional role of leading the faculty's research and teaching direction is now often left to those below them" (Heffernan, 2022, p. 109). The result of this is that the individuals best place to influence organisational culture are tied up worrying about finances and performance against targets.

What if? What if it were different? What if managerial leaders didn't have to worry about financial targets? If they could instead focus on the learning and teaching, and research direction and support? This could make a positive change to organisation culture that would benefit everyone, but by removing the need to increase in size to get more income it also fosters a better climate for collaboration, and by doing so makes it more likely that interdisciplinary initiatives would succeed. And what if those managerial leaders had come through an interdisciplinary PhD programme that has also prepared them for future leadership?

How this decoupling could be achieved is uncertain and requires a deep understanding of finance in an operational context. It is possible that this is a change that is also not needed should other changes be successful. Despite this, the speculative of question of how universities might create better internal financial systems is left for other researchers to explore.

**Radical Structural Change**

How much have universities really changed? That was a question posed earlier in this thesis, and from a structural or organisational perspective it is hard to argue that any real change has occurred. As the one of the oldest universities in the world, the University of Bologna in the 11$^{th}$ century was divided into two areas of study, canon and civil law. A Faculty of Medicine was added in the 13$^{th}$ century and a Faculty of Science in the 17$^{th}$ century (Britannica, 2019). Pryor and Barringer argue that "Academic structure has historically evolved via an additive model. As new 'categories of ideas' have arisen, institutions have incorporated them into academic structure through a complex sociohistorical development process" (Pryor & Barringer, 2022, p. 46), which in essence means that the hierarchy has become more complex in terms of layers and number of units but fundamentally are unchanged. Pryor and Barringer also suggest that "academic structure fundamentally shapes work within and outputs of institutions" (Pryor & Barringer, 2022, p. 46). This suggests that if institutions remain organised around traditional units such as faculties, departments, divisions,

schools, and colleges, that work within the institution will retain some of the same characteristics and potentially stifle attempts to foster the new ways of working that are necessary for interdisciplinary scholar activity to occur.

What if? What if different structures and ways of organising the university were possible? What if they addressed at a deeper level the issues presented in the earlier section, fostered the potential for interdisciplinary whilst at the same time preserving the respect and need for disciplines? Is such a thing even possible?

Eric Jantsch thought so and proposed an alternative way of structuring universities for transdisciplinary practices. Jantsch's model of education as a system of interconnected disciplines and his corresponding model of a university is shown in Figure 6.2, with the original figure captions retained.

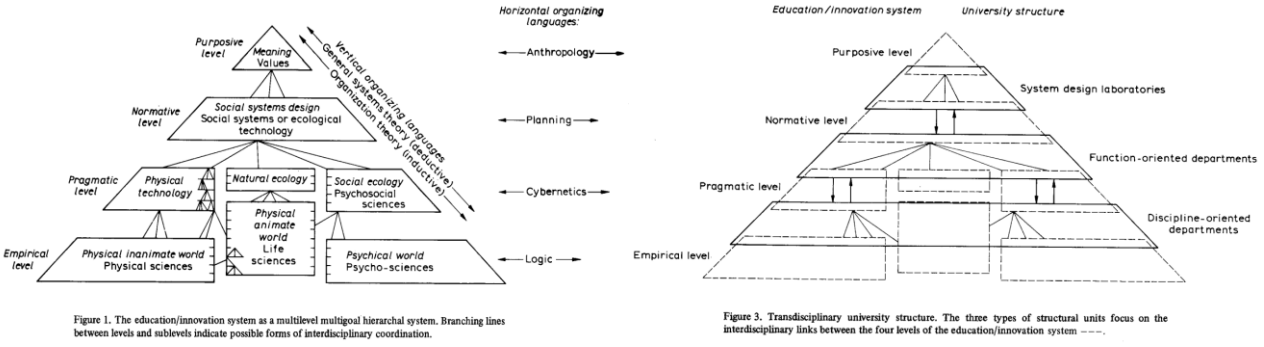


Figure 1. The education/innovation system as a multilevel multigoal hierarchal system. Branching lines between levels and sublevels indicate possible forms of interdisciplinary coordination.

Figure 3. Transdisciplinary university structure. The three types of structural units focus on the interdisciplinary links between the four levels of the education/innovation system ———.

Figure 6.2 Education as a System and a Transdisciplinary University Structure (Jantsch, 1972)

At first glance, these models seem overly complicated, perhaps the main reason that this work has been overlooked so much, though in realitythe intention is relatively simple. The diagram on the left indicates that disciplines sit in different levels in relation to each other, based on the questions they ask of the world. Empirical disciplines ask the question 'what exists?', pragmatic disciplines ask 'what can we do?', normative ones ask 'what do we want to do?' and purpose level disciplines ask 'why do we want to do it?' or 'how should we do it?'. The boxes in the left hand diagram are groupings of disciplines, and other studies have elaborated on this by naming where these disciplines sit. For example, Max-Neef (2005) suggests the incomplete example shown in Figure 6.3.

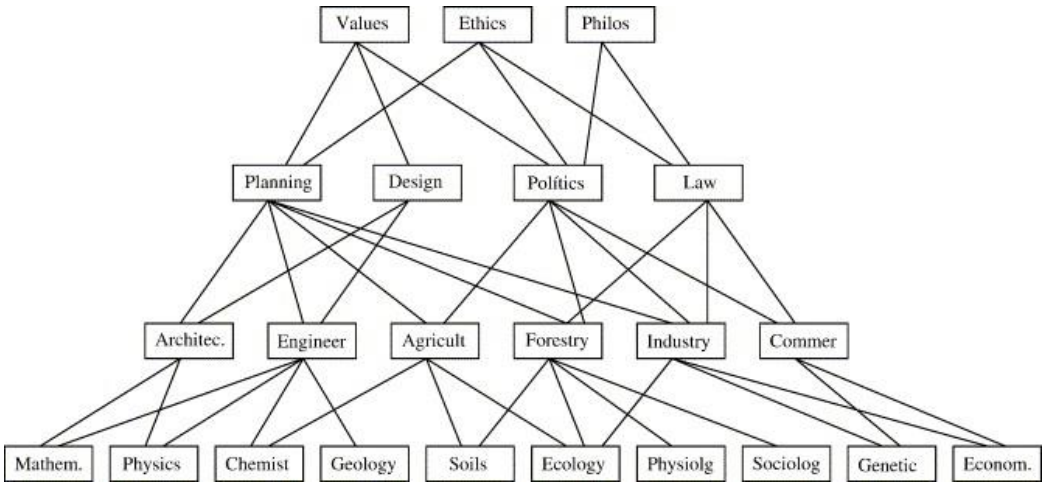


Figure 6.3 Hierarchy of Disciplines (Max-Neef, 2005)

