THE COMPLEXITY OF HIGHER EDUCATION RESEARCH IMPACT: EXPLORING THE REAL-WORLD INFLUENCES OF RESEARCH FROM THE PERSPECTIVE OF RESEARCHERS IN A COLLABORATIVE MULTIDISCIPLINARY RESEARCH PROGRAM

A thesis submitted by

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Abstract

The issue of impact in relation to higher education research has received increasing attention since the 1960s. Governments, funding agencies and research stakeholders, including the general public, are seeking evidence that publicly-funded research is delivering real-world advantages in terms of economic, social, cultural and environmental benefit. A focus on impact has increased the pressure on researchers and research institutions to demonstrate how research achieves impact beyond scholarly contributions. However, the way in which research impacts society is not well understood.

The aim of this research is to enhance understanding about how higher education research influences society by exploring the phenomenon of research impact. The study addresses the research question: *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?* Real-world impact is understood to occur when research delivers benefits beyond academia, to make a demonstrable contribution to society.

The case study selected for the research is the Digital Futures Collaborative Research Network Program at the University of Southern Queensland in Australia. A phenomenological research approach seeks to understand the *lived experience* of research impact, by exploring the perceptions and experiences of research impact shared by research executives, institutional leaders, senior research officers and researchers. The conceptual framework for the study uses a logic model to understand how research generates impact.

What emerges from the research is evidence that research impact is a complex process, whereby research knowledge makes a difference to knowledge beneficiaries. However, the influence of research knowledge may be difficult to discern due to the nebulous nature of research impact. Participants in this study emphasised that research knowledge achieves impact when it extends understanding, influences perspectives, satisfies curiosity and incites enthusiasm.

The perceptions and experiences shared by the research participants revealed five themes of research impact: *research is useful for society; research impact is about making a difference; research impact is a nebulous concept; research impact includes scholarly and real-world impact; and research impact is a shared responsibility*. The real-world impact of research is revealed as occurring at the interface of research knowledge and knowledge beneficiaries. The data suggest that research impact includes both scholarly and real-world impact, and that scholarly impact is, in itself, a real-world impact. Efforts to distinguish between scholarly impact and real-world impact, in order to prioritise research with demonstrable benefits for society, may be immaterial and contradictory in a sector influenced by neoliberal doctrine, and dominated by a culture of *publish or perish*.

Understanding the impact of research knowledge on individuals, groups and communities is a challenging process, due to the indirect, intangible, unexpected and endless influences of research. Attempts to assess research impact may be improved by including knowledge beneficiaries in the process of identifying how research delivers benefits for society.

Achieving real-world impact depends upon the *usefulness* of research knowledge from the perspective of the knowledge beneficiary. However, an expectation of usefulness alone should not drive university research. Usefulness is a subjective assessment that varies with time and context. The prioritisation of research activities, to address contemporary research concerns, may deliver short-term advantages at the expense of achieving long-term benefit. As evidenced from the data, there is a need to support both applied and blue-sky research activities so that the research conducted in universities can achieve short-term and long-term public good.

The findings from this study reveal the limitations of a logic model approach to understanding research impact, by challenging the linear relationship between research and impact. The five themes of research impact reflect the complexity of real-world impact, and suggest a re-conceptualisation of impact as a process, rather than a product. Re-conceptualising research impact as a process provides an alternative perspective to logic model approaches for understanding the impact of research. The new definition of research impact proposed in this thesis reflects the contemporary reality of public good: *Research impact is the process whereby research knowledge makes a difference to the knowledge beneficiary*. However, it may not be possible to fully understand and describe how research knowledge makes a difference, given the nebulous nature of research impact, and the indirect, intangible, unexpected and endless influences of research.

Certification of thesis

This thesis is entirely the work of *Joanne Doyle* except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Student and supervisors signatures of endorsement are held at USQ.

Professor Michael Cuthill
Principal Supervisor

Dr Stewart Riddle
Associate Supervisor

Publications arising from this research

Journals

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Other dissemination activities

Paper presentations

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Doyle, J. (2015, June). *Translating research in a connected world.* Paper presented at the Symposium on Language, Culture and Technology in a Connected World, Toowoomba, Australia.