The new structure for the university proposed by Jantsch given in Figure 6.2 can now be explained and elaborated with specific examples. The typical structure of universities now is based on clustering departments based on similarity of discipline to produce schools and faculties. What Jantsch proposed was a hierarchy based on similarity of organising languages, or to simplify further, goals. His model shifts the three types of organisational units, namely discipline oriented departments, functional orientated departments, and systems design laboratories, so that they bridge disciplines and are inherently interdisciplinary. With reference to Figure 6.3, a discipline-oriented department might combine engineering with physics, whilst a function orientated department might combine engineering with design. Finally, a systems design laboratory might combine design with values or ethics. In practice, each of these units would likely incorporate multiple disciplines, not just two.

What is central to understanding of Jantsch's proposed model is his observation that:

> We may then envisage a university in which some students go through discipline- and function-oriented departments only, and others go through all three types of structural units. As the latter proceed from undergraduate to graduate and doctoral work they will shift the emphasis of their studies from discipline- and function-oriented departments more and more to the systems design laboratories, at the same time getting increasingly involved with purposeful work in technology and actual sociotechnological systems design and engineering, which will become a full-time (and paid) engagement during the doctoral work. (Jantsch, 1972, p. 31)

What does this structure achieve in practice? It certainly addresses most, if not all, of the speculative recommendations in the preceding sections. And it underpins and supports the development of the other possibilities discussed in this section, addressing the need seen by Kandiko (2012) who suggests:

> Interdisciplinarity can be supported throughout a career, particularly through mentoring schemes. However, as disciplinary-based departments and Schools were seen as key challenges to developing an interdisciplinary career, it was often seen as essential to create institutional structures that supported interdisciplinary academics, from the PhD throughout a career. (Kandiko, 2012, p. 196).

One potential criticism of the structure proposed by Jantsch (1972) is that it is still inherently hierarchical, with the three layers that will potentially not in practice be different from faculties, schools and departments. Flatter organisational structures "remove barriers to communication, spark unplanned exchanges of ideas, increase shared dialogue, and breed familiarity and acceptance of diverse thought" (Schreiber, 2019, p. 42)and indeed some professions have noted that matrix based structures combine the advantages of traditional functional hierarchies with the ability to incorporate project teams (Grubenmann, 2017).

In the traditional structure of a university it is a relatively easy task to remove the faculties, leaving just schools and departments. Research institutes can still exist outside of this flattened organisation and can be the basis of developing cross-functional teams. A proposed structure for a university such as this is show in

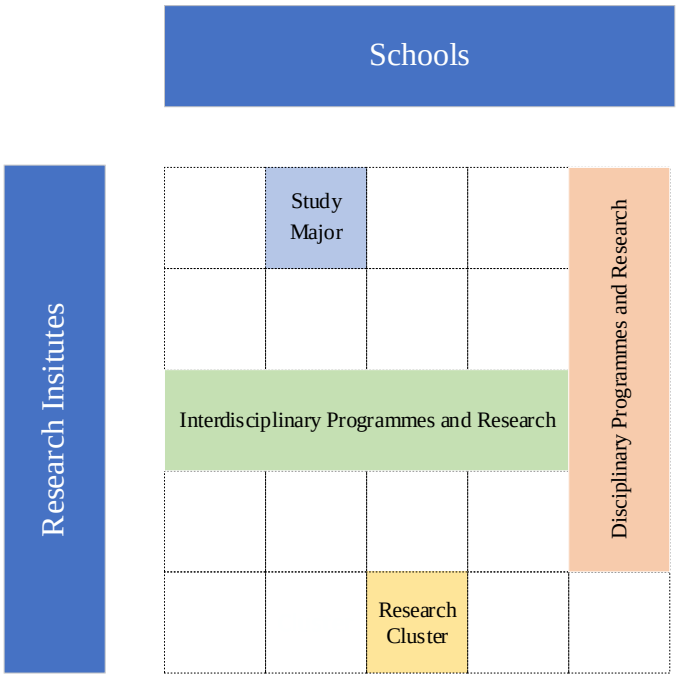


Figure 6.4 A Matrix Structure for the University

Each cell in the matrix is a potential department, a team of individuals that have common interests in terms of teaching and research that allows them to offer study majors and undertake research. A school in this structure can, of course, have multiple departments and the majors they offer can be

contained within discipline-based programmes of study. The research institutes conduct research and offer programmes that integrate majors from different disciplines. Any individual in this organisation may be involved in both discipline-based and interdisciplinary work.

Elevating research institutes to the same organisational authority as schools and expecting cooperation doesn't eliminate fully the potential for competition, and comes with its own financial and organisational challenges. But it does address many of the issues raised in the data collection from this thesis, and potentially accepting competition and collaboration together does offer the potential to embrace the notion of 'coopetition', which some authors argue has many benefits in organisations (Cygler et al., 2018; Strese et al., 2016).

And so the final question here is….. what if?

# Chapter 7: Conclusions

This thesis has presented the findings and implications of a multi-methodology study investigating the current state of interdisciplinarity in New Zealand universities. The study has identified the perceived motivations and barriers to interdisciplinary scholarly work as well as capturing the strategies used by established interdisciplinary academics and condensed these into some initial advice for early career academics wishing to pursue interdisciplinary careers.

This chapter concludes the thesis by considering the contribution it makes as well as highlighting the limitations of the work. Recommendations for future work are included as specific next steps that emerge from the grounded speculation in the previous chapter.

## CONTRIBUTION

This thesis makes a number of contributions across different areas. Firstly, it confirms that the barriers and motivations to interdisciplinary scholarly activity in New Zealand broadly align with those in other regions, however some differences do exist particularly in relation to the extent to which institutions seem to support interdisciplinary work.

By identifying strategies used by established interdisciplinary academics, this thesis also adds to the body of knowledge as to how to support early career academics, particularly those wishing to pursue interdisciplinary careers. The thesis also highlights changes that could be made to produce organisational cultures that are better suited to fostering interdisciplinary work that relate to both managerial and academic leaders.

Whilst the speculative nature of part of the discussion is not traditional, it also forms a contribution as the foundation of a manifesto for change for the future.

## LIMITATIONS OF THE STUDY

The main limitations of this study are related to the relatively small sample sizes in both phases of data collection. Only seventy-five responses were received for the initial survey which is significantly less than the number of academic staff who submitted for assessment in the 2018 PBRF evaluation round (7408). Whilst this represents less than 1.5% of the academic workforce and therefore considered not representative, the majority of academic staff at tertiary institutions focus predominately on discipline-based research and teaching. No formal attempt has been made to quantify the total number of interdisciplinary academics in the work force but it would be expected

to be a relatively small percentage, and therefore the extent to which the survey is representative of the opinions and perceptions of interdisciplinary academics would be much greater.

The small sample size also extended to the data collection in the phase of the research relating to identifying strategies for interdisciplinary success, with only seven participants, one of whom was the author. The demographics of these participants have not been reported in this thesis, but they represented only three of the seven universities in the country. This potentially limits the generalisability of the recommendations for early career academics.

The qualitative analysis was also only conducted by a single individual, which opens up greater potential for bias, which in this case would be demonstrated as subconsciously mining the data in a way to confirm preconceptions. Certainly, some questions were framed and included in the survey for that purpose, as noted in the personal statement at the beginning of the thesis. Similarly, the use of the reflexive thematic analysis approach is inherently biased and embraces the role of the research in creating rather than discovering themes. Whilst potential bias may be considered a limitation, it is welcomed and embraced in parts of this work.

The research purposefully chose not to frame interdisciplinarity in a particularly way to the participants, which is both a strength and limitation of the work. By leaving the interpretation of interdisciplinarity open to the individual participant, the research embraces the full diversity of what interdisciplinarity may be and includes potential for consideration of cross-, pluri-, trans-, and all other forms to be included. The drawback here is that this diversity of interpretation may lead to dilution of the implications of the study and how they may be applied in relation to particular individual circumstances.

## FURTHER WORK

The suggestions for further work that emerge from this thesis fall into two categories, firstly the practical implementation of the suggestions for improving organisational culture, and more widely the suggestions for changes to the institution to better foster interdisciplinarity. These will be commented on in the next section.

The second category is focused on further research that needs to be conducted. As this research is intended to provide guidance to early career academics, the suggestions for future work focus on this.

One of the recommendations from this work is to consider the development of an interdisciplinary PhD programme. Whilst there is some existing work in the literature that focuses on this type of

programme, there is only a limited amount that focuses on the experiences of candidates in such a programme. Investigating the lived experience of interdisciplinary PhD students would be necessary to understand the challenges they face and how best to incorporate the appropriate levels of support in future programmes. This should include some focus on how interdisciplinary PhD candidates build an interdisciplinary academic identity.

Similarly, the plight of early career academics pursing interdisciplinary careers is an area for future work. Whilst this study has proposed some high-level guidance this would still need to be individualised and evaluated. The first step is the transition of the dictums presented in this thesis to a more applied format that can be shared with early career academics. The thesis has also proposed that mentoring by academic leaders would be useful, but how is this best implemented? To what extent does informal networking impact the transition from disciplinarian to interdisciplinarian? There are many unanswered questions that need to be addressed.

## CONCLUSION

The objective of this research was to identify the barriers to interdisciplinary scholarly activity in New Zealand universities, and to then identify the strategies used by established interdisciplinary academics to navigate these barriers in order to be able to provide guidance to early career academics wishing to pursue interdisciplinary careers. This advice has been distilled into a small number of dictums that are intended to help people start their journey, however ongoing mentoring and support will be needed to individualise this advice in practice.

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# Appendices

## APPENDIX A: SURVEY QUESTIONS

The survey used in this research was proctored in the form of three separate surveys, each with a distinct purpose, however these were presented to participants as if they were a single survey.

The first survey was used to provide information to the participant about the purpose of the study and to ensure that they were able to consent to participate in an informed way. For those individuals that chose to participate, this survey also collected their institutional affiliation. This was collected separately from the main survey to ensure that the collected data was not analysed in a way that compared institutions. The main survey included questions that were only displayed to participants that indicated that their work was predominately interdisciplinary in nature and were either mid-career or late-career academics. The responses to these questions embedded the eligibility criteria for inclusion in the second stage, and at the end of the main survey potential participants were referred to a third survey to allow them to express interest in further participation. Each of the surveys are presented below with annotations and descriptions of flow added using square brackets to indicate that this text was not part of the survey.

### Survey 1: Information, Affiliation and Consent

*What is the purpose of the study?*
The overall purpose of the study is to develop an understanding of the challenges and barriers to interdisciplinary scholarly activity in the modern university and use this insight as a resource for academics, particularly early career academics, who may wish to do this. In addition, the study will also consider the governance and structure of tertiary institutions and whether these may be changed to remove some of those barriers.

*How is the survey related to this overall purpose?*
There are two phases of the study, and the survey is the first stage. The survey has a dual purpose, it is firstly intended to provide a national perspective of how academics view interdisciplinarity in tertiary institutions. Secondly, it aims to help identify academicswho may wish to share their experiences of crossing disciplines in the second stage of the study.

*Why have I been invited to participate?*
The survey is open to all academic staff employed at one of the Universities in New Zealand.

*Why is my participation important?*
To be able to represent academics reliably, we need as diverse and broad a range of participants as possible. To ensure that the perceptions of barriers and challenges related to interdisciplinarity are not biased, it is important to have good participation across all institutions and disciplines, irrespective of whether you yourself conduct interdisciplinary work. By participating in the first stage of this study you will be contributing to determine whether there is imperative for changes to tertiary governance. if you are eligible for the second stage and decide to participate, you will be helping early career academics to better face the challenges of interdisciplinary activity.

*Can you tell me more about how I can participate?*
In the first instance, completion of the survey will help increase the diversity of the responses. Based on your responses, you may be eligible for the second stage of the study and will be prompted to supply contact information to allow you to receive further information. If provided, your contact information is stored separately from your your survey response and cannot be used to identify how you responded to the questions in any way.

*How long will the survey take?*
Most people will take between 10 and 15 minutes to complete the survey, depending on how detailed a response they give to some of the open ended questions.

*What happens if I change my mind?*
If during the survey you decide you no longer want to complete it, then you may simply close your browser. Your partial response will be deleted from survey responses. However, once you have finished the survey it is not possible to identify your response in order to remove it from the data.