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Ultimately, he who does not know where he is going goes the farthest

Karl Jaspers (1959)

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CHAPTER 1 - OVERVIEW

The topic of impact in relation to higher education research is receiving attention globally, and changing the practices of researchers, research institutions and research funders (Chandler, 2014; Harris & Chib, 2012; Rogers, Bear, Hunt, Mills, & Sandover, 2014). An *impact agenda* prioritises research with explicit benefits for society (Chandler, 2014), and proposes that research should be planned with end-use in mind (Ferguson, 2014). Demonstrating impact from research helps to justify how well public funds have been expended in terms of accountability and relevance (JISC, 2013), so that research "earns its keep" (Phillips, 2010, p. 447) by doing more than satisfying academic curiosity. Evidence of the real-world impact of research helps to ensure society understands the value of research and does not under-appreciate and under-invest in universities (U. Kelly & McNicoll, 2011). The real-world is understood to exist "beyond the research setting" (Newson et al., 2015, p. 2). Real-world impact occurs when research responds to "real and tangible everyday needs" (O'Leary, 2004, p. 5).

The Australian Research Council (ARC), which is responsible for administering Australia's public investment in research and development, defines research impact as "the demonstrable contribution that research makes to the economy, society, culture, national security, public policy or services, health, the environment, or quality of life, *beyond contributions to academia* [emphasis added]" (ARC, 2016b, p. 1). Inclusion of the word *demonstrable* suggests that impact is obvious and unmistakable, and the word *beyond* rather than *including*, infers that research impact is more than scholarly impact. As such, the definition appears to preference real-world impact over scholarly impact, reinforcing the notion that the ultimate research objective is delivering benefits for "research users outside

universities" (McGuigan, 2013, p. 82). Such research users include policymakers, practitioners and the general public (Neale & Morton, 2012).

Despite a contemporary focus on impact, researchers in higher education institutions continue to receive criticism in the literature for engaging in research that is disconnected from real-world issues (Harris, 2015a). Literature distinguishes between scholarly impact and real-world impact, highlighting a dichotomy between the academic world and the non-academic world, and reinforcing notions of the university as an ivory tower (M. Marshall, 2014). Such polarity reflects a *two communities* perspective (Harris, 2015b), where scholars immerse themselves in disciplinary research isolated from society (Etzkowitz, 2014), and perpetuates a disconnect between academics and practitioners that inhibits real-world impact (M. Marshall, 2014).

Literature suggests there exists ongoing confusion around research impact, with impact terminology used inconsistently in Australia and overseas (Brewer, 2011; Penfield, Baker, Scoble, & Wykes, 2013). There is no commonly agreed definition of research impact (Brewer, 2011; Weitkamp, 2015), with notions of impact varying across research stakeholders (Terämä, Smallman, Lock, Johnson, & Austwick, 2016). A range of terms has been used to describe research impact including "outcomes, benefit, payback, translation, transfer, uptake and utilisation" (Boaz, Fitzpatrick, & Shaw, 2009, p. 256). The diversity of terms suggests that the phenomenon of impact may be complex and multi-various (Sixsmith, 1986). To add further to the confusion, impact and benefit are often conflated (Vincent, 2015), yet not all impact is beneficial (B. R. Martin, 2011), and in some cases, the impact of research may be detrimental, such as research that enabled development of the atomic bomb.

Attempts have been made to distinguish between academic and non-academic impact. Impact is perceived as occurring either inside academia or outside academia (Harris & Chib, 2012), reflecting two dimensions of impact: impact on other scholars, and impact in the wider

community (Mamtora & Haddow, 2015). Academic or *scholarly impact* is "the intellectual contribution to one's field of study within academia" (Penfield et al., 2013, p. 21). Scholarly impact, also referred to as scientific impact (Derrick et al., 2010), is generally measured in terms of the number of peer-reviewed publications and citations achieved by a scholar (Agarwal et al., 2016). In contrast, non-academic impact in the wider community has been described as *real-world impact* (H. Davis, Nutley, & Walter, 2005; Wineburg, 2013). The real world comprises "any setting where human beings come together for communication, relationships or discourse" (Gray, 2009, p.3), and includes businesses, hospitals and schools, communities where people live, networks such as professional associations or community groups, and Internet-supported virtual communities (Gray, 2009).

The aim of this research is to enhance understanding about how higher education research influences society by exploring the perceptions and experiences of research impact shared by research executives, institutional leaders, senior research officers and researchers. In this thesis, the term *higher education research* is used to denote research activities undertaken by university-affiliated research centres, research institutes, research groups or research teams (Landry & Amara, 1998).

The focus of the investigation is a thematically-bound collaborative research program at a regional Australian university. The study seeks to explore the real-world impact of research, beyond contributions to academia, to enhance understanding of the challenges faced by academics in generating research impact (Cherney, Povey, Head, Boreham, & Ferguson, 2012). There have been few studies about how researchers perceive the scientific and social impact of their own research (Derrick et al., 2010), and there is recognition that further efforts are needed to understand the impact of research (Bornmann, 2012; Buxton, 2011; Ovseiko, Oancea, & Buchan, 2012).

The conceptual framework for this study (Figure 1) illustrates the variables and the relationships between the variables relating to the phenomenon of research impact.

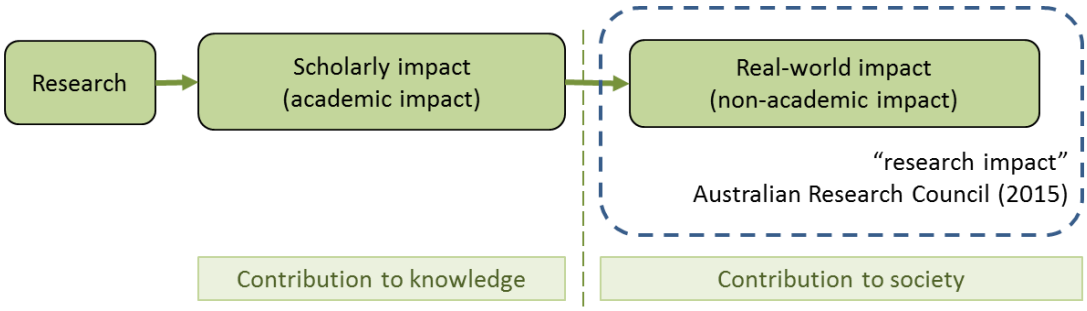

Figure 1. Conceptual framework for research impact derived from the literature.

The framework uses a logic model approach to understanding research impact (Kellogg Foundation, 2004), and is derived from literature suggesting a causal linear relationship between scholarly impact and real-world impact[1]. As noted by Marjanovic, Hanney, and Wooding (2009), such models have been used frequently to demonstrate the impact of research (see, for example: Connolly & York, 2002; Gugiu & Rodríguez-Campos, 2007; Kaplan & Garrett, 2005; Ruegg & Feller, 2003; Sarli, Dubinsky, & Holmes, 2010; A. Weiss, 2007).

The logic model provides a conceptual framework for exploring perceptions and experiences of research impact. However, the research findings presented in this thesis reveal the nebulous nature of research impact (Bastow, Dunleavy, & Tinkler, 2014a; Rogers et al., 2014; Stella, 2014), providing support for literature that challenges linear approaches to understanding impact (B. R. Martin, 2011). Analysis suggests there are myriad ways that university research achieves real-world impact, with some impact difficult to identify such as

[1] The pathway approach is reflected in literature suggesting a causal approach from inputs to impact. For example, the Research Impact Pathway Table developed by the ARC uses categories of inputs, activities, outputs, outcomes and impact. These categories are explored later in this chapter.

the impact of research on "social relationships, values and beliefs" (Marjanovic et al., 2009, p. 31).

Throughout this thesis, the term *scholarly impact* will be used to denote the academic impact generated by publishing research findings and achieving citations, in other words, "the impact that research has on other research" (Harris, 2015a, p. 3). The term *real-world impact* will be used to denote impact that makes "a demonstrable contribution to society as opposed to the continual manipulation of ideas and theories" (Harris & Chib, 2012, p. 5). Real-world impact encompasses *non-academic impact* (H. Davis et al., 2005; Molas-Gallart, Tang, & Morrow, 2000), *non-scholarly impact* (Doyle, McDonald, Cuthill, & Keppell, 2015), *societal impact* (Kuruvilla, Mays, Pleasant, & Walt, 2006), *social impact* (Derrick et al., 2010; Molas-Gallart & Tang, 2011), *socioeconomic impact* (Williams, Eiseman, Landree, & Adamson, 2009), *external impact* (London School of Economics Public Policy Group, 2011), *wider impact* (Wooding et al., 2007) and *secondary impact* (Bastow et al., 2014a).