*How do you ensure my confidentiality?*
The survey is completely anonymous and no identifiable information is recorded. There is no tracking of whether you have or have not completed the survey and as a result there will be no follow up email to remind you to complete the survey. Once data collection is completed, the survey data will only be accessible to myself and my thesis supervisors, Professor Jane Gilbert. Once the study has come to an end, the collected data will be stored on disk and kept for a period of seven years in a locked filing cabinet. After this time, the disk will be securely erased. If you are eligible to be involved in the second stage of the study, you will be asked to provide contact information however this will not be included with your survey responses to maintain the anonymity of the data. The questions of the survey have been designed so that they do not allow an individual to be identified by association, however if at any time through the survey you feel that your anonymity is at risk you may exit and no data will be collected.

*Where will I be able to read further about the findings from the study?*
Interim results of the survey will likely be available in the fourth quarter of 2021 and a summary will be accessible at this url:

http://creativetechnologies.aut.ac.nz/~aconnor/interdisciplinary_survey_results.html

The findings will also be presented in a thesis that will be made available in the AUT repository and will be openly accessible. There may also be some interim publications in journals. This will be linked to from the above webpage when available.

This research was approved by the AUT Ethics Committee on 14th April 2021 and assigned reference 21/75.

Q1 The data collected in the main survey will be analysed to see if patterns exist across different demographic groups, e.g. senior academics compared to early career academics. However, the survey does not intend to compare different Universities. However, it is important for the research team to understand whether the data represents a reasonable cross-section of Universities. Your response to this question is therefore recorded separately from your main survey response and the research team are unable to link the two datasets.

Please indicate which University at which you are currently employed. If you are employed at more than one University, feel free to make more than one selection.

- ☐ Auckland University of Technology
- ☐ Lincoln University
- ☐ Massey University
- ☐ University of Auckland
- ☐ University of Canterbury
- ☐ University of Otago
- ☐ University of Waikato
- ☐ Victoria University of Wellington

Q2 Before proceeding with the main survey, please indicate whether you understand the information presented on this page and agree to participate in the survey.

- ○ Yes, I agree and will continue with the survey.

*[Participant redirected to main survey]*

- ○ No, I do not agree and do not wish to complete the survey.

*[Participant redirected to closing statement and thanked for their time]*

**Survey 2: Main Survey**

Q1 What is your gender?

- ○ Male
- ○ Female
- ○ Gender Diverse
- ○ Prefer not to say

Q2 How old are you?

- ○ 20-29
- ○ 30-39
- ○ 40-49
- ○ 50-59
- ○ 60-69
- ○ 70 or over
- ○ Prefer not to say

Q3 What ethnicity do you associate with?

- ○ Asian
- ○ European
- ○ Māori
- ○ Middle Eastern / Latin American / African
- ○ Pacific
- ○ Prefer not to say

Q4 What best describes your position?

- ○ Associate Professor / Professor
- ○ Senior Lecturer / Senior Professional Teaching Fellow
- ○ Lecturer / Professional Teaching Fellow
- ○ Research Assistant / Research Fellow
- ○ Other (Please Specify)

Q5 How would you describe your career stage?

- ○ Early Career Academic
- ○ Mid-Career Academic
- ○ Late Career Academic

Q6 Does your role include substantive leadership or management components (e.g. Dean, Head of School, Head of Department)

- ○ Yes
- ○ No

Q7 Use the options from the drop down lists to select a discipline with which you associate your current scholarly activity.

*[The drop down lists allowed participants to select one of 380 options from the first two tiers of the bepress taxonomy of academic disciplines. An additional option was available for participants that could not find a suitable classification in the taxonomy. Q8 was only displayed to those participants that selected this option.]*

Q8 Please provide the name of your area of scholarly activity in your own words.

*[Open ended text response]*

Q9 Can you tell us about whether your scholarly activity is interdisciplinary?

| | A great deal | A lot | A moderate amount | A little | Not at all | Don't Know |
|---|---|---|---|---|---|---|
| To what extent do you consider your scholarly activity to be interdisciplinary in nature | ○ | ○ | ○ | ○ | ○ | ○ |

Q10 Can you tell us how important you think interdisciplinary scholarly activity is to the future of the University?

| | A great deal | A lot | A moderate amount | A little | Not at all | Don't Know |
|---|---|---|---|---|---|---|
| To what extent do you think interdisciplinary scholarly activity is important to the future of the University? | ○ | ○ | ○ | ○ | ○ | ○ |

*[Q11 and Q12 were only shown to participants who indicated in Q9 that their scholarly activity was to some extent interdisciplinary, so it was restricted to those who responded "Not at all" and "Don't Know"]*

Q11 What were your motivations for engaging in interdisciplinary scholarly activity? Choose all that apply.

- ☐ Improved publication opportunities
- ☐ Opportunities to gain research funding
- ☐ Taking my career in a new direction
- ☐ Personal interest in novel research questions and methods
- ☐ Enjoying new collaborations and working with different disciplines
- ☐ A belief that teaching discipline based knowledge is limited when it comes to contemporary challenges
- ☐ Other (Please Specify)

Q12 What were your motivations for engaging in interdisciplinary scholarly activity? Choose all that apply.

- ☐ Improved publication opportunitie
- ☐ Opportunities to gain research funding
- ☐ Taking my career in a new direction
- ☐ Personal interest in novel research questions and methods
- ☐ Enjoying new collaborations and working with different disciplines
- ☐ A belief that teaching discipline based knowledge is limited when it comes to contemporary challenges
- ☐ Other (Please Specify)

Q13 What barriers do you think exist to interdisciplinary scholarly activity? Choose all that apply.

- ☐ No interest in other disciplines
- ☐ No interest in applied research
- ☐ Fewer publication opportunities in top journals in my field
- ☐ Lack of institutional support
- ☐ Diluting your disciplinary identity
- ☐ Difficulty in managing multiple strands of research
- ☐ Greater in difficulty in collaboration and research design
- ☐ Not recognised in terms of promotion or PBRF
- ☐ No relevance to teaching
- ☐ Other (Please Specify)

Q14 Tell us about interdisciplinarity at your institution

| | A great deal | A lot | A moderate amount | A little | Not at all | Don't Know |
|---|---|---|---|---|---|---|
| To what extent are the terms mutli-, cross- and interdisciplinary used interchangeably at your institution? | ○ | ○ | ○ | ○ | ○ | ○ |
| To what extent is interdisciplinary scholarly activity encouraged and supported at your institution? | ○ | ○ | ○ | ○ | ○ | ○ |
| To what extent is interdisciplinary scholarly activity valued at your institution? | ○ | ○ | ○ | ○ | ○ | ○ |

Q15 What in your opinion are the major institutional obstacles or constraints that limit or hinder interdisciplinary research and the pursuit of funding for interdisciplinary research at your institution?