The research findings suggest that attempts to distinguish between scholarly impact and real-world impact may be immaterial due to the permeable nature of impact. Rather, the complex relationship between researchers, research knowledge and knowledge beneficiaries has implications for the way research impact is assessed and funded. The relationship between scholarly impact and real-world impact is explored within this thesis.

Despite some concern that the impact agenda is an "infringement to a scholarly way of life" (Watermeyer, 2016, p. 199), ensuring research has impact is now an ambition of researchers and an expectation of governments, research funders and assessors (Benneworth, Gulbrandsen, & Hazelkorn, 2016; Chandler, 2014; Hammersley, 2014).

Background to the research

Universities play an important role in generating new knowledge (Group of Eight Australia, 2014; Hazelkorn, 2013), and helping to address society's problems (Boulton & Lucas, 2011; Boyer, 1990). Whereas universities were traditionally focused on creating and certifying knowledge (Castree, 2010), contemporary universities are engaged in a multitude of other activities including innovation and entrepreneurship, commercialisation, regional capacity building, skills development, community engagement, cultural ambassadorship, business networking and knowledge transfer (Abreu & Grinevich, 2013; Cuthill, 2010; Goddard & Kempton, 2011; Nelson, 2012; Regional Universities Network, 2013; Sarli et al., 2010; Winchester, Glenn, Thomas, & Cole, 2002).

The expanded range of activities provides an increased opportunity for universities to achieve public good outcomes. Public good – also referred to as common good (Nixon, 2012b) – arises from the civic mission of universities whereby they endeavour to address complex contemporary issues to deliver benefits for society (Cuthill, 2012). The contemporary impact agenda encourages higher education institutions to prioritise research with demonstrable benefits for society. Universities are under increasing pressure to excel in both scholarship and achieving public good (Cuthill, 2014).

The concept that publicly-funded research should benefit society is being promoted across Europe, the United States of America and Australia (Donovan, 2011; Guthrie, Wamae, Diepeveen, Wooding, & Grant, 2013; Marjanovic et al., 2009). In the United Kingdom, efforts to ensure research achieves real-world impact date back to the nation's 1965 *Science and Technology Act* that formally recognised the requirement for publicly-funded research to deliver national benefit (Payne-Gifford, 2013). Since the 1960s, there have been increasing attempts to understand how research makes a contribution to society (Marjanovic et al., 2009). In the United States of America, the National Science Foundation has focused on the

broader impacts of research since 1997 (M. R. Roberts, 2009). Even prior to this, the United States Office of Scientific Research and Development released a report entitled *Science: The Endless Frontier* that emphasised the need for fundamental scientific research to be applied for "practical purposes" (Bush, 1945, p. 1). In Australia, a contemporary focus on the broader benefits of academic research for national benefit dates back to 2004 (Donovan, 2008). During this time, successive Australian governments have grappled with how to determine the real-world impact of research (Pyne & Birmingham, 2016).

Efforts to assess research are undertaken to demonstrate the value of research activities. Countries including Australia, New Zealand, the United Kingdom, Finland, Norway, Sweden, Denmark, Holland, Italy, Romania, Hong Kong, Germany and the Czech Republic conduct research evaluation exercises (H. P. McKenna, 2015). The results of research evaluation exercises are used to inform the allocation of performance-based research funding in countries including Australia, New Zealand and the United Kingdom (Auranen & Nieminen, 2010; J. Grant, 2015; Wright, Curtis, Lucas, & Robertson, 2014). In 2014, the United Kingdom's Higher Education Funding Council for England (HEFCE) extended its research assessment exercise so institutions could provide case study submissions to demonstrate the impact of research (HEFCE, 2014a). Other countries are considering the inclusion of similar societal impact assessments (Given et al., 2015), including Australia (ARC & Department of Education and Training, 2016).