*[Open ended text response]*

Q16 Tell us about interdisciplinarity in New Zealand

| | A great deal | A lot | A moderate amount | A little | Not at all | Don't Know |
|---|---|---|---|---|---|---|
| To what extent does PBRF value and reward interdisciplinary scholarly activity? | ○ | ○ | ○ | ○ | ○ | ○ |
| To what extent is interdisciplinary scholarly activity encouraged through other funding programmes? | ○ | ○ | ○ | ○ | ○ | ○ |
| To what extent do employers value graduates with interdisciplinary knowledge and skills? | ○ | ○ | ○ | ○ | ○ | ○ |

*[Participants that responded to Q9 that their work was either "a great deal" or "a lot" and did not respond to Q5 that they were an early career academic were referred to the third survey to capture any interest in participating in the second stage of the study]*

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## Survey 3: Further Participation

Q1 Based on your responses to previous questions, you are invited to participate in the second phase of this research study.

The aim of the second phase is to find common challenges that academics have faced in undertaking interdisciplinary scholarly activity to help define strategies that would be useful for early career academics.

If you would like to find out more about the second phase, please enter your name and email address below. Your email address will be stored separately from your survey responses and cannot be used in any way to identify how you answered questions in the survey.

*[Open ended text response]*

## APPENDIX B: QUALITATIVE SURVEY DATA

This appendix includes all of the raw data from the qualitative data collected in the survey to extend that which is given in Chapter Five. All identifying information has been removed from this data as per the ethics requirements.

Q: What were your motivations for engaging in interdisciplinary scholarly activity?

The following are the open-ended responses that were received when a participant selected other. These responses can be related to Figure 4.11.

| |
|---|
| My focus is on a particular interdisciplinary area |
| Most of the interesting work is to be done on the boundaries of disciplines, and bringing knowledge from one field into another. |
| Eclectic knowledge and thinking are essential to the development of society |
| This is an interesting and complex question to answer. To some extent I have always been multidisciplinary. I started university in a very old and traditional context (*[University Name]* is a thousand years old). Between my degree and my PhD I moved from two initial areas of subject study to two new areas of subject study (though they were all in the humanities and social sciences faculties). When I finished my PhD and moved to New Zealand the opportunity to move from fairly traditional academic study into combined theory and practice based design, in a school that was situated in a science faculty was incredibly exciting. I felt at the time, and only feel more strongly now, that design offered a unique opportunity to be able to function in a truly cross disciplinary manner fusing both theory and practice working with both traditional academic methods and methodologies and developing new hardware and software-based lines of enquiry and practice. I am increasingly of the opinion that the social technological and ecological reasons, Universities will increasingly need to pursue twin track approaches to research. On the one hand very traditional and often conservative methods of extremely narrow focus will still be important and useful, but on the other hand it is my belief that such approaches are only complementary to the increasing need to find new theoretical and practical solutions to problems that require the fusing of broad ranging skill sets and methodologies. This is what does and has always motivated me to cross fields of study. And while this may sound like I am suggesting it is a new phenomena, I actually think there are plenty of examples in history of sudden bursts of interdisciplinarity and cross-disciplinarity and sudden bursts of theoretical and practical methodological cross pollinations. Many of the innovations of both Renaissance Italy and later Industrial Revolution Europe were characterised by this. |
| The field I work in is necessarily interdisciplinary. |
| Global problems require a sense of global responsibility which cannot be assumed without an interdisciplinary approach to education. |
| To solve wicked problems (e.g. climate change, inequality) we need an interdisciplinary approach.We will not solve these issues within a single discipline. |
| To strengthen the capability of research teams |
| One pathway can be looked at from different angles. Why not use everyone's expertise to look at the same problem? That way, the study is been done once, not 4-5 times. |
| This was the only job available to me. |
| It evolved out of the questions i was asking |
| As a social scientist/applied linguist working within health sciences, it would not have been possible to undertake the research we did if we did not have an interdisciplinary team and approach. |
| When the research project requires another discipline to help assess the hypotheses |
| Engaging with the industry, that needs to tackle issues of a multi-disciplinary nature. |
| Need more than one disciplinary perspective to make real progress with the research |

Q: What barriers do you think exist to interdisciplinary scholarly activity?

The following are the open-ended responses that were received when a participant selected other. These responses can be related to Figure 4.12.

| |
|---|
| Professional "ownership" of areas of knowledge - particularly in health. |
| Challenging to find time |
| Budgetary constraints created as a result of devolved university systems (ie, if you work in one faculty, it's hard to do things in/with other faculties because of cost-splitting, etc). Also, 'scholarly activity' is teaching (not just research) in my definition, and some of the biggest issues with inter-disciplinary teaching are workload models, EFTS-sharing, and line manager and administrative responsibility. For example, we tried to create a cross-university first year course that received incredible support and encouragement |

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| from students and staff alike, but never got off the ground because no-one wanted to 'own' it, in an administrative sense. |
| University funding model, in particular when it comes to innovations in interdisciplinary teaching. The question where EFTS go dominates the discussion, rather than what is best for the students, and potentially interesting contributions to teaching practice and research. |
| There is often no time to investigate partnerships in another discipline, let alone in my own discipline. |
| Interdisciplinarity is a term of art that is only as meaningful as the person who uses it wants it to be. It is an impediment to getting things done because so much time and money is spent arguing about what it means - easier to just banish the concept all together |
| These are not all problems for me but I think they are barriers to many. I also suspect that the promotion process of Universities is far too heavily weighted toward encouraging and rewarding individualised behaviour when seeking promotion. This causes all sorts of institutional distortions that I think most people understand but few people seem to know what to do about it. I would also add to this list "inherent conservatism of ones discipline". Many people I know in my past disciplines tell me they would love to develop software and hardware and apply it to their disciplines the way many of my colleagues can and do but they have almost no access to or engagement with technologies or skills acquisition that they would need to be able to do so. So many feel stuck in a "lane" that is no longer particularly very productive. |
| Many in academia say they value interdisciplinarity, that it should be encouraged and promoted... Funding bodies want to see connections between different disciplines. But then judge your proposal on a specific panel. There are a lot of ambivalence, I believe. And when you have more than one interest it seems you don't fit anywhere. Not too many academic posts where across disciplines - e.g. a design department hiring a learning scientist. |
| Academic imperialism: some disciplines consider others less important or relevant. |
| The lack of an understanding by faculty and departmental gatekeepers (doctoral boards, etc.) of the nature of interdisciplinary work, particularly in faculties/departments where interdisciplinary work is not commonplace. |
| Research is harder to do and publish because you have to familarise yourself with a whole new area of research. There is also tension in where to publish at the end given the different expectations and requirements from different discipline areas. Its a great idea in theory but executing it successfully is very challenging in a system that is geared towards rewarding those with specialist subject expertise. |
| Difficult to get funding e.g. Marsden fund is has discipline panels that don't accommodate inter-disciplinary work. Can be harder to publish |
| Problems with supervision, e.g. FTE proportioning, rules change depending on faculty of main supervisor, problems to get conference funding (if not enrolled in same faculty as supervisor) etc. |
| Institutional budgetary mechanisms that are discipline/department specific |
| Very often other disciplines don't understand how management might be beneficial to, say, a predominantly science-based research bid. |
| It is impossible to build in time with the current funding & promotional models. Anything that makes publication more complex or slower is not just discouraged, it is actively punished through the promotional system. |
| It is easy for collaborators from other divisions to shaft you when it comes to resources you have jointly won. Biophysical scientists - dare I Generalize - tend to only engage with business academics and other social scientists after research programmes are substantially designed. |
| Difficult to co-supervise across departments given the EFT structure. HoD won't be please for instance if the EFT has to be shared. |
| Some individuals are so concentrated on their little field, that they are unable and unwilling to let anyone in. That is fear of losing out on funding, losing their job if someone "steals" their ideas. The grant-only funding is increasing competitiveness, not increasing collaboration. |
| Most so-called interdisciplinary research involves people working within their own disciplines alongside academics in other disciplines. In my experience, those trained in the health sciences dominate in these so-called collaborations for a range of reasons- their greater access to funding, limited understanding of non-scientific disciplines etc. It takes a great deal of time and effort on both sides to overcome these limits. The interdisciplinary research I have been involved in, largely means I work as a health scientist and there is no appreciation of the huge methodological leap this involves for me. I would strongly recommend others avoid being in this position. |
| Not knowing who potential collaborators are within own institution |
| The tendency to water down the research by needing to work to the average of the knowledge about a subject of the interdisciplinary members.This often weakens the research output but can make it more acceptable to known dogma. |
| While my research is important, being Pacific focused, this is not given the same level of value across the university as others approaches |
| Traditional promotion and recognition of academics (especially early career researchers) focuses on publications (with only the first or last author having any significance), which often requires specialising in a particular obscure and niche area. There is no incentive (and a lot of disincentives, in terms of wasted time) or support to work with other disciplines. In addition, academics are solitary and unsociable, proud and do not work well with others.... it is difficult to collaborate with colleagues from other disciplines if each researcher thinks their area is 'the most important'. This, in part, comes from the narcissistic way we are trained to talk about and consider our own research area - every small study must have the 'potential' to be 'world-changing'... |

Q: What in your opinion are the major institutional obstacles or constraints that limit or hinder interdisciplinary research and the pursuit of funding for interdisciplinary research at your institution?

| |
|---|
| The internal structures of the University and how they are tied to the financial model make it difficult to collaborate across disciplines. It's not impossible, but it takes a lot longer to build relationships that can work across those structural |

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| divisions. |
| It goes to the core of how the University is organised primarily by discipline. Faculties, Schools, Departments. This causes the funding model to make disciplines compete for resources and over KPIs. To me this is THE major obstacle, from which a myriad others derive. |
| Administration issues - different faculties have different policies at a very low level for no apparent reason e.g. how students apply for funding support fore.g journal publication. Different policies for teaching and assessment,Purely destructive 'competition' between faculties. |
| Funding models still thinking in "silos" - The fact that there are "schools"/faculties |
| Silos and structures that separate Faculties |
| Decision-makers or managers can have fairly rigid ideas about disciplinary identity and what research activity and outputs can and should look like. PBRF also requires people to pick the right box and craft a narrative that fits that box. The institution is very keen on interdisciplinary research collaboration but rather than supporting what's already happening, there are clumsy attempts at matchmaking e.g. though funding RFPs that require people to put together an interdisciplinary team around fixed criteria such as a requirement to work with people outside your department or school, and giving people a matter of weeks to find partners and put together proposals around predetermined themes. It's incredibly narrow minded and shows a total lack of understanding of how meaningful collaborative partnerships actually work. |
| You're using the terms 'scholarly activity' and 'research' interchangeably, but I take 'scholarly activity' to include teaching as well (cf Ernest Boyer, Scholarship Reconsidered, 1990 and Charles Glassick et al, Scholarship Assessed, 1997).In any case, the institutional obstacles to interdisciplinary research are similar to those for interdisciplinary teaching (which I mentioned in the previous comments box): lack of willingness to provide administrative support and workload models that cross traditional faculty boundaries. |
| Siloisation of disciplines. Not easy to pigeonhole interdisciplinary research in pre-defined funder categories. Difficulty with publishing in disciplinary journals. |
| I've written on how difficult it is for interdisciplinary doctoral candidates to find supervisors willing to work outside of their own areas of expertise; write crossing epistemological differences; find examiners; find academic jobs after graduating.... |
| Time and support |
| Siloed and separated approach towards disciplines at top tier (E.g. Humanities and Social Sciences) and lower tiers (Higher Education as interdisciplinary connection of psychology, sociology and education) |
| One limitation is that of siloed funding for departmental work, and little opportunity, or limited opportunity, to apply for research funding for interdisciplinary projects. Also, who owns the project? Who owns the kudos, so to speak, for the work? Also, if it is a rather unconventional partnership between disciplines, where does the work get published? Also, further to the last point, how does this feature in the institutions estimations of it being relevant to your disciplinary focus, for other research funding opportunities or promotional opportunities. |
| Lack of time for research in general let alone interdisciplinary research. |
| The funding models, institutional culture of silos, lack of opportunities to engage with other scholars |
| I have seen so many times that their interdisciplinary studies in academic papers are "relevant indeed" because of this and that reasons; however, in the real world, the researchers do opt-out from others' interdisciplinary topics and want to be involved in their own or a specific interdisciplinary group around them. |
| Not understanding what it means by interdisciplinary. In fact, not understand what research truly means! |
| I think there is a great deal of difference between institutional lip service paid to the idea of interdisciplinarity and actual structural and institutional processes that would reward interdisciplinarity in reality. My experience is and has always been in all of the universities I have visited that a great deal more discussion about encouraging interdisciplinarity is voiced than is supported through actual structural change that would lead naturally to interdisciplinary research groups and outputs. |
| Generally speaking, the education field is averse to innovation. There is also a very old fashion way of seeing scholarship - for example, emphasising the need for single authorship. In my view, this is a contradiction. On the one hand, we are told to collaborate, develop partnerships, but then we are told to write-up ideas by ourselves. |
| There are a limited number of funding sources in NZ and I think the few entities that provide funding do struggle with the evaluation of interdisciplinary proposals |
| Lack of respect for different disciplines and their genealogy, traditions and methods. |
| The main issue is that while the institution more widely encourages interdisciplinary work, including interdisciplinary work that has a practice-based focus, there are individuals scattered throughout the institution with specific beliefs and values, which, often due to their specific disciplinary backgrounds, counter this narrative. The problem arises when these individuals are in management or gatekeeping roles. As your survey also implies PBRF is an issue as well. My particular research foci are not explicitly represented by a PBRF category and I float from one to another trying to find which works best for my outputs. |
| There's a lot of high level talk about interdisciplinary research and how important it is. But there are still so many structures and systems that are based on siloed disciplines and this makes it easy to run into roadblocks with interdisciplinary work. I have found I have to explain my work over and over again to different people in management and administrative roles. I am very persuasive and a high achiever, so I "get away" with the sort of work I do, but I feel there is an extra hard sell needed for this sort of work. The PBRF system does not deal well with interdisciplinary scholars. In all sorts of classification categories both at the university and nationally I find that my disciplines are not represented, so I need to select categories that have relevance but don't really reflect what I do. |