There remains strong interest in understanding how investment in university research makes a difference beyond academia (Boaz et al., 2009; Chandler, 2014; de Jong, Barker, Cox, Sveinsdottir, & Van den Besselaar, 2014; Dlouhá, Huisingh, & Barton, 2013; Eynon, 2012; Given, Kelly, & Willson, 2015; Guthrie et al., 2013; Hanney, 2005; JISC, 2013; Kutinlahti, 2005; Lyall, Bruce, Firn, Firn, & Tait, 2004; B. R. Martin, 2011; H. P. McKenna, 2015; Sanberg et al., 2014) to achieve real-world impact, particularly in terms of value and

utility. However, impact is a complex phenomenon (G. King et al., 2009), and assessing how research is used is a challenging process (Wood, 2014). Despite a proliferation of methods for assessing impact (Morrison-Saunders, Pope, Gunn, Bond, & Retief, 2014), the formal assessment of research impact is at an early stage (Redman, Haynes, & Williamson, 2015). Efforts to understand the contribution made by research tend to focus on economic impact, and fail to capture how research influences the organisational, social and cultural aspects of society (Godin & Doré, 2004).

Research questions

This research explores the phenomenon of research impact from the perspective of higher education research executives, institutional leaders, senior research officers and researchers to enhance understanding of how research achieves real-world impact. The study is framed around one main research question as a "point of orientation" (Bryman, 2007, p. 5) for the research:

> *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?*

The main research question is informed by two research sub-questions:

> *How do researchers and research leaders perceive research impact?*
>
> *How does a logic model approach support understanding of research impact?*

The first research sub-question seeks to explore perceptions of research impact in recognition that perceptions are individual and will vary across research participants (Sarma, 2013). The second research sub-question seeks to understand the relationship between research and impact as depicted by the logic model. These concepts are explored later in this chapter.

Research design and context

The Digital Futures Collaborative Research Network Program (Digital Futures CRN) was selected as the case study for the research. This multi-disciplinary research program operated at the University of Southern Queensland (USQ) in Toowoomba, Australia, between June 2011 and May 2016. The Digital Futures CRN was funded as part of the Australian Government's Collaborative Research Network (CRN) Program that sought to improve research capacity in three ways:

> In the short term, the programme aims to improve the efficiency of research at smaller and regional universities and increase collaborations between universities and other research institutions. The long term objectives include addressing wider national research and innovation goals as well as increasing research capacity in Australia by increasing the number of research groups operating at world-class level. The overarching goal of the programme is to achieve a stronger research and innovation system in Australia, particularly in regional Australia (ACIL Allen Consulting, 2015, p. 1).

The Digital Futures CRN was selected for exploring the phenomenon of research impact as it is a thematically-bound case study that features many elements typical of large multidisciplinary research programs in higher education. Researchers within the program have a diversity of research experience across a range of disciplines including sciences, engineering, education, economics and commerce. As such, the Digital Futures CRN is representative of research programs at other Australian universities.

Case study research allows a specific phenomenon to be explored "within its real life context using multiple sources of evidence" (Robson, 1993, p. 146), and is a rigorous way to gain a deep understanding of a field of interest (Houghton, Murphy, Shaw, & Casey, 2015). In addition, case study research is one of the preferred research methods for answering *how* research questions, such as the main research question in this study, that tend to be more explanatory than predictive (Yin, 2014).

In seeking to understand how research achieves real-world impact, this study explores perceptions and experiences of research impact through the eyes of those who experience the phenomenon (Titchen & Hobson, 2005) to elucidate research impact "from the inside" (Gibbs, 2007, p. 8). The phenomenological research approach reveals the *lived experience* of research impact (Max van Manen, 2016) by exploring the "subjective experience of individuals and groups" (Kafle, 2013, p. 186). Although lived experience is an individual reality (Söderhamn, 2001), it is possible to identify "essences of the experience" (Flood, 2010, p. 13) by reflecting on experiences that have already occurred (Max van Manen, 1997) to reveal themes of research impact.

There is an increasing expectation that the research undertaken by academics in higher education institutions will achieve real-world impact {Hammersley, 2014 #1093}. The phenomenological approach to this study will explore the perceptions and experiences of research impact shared by research executives, institutional leaders, senior research officers and researchers. The perceptions and experiences shared by the research participants will elucidate the lived experience of research impact to enable "a deeper understanding of the nature or meaning" (Max van Manen, 1997, p. 9) of research impact. However, the research does not attempt to imply any shared reality (Gibbs, 2007) as this would undermine the phenomenological approach to the research that recognises the individual nature of lived experience.

Researcher influences

In conducting this research, I was aware that my own assumptions, attitudes and biases would influence my attempts to describe the lived experience of research impact. It is difficult to completely avoid the impact of personal beliefs and everyday experiences on the research

being undertaken (Söderhamn, 2001), and my recent experience working at a university influenced the way in which I approached the research.

For two years prior to commencing my doctoral studies, I worked at USQ as a Research Proposal and Project Manager. In this role, I provided research development support to the Digital Futures CRN, and later, I participated as a team member in one of the five Digital Futures CRN projects. I had a good understanding of the program's objectives and historical context, and was familiar with the program's researchers, senior research officers and institutional leaders who participated in my data collection process. This familiarity supported the interpretive phenomenological approach to the research whereby pre-understandings are integrated within the research process (Matua & Van Der Wal, 2015). However, I was also aware of potential ethical and interpersonal tensions that may have arisen from working with colleagues as research participants. During data collection, I was careful to emphasise to each participant that my research sought to enhance understanding of research impact, rather than assess the value or worth of research impact. Emphasising the intent of my research was important to ensure participants did not feel the need to justify the impact of their research, but rather, were encouraged to engage in lively and detailed discussions about research impact that would produce data rich in detail (Gibbs, 2007).

For the duration of this study, I was fortunate to work in a part-time capacity preparing university funding submissions and reports for research funding agencies. I worked closely with research colleagues and witnessed their efforts in tailoring research activities to meet funding priorities, rather than pursuing research for reasons of passion or curiosity (Stipp, 2010). I was aware of the increasing requirement to specify real-world impact in funding documentation, and the potential for researchers to exaggerate claims of impact in seeking to secure research funding (Chubb & Watermeyer, 2016). The pressure on researchers to anticipate, articulate and demonstrate the real-world impact of research was

evident in my daily interactions with university staff, and intensified my interest in seeking to understand how research influences society.

In the final year of my doctoral research, I participated in two university research projects that were not related to the Digital Futures CRN. The first project sought to explore how digital technology could enhance learning opportunities for incarcerated students in Australian prisons, and the second project investigated the mobility and wellness of aged care residents using wearable technology. These research projects, that were separate to my PhD research, provided ancillary opportunities to explore the real-world contribution of research, and reinforced to me the complexity of research impact: a concept that is frequently articulated, and highly prized by research stakeholders, but vaguely understood given its "various and variable forms" (Rogers et al., 2014, p. 3).

In undertaking my doctoral research, I was surprised at the extent to which I used knowledge and skills acquired in the years prior to becoming a research student. For example, I have a background in marketing, and my understanding of concepts such as value (Holloway & Hancock, 1973; Payne, Storbacka, & Frow, 2008; Zwick & Cayla, 2011), public good (Corner & Randall, 2011) and the product-process dichotomy (Vargo & Lusch, 2004; Wolak, Kalafatis, & Harris, 1998) supported my efforts to analyse and interpret the research data, and provided the impetus for reconceptualising impact as a process.

Research framing concepts

This research is based upon three key concepts. First, that universities exist to serve the public good; second, that assessments of impact are based upon individual perceptions of impact; and third, that real-world impact is an extrapolation of scholarly impact as represented by the logic model. Each of these concepts is explored in the following sections.

The public good of universities

The quest to ensure higher education research achieves real-world impact has been gaining momentum, however the expectation that research will deliver benefits for society is not a recent concern (Molas-Gallart, 2014). The German philosopher Karl Marx (1818 – 1883), in his 1845 *Theses on Feuerbach,* suggested that "philosophers have only *interpreted* the world, in various ways; the point, however, is to *change* it" (Marx, 1845/1976, p. 30), reinforcing the need for real-world impact. Across Australia, the United Kingdom and Europe, there is an increasing expectation that the research undertaken in universities will not only achieve scholarly impact, but will also achieve real-world impact by improving the public good (Cuthill, 2012; Goddard, 2016). Rather than existing solely to accumulate knowledge (Youtie & Shapira, 2008), universities create and disseminate useful knowledge and engage with society in applying that knowledge (Boulton & Lucas, 2011). In doing so, universities make real-world contributions that are "intellectual, educational, scientific and cultural" (Collini, 2012, p. 3).