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| I think the challenges aren't necessarily institutional - the universities encourage it, its just that the outcomes are difficult because of effort required around learning a new discipline area and publishing in an interdisciplinary teams. Its much easier to work in your discipline in terms of efficiency and outputs. |
| Lack of researchers openness. |
| The main problem is the de facto competition between programmes and disciplines for scarce resources.There is also a secondary problem of there being preconceptions and assumptions about how interdisciplinarity should work out in research, particularly between social science and humanities. The often unspoken assumption is that the quantitative disciplines have greater weight and value than those that have a the qualitative core.This actually vitiates what should be one of the key merits of interdisciplinarity. |
| Lack of overall sustained interest |
| So far, the institution talks a lot about it but doesn't walk the talk, with the exception of the occasional workshop. Funding is siloed. Career advancement relies on disciplinary identity and reputation. |
| My university is pretty keen on interdisciplinary work so there aren't many barriers |
| I find the schools are completely siloed. Even within schools (eg medicine) the specialities don't mix much |
| Difficult to get research funding if no supervisor/PI from the other research fields. Often requirement to consult and get permission from other faculties. |
| The staff philosophy in departments and faculties. All staff need to buy into the purpose of being interdisciplinary. Without this, progress is undermined by staff feel threatened by change. They'd rather see the world burn up than lose their jobs. |
| The model of research favoured is discipline focussed and prioritises the "hard" sciences. Basic research in new areas, using new methodologies is not recognised. |
| The main budgetary driver for Unis is EFTS. EFTS are degree specific so middle layer academic management are incentivised to concentrate staff time in disciplinary silos that relate to teaching.The side effect of this is that staff miss out on opportunities to mingle with other disciplines informally and can sometimes be unaware that the answer to their research questions is sitting in the office down the hall.At its worst this budgetary model extends to postgraduate supervision, making it hard to supervise across disciplines, and even FTE allocation from grant funding. None of these perverse outcomes are deliberate, they are the result of everyone doing what they think is best without looking at how the whole thing hangs together.This means that institutional rhetoric might suggest high support for interdisciplinary research but the levers that drive genuine outcomes are missing.The road to hell is paved with good intentions. |
| The structures of the uni, the faculties, etc, are very old fashioned and shape interactions.<br>There is often a snobbery from the hard sciences, engineering, etc, about the value of other disciplines, particularly social sciences. There is also a fear of engaging with indigenous scholars. |
| Finding out who is doing what is really challenging.At a recent meeting, people on climate change were asked to participate - I had no idea all those academics were working on climate change. |
| There aren't any communication channels designed to facilitate interdisciplinary research (i.e, a space online where researchers could identify each others research interests and willingness to cooperate with others) |
| The university has publicly stated that it seems academic salaries as an excessive cost factor. As part of the general business model currently in place, a very narrow range of specific activities are targeted for reward (at least in my own faculty), meaning that anything outside those activities is a problem, particularly for early & mid-career academics. As such, applied or managerial research that goes beyond the simple need to publish paper by paper in a small number of journals is not rewarded in any way. |
| There is lots of opportunities. I have collaborated with colleagues in 5 other Schools and achieved good research outputs |
| Not really institutional obstacles; Instead individual difficulties going out of one's comfort zone. |
| The inability of some to see a broader picture than working/ researching in one area only |
| It is the very nature of those systems of classification and codification of knowledge domains, types, and pursuits which, at their heart, form, frame and define the ontological and epistemological limitations and delimitations of specialized and refined tertiary level knowledge. It is asinine to frame monodisciplinary study as something to overcome, rather than the essential super structure of the entire enterprise of higher learning which allows conversations like this to take place. |
| Everything about the individualisation of activity in a university setting is an impediment to working across any perceived boundaries of discipline - or any field of activity really! |
| The vice chancellor |
| Finance: Across schools, faculties and divisions there is transfer of funds, which appears to researchers to be unnecessarily difficult. |
| Money is allocated to each department. There is no monetary incentive to collaborate across disciplines. |
| Discipline or school-based budget allocation |
| Grant-only funding severely limits collaboration and increases competitiveness. |
| Over-funding of STEM disciplines and pressure on Universities to value income first. |
| Competition for funding, lack of access to staff in others schools/disciplines (ie time to meet, time to work out intersections, time to integrate approaches), lack of funding |
| Separate departments eg zoology botany humanities with little contact between them, few shared courses etc. Tendency to categorise staff and put them in boxes eg Māori / non-Māori (speaking as a non- Māori person who has lived in Māori communities for 35 years, and is officially excluded from formal Māori networks within the university). Few mixed networks. Little recognition of extra time involved in community partnered research. |
| Faculty/divisional and department level silos. Lack of recognition of different research/ publishing / authorship traditions |