However, the advent of neoliberalism in the mid-1970s (Radice, 2013) influenced the higher education sector in countries including Australia, New Zealand, the United Kingdom and the United States of America (Cassell & Nelson, 2013; M. A. Peters, 2011; Shore, 2010). Universities were encouraged to be entrepreneurial, financially responsible, and productive, even though such characteristics were not suited to these institutions (D. Harvey, 2005). An increasingly bureaucratic university emerged in the 1980s and 1990s (M. A. Peters, 2011), due to pressure to operate like a business corporation (Crouch, 2011). Australian universities were particularly affected by neoliberal doctrine (Heath & Burdon, 2015) that pervaded academic practice in an insidious way, influencing the hearts and minds of those within the institution (Ball, 2012). Although academics have a "lingering nostalgia for the 'public good' of higher education" (Vincent, 2015, p. 479), universities began to prioritise knowledge that

could be sold in the form of intellectual property (Hewitt-Dundas, 2012), and received criticism for pursuing research without apparent application (J. Muller, 2015).

During the same period, an impact agenda prioritised real-world impact over scholarly impact. University researchers were challenged to integrate their knowledge creation in a way beneficial to society and the economy (Kutinlahti, 2005; B. R. Martin, 2011). However, the influence of neoliberalism changed the university's traditional identity (Marginson & Considine, 2000) and challenged its public good ideals in the 21st century (Calhoun, 2006; Marginson, 2011; Olssen, 2016). Neoliberal policies and practices, evident in "individualised incentives and performance targets" (Olssen, 2016, p. 130), encourage scholarly productivity at the expense of real-world impact, and may be undermining the impact agenda. As suggested by Nixon (2012a), academics have become ethically compromised in a system that promotes "collaborative, inter-disciplinary and cross-institutional research" (p. 8), yet at the same time encourages competition between and within universities for research funding.

Despite efforts to prioritise research with real-world impact, evidence over an extended period of time suggests that research knowledge is not effective in achieving broader impact, and this dilemma remains a contemporary concern (see, for example: Cvitanovic, Hobday, van Kerkhoff, & Marshall, 2015; Hammersley, 2005; Lindblom & Cohen, 1979; Shokar, 2014; Steffens, Weeks, Davidsson, & Isaak, 2014).

The role of perception

Understanding the real-world impact of research is a challenging process. Efforts to assess the impact of research are based on value judgements (Brewer, 2011) that may vary depending upon the significance of the difference made (Roche, 2001). Perspectives of value and benefit vary across disciplines and research stakeholders (Brewer, 2011; Harris, 2015b; Jaffe, 2015; U. Kelly & McNicoll, 2011; Kristjanson, Place, Franzel, & Thornton, 2002;

Lakey, Rodgers, & Scoble, 2013; Rymer, 2011). Stakeholders include "peers, editorial review boards, publishers, grant reviewers, and dissertation committees" (Anfara, Brown, & Mangione, 2002, p. 2) as well as user communities (H. Davies & Nutley, 2008) and governments, investors, potential partners, the media and the general public (Hazelkorn, 2015).

Perception plays an important role in seeking to understand the impact of higher education research (U. Kelly & McNicoll, 2011; Lakey et al., 2013; Morton & Fleming, 2013). Perceptions simplify information that is too costly, or too difficult, to process or organise (Tybout & Calder, 2010). A diversity of perceptions reflect individual values and beliefs (Bellamy & Hulme, 2011) to reveal how individuals see the world (Siegel & Silins, 2015). Perceptions are informed by experiences yet are moderated by other factors including attitudes and behaviour (Clayton et al., 2015).

The phenomenological methodology recognises that perception creates reality (Merleau-Ponty, 1962). Perceptions are "sufficiently complete, but always incomplete" (Tybout & Calder, 2010, p. 12), however they form the basis of a *perceived reality* which, even though the perceived reality may be incomplete and lacking, is an individual reality that is real in the mind of that person (Lincoln & Guba, 1985). Hence, in seeking to better understand research impact in general, there is a need to understand individual perceptions and experiences of research impact.

Phenomenology is an appropriate approach for researching human experiences of research impact as it aims to explore individual experiences (Pringle, Hendry, & McLafferty, 2011). The purpose for exploring the lived experience is to understand "life as we live it" (Max van Manen, 2014, p. 39). However, as noted by Laing (1967), "I cannot experience your experience. You cannot experience my experience" (p. 16). This research acknowledges the individual nature of experience, reflected in literature suggesting a disparity between

academic perceptions of impact and policy-maker perceptions of impact (Ferguson, Head, Cherney, & Boreham, 2014), and does not attempt to infer a common experience of research impact. Rather, research impact is a lived experience that will vary across the research executives, institutional leaders, senior research officers and researchers in this study. The research seeks to understand researcher experiences as an under-researched area noted as needing investigation (Dickson-Swift, James, Kippen, & Liamputtong, 2007).