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| and practices for different disciplines eg when considering strategic funding or promotion applications |
| The tendency of some disciplines with few members to hold to ransom the research that others wish to conduct resulting in them having the power to determine what research will be conducted. |
| Lack of interest and a focus on economic value of academia |
| A poor understanding of the benefits of interdisciplinary research and a general lack of experience with disciplinary border crossings. It is an infrastructural problem but it's also an ongoing legacy of inward-looking disciplinary practice. |
| At [University Name], the recent restructuring of the Schools within the [Organisational Unit] has meant that the universities only interdisciplinary school [School Name] is being split up into two schools with more traditional academic boundaries. Recent, very productive collaborations (between biologists and computer scientists) will be made more difficult as a result as we will no longer regularly mix socially. Throwing around novel ideas in casual discussions in the past has often translated into research outputs and projects. |
| Lack of value of Pacific related interdisciplinary research. |
| Transdisciplinarity is the other term that is often used at my institutions - I have asked how it differs from cross-disciplinarity but it is not well defined. seems to be the new buzz word |
| Disciplinary silos still exist in the minds of many who have the authority to enable interdisc collab, keeping it a very low priority in some departments. |
| Promotion and recognition processes, as well as discrete schools, departments, faculties with no communication or joint events/networking/etc between them. Working in solos is encouraged. |
| The institutional interdisciplinary funding schemes are aimed at very narrow themes/topics while the larger funding schemes don't have a great way of emphasising interdisciplinarity of work. I also feel that interdisciplinary journals aren't regarded as well, which I'm hoping won't be problematic while I look for my next contracts. |
| The erosion and the weakening of the disciplines is the largest barrier. Quality is proactively being stripped from the disciplines in [our faculty] in the name of consistency across the faculty. Anyone questioning this is removed from their leadership positions and replaced. This in effect is creating inconsistency in the disciplines themselves. In order to be inter-disciplinary we need to have robust disciplines. |
| When an institution (with the best of intentions) 'overly encourages' and prescribes how the interdisciplinary matches need to be/must be made, it prevents the natural organic formations that perhaps take more time to occur but would in the long term lead to more fruitful research. I hear a lot of discussion around interdisciplinary and terms bandied about but it takes more than that. |

## APPENDIX C: STAGE TWO PARTICIPANT INFORMATION

Project Title: Letters to a Younger Self: An exploration of interdisciplinary narratives

*What is the purpose of the study?*

It is arguable that Universities have not really changed since medieval times and have become entrenched in the concept of discipline, whilst the world around them calls for different ways of thinking that transcends disciplinary boundaries. I believe that there is little to incentivise academic staff to start an interdisciplinary journey and little guidance available for those that wish to. Furthermore, the very nature of a tertiary institutions often penalises true interdisciplinary approaches to teaching and research. The first stage of this study undertook a national survey of academics to gain insight generally about interdisciplinarity in the academy and what barriers to such approaches exist. This second stage is a collation of shared experiences from established interdisciplinary academics that may be helpful to early career academics academics thrive in the existing environment, and potentially to re-imagine the University to reduce the barriers to interdisciplinarity in the future.

*How is the second stage related to this overall purpose?*

The study has been implemented using a two stage design that allows both a broad and deeper understanding of the topic. The purpose of the first stage was to survey and get a broad understanding of barriers to interdisciplinarity in the academy. This second stage of the research extends this by exploring a smaller number of experiences in more depth.

*Why have I been invited to participate?*

During the survey in the first stage of this research, you indicated that you would be interested in participating in the second stage.

*Why is my participation important?*

To develop meaningful guidance for early career academics the study needs a diverse range of participants to highlight strategies that are consistently successful in becoming an interdisciplinary academic.

*Can you tell me more about how I can participate?*

You will have already completed the survey in the first stage of the research. The second stage involves reflecting on your journey as an interdisciplinary academic and sharing what you have learned along the way. The mechanism for doing this is to write a short letter, say 1-2 pages, to your

younger self. You can use this letter to guide your younger self to overcoming the barriers and challenges that they will face.

You are more than welcome to reframe this letter. For example, if you see particular challenges for individuals of particular gender or ethnicity, you can choose to write the letter to an imaginary younger colleague.

*How long will this take?*

It is difficult to provide an accurate estimate here, as each participant will determine how much time they wish to invest in this process. It is likely that the letter writing itself will only take 1-2 hours of your time, however there may well be a much longer process of thinking and reflecting.

*How do you ensure my confidentiality?*

You are advised to not make any particularly references to yourself or your institution in your letter. However, should you forget this then they will be replaced with pseudonyms during the analysis phase. Any sections of your letter used in the thesis or publications will be carefully analysed for identifying information.

As the primary researcher, I will be aware of who wrote the letters that I receive in this second stage. That information will not be shared in anyway and your letter will not be shared with other participants without your express consent.

Once data collection is completed, your original letter will only be accessible to me and my thesis supervisors until the project is completed, at which time the documents will be stored securely for a period of six years before being destroyed.

*Where will one be able to read further about the findings from the study?*

There are a number of options to not only read about the findings, but to be involved in the ongoing research.

If you wish, you will be able to read anonymous letters by other participants in the study and comment on the similarities with your own experiences.

The findings will be presented in a “thesis by publication”. The final thesis will be openly available in the AUT repository, though if you are interested in receiving an advance copy of the journal articles that will form the thesis then you may register that interest at any time.

After completion of the research, there may be further collaborative options to extend this study.

*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 thesis supervisor, Professor Jane Gilbert, jane.gilbert@aut.ac.nz Tel: +64 9 921 9999 extn 8159.

*Who do I contact for further information about this research?*

If you have any questions about what is involved, you may direct these to the researcher either by email or by telephone.

Andy Connor, andrew.connor@aut.ac.nz Tel: +64 9 921 9999 extn 5211.

*Ethics approval*

This research was approved by the AUT Ethics Committee on 14th April 2021 and assigned reference 21/75.

*[Once a consent form was received, participants were reminded that their task was simply to write a short letter, just a few pages, to their younger self to indicate what they knew now that they had wished they had known when starting out on their interdisciplinary journey.]*