The logic model

The conceptual framework for this research study (Figure 1 on page 4) uses a logic model approach to understanding research impact. Logic models visually represent how programs work (de Vaus, 2001) by showing the relationships between elements (Renger & Titcomb, 2002). They use a causal chain approach to reflect the theoretical assumptions of the program (Kellogg Foundation, 2004). A typical logic model includes inputs, activities, outputs, outcomes and impact (Figure 2).

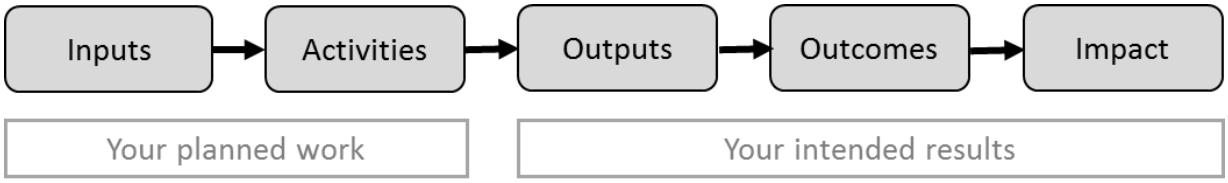

Figure 2. Logic model framework adapted from Kellogg Foundation (2004).

In the case of a university research program, research inputs are the "financial, human, material and knowledge resources used to deliver a research intervention" (ARC, 2016b, p. 2). This includes researcher effort, time and costs, institutional resources and infrastructure, leadership and any funds (internal or external) made available for the research activity.

Activities are the "processes, events and actions" that transform the inputs into outputs (Savaya & Waysman, 2005, p. 87). A diversity of research activities has been noted

by Howard, Ferguson, Wilkinson, and Campbell (2013): writing research proposals, preparing ethics documentation, collecting and analysing data, conducting literature reviews, drafting papers for publication and presenting research findings. Activities may also include tools and technology used to deliver the program results (Kellogg Foundation, 2004).

Research outputs are the "products, services or results produced as a result of undertaking research" (ARC, 2016b, p. 2), and include both core research activities as well as dissemination activities (Economic and Social Research Council, nd). The direct outputs from a university research project may include "new knowledge and understanding, trained researchers, new technologies, capabilities, networks, institutional and researcher reputation" (Group of Eight Australia, 2014, p. 11). Outputs tend to reflect volume of work accomplished (Savaya & Waysman, 2005), and are more easily measured than outcomes (A. Weiss, 2007). As noted by Brewer (2011), research outputs, such as publications, that are easily measured, tend to be used as a proxy indicator of impact despite being "the weakest meaning of impact" (p. 256). Brewer's value judgement of scholarly impact reflects literature suggesting that publicly-funded researchers in universities have an obligation to demonstrate the real-world impact of research undertaken by them (B. R. Martin, 2011). Academic research produces a diversity of outputs as evidenced from the literature (Figure 3).

Publications	Models	Discussion papers
Citations	Frameworks	Launches & public events
Funding applications	Reports	Conferences
Grants awarded	Exhibitions	Media appearances
HDR completions	Social media activity	Public lectures
Patents	Workshops	Community forums
Patent applications	Media coverage	Live performances
Presentations	Industry forums	Videos
Partnerships	Collaborations	Memberships
Datasets	Code	Fellowships

Figure 3. Examples of research outputs.

Outcomes may be viewed as the difference made by the outputs (Mills-Schofield, 2012). Outcomes include changes in "attitudes, values, behaviours or conditions" (Muir & Bennett, 2014, p. 6), as well as changes in "knowledge, skills, status and level of functioning" (Kellogg Foundation, 2004, p. 2). They have also been categorised in terms of timeframe (Savaya & Waysman, 2005) with New Zealand's National Centre for Tertiary Teaching Excellence distinguishing between immediate outcomes (within 6 months), medium term outcomes (1 – 2 years) and longer term outcomes (2 or more years) (Alkema, 2012).

Impact is understood to be "significant or lasting changes in people's lives, brought about by a given action or series of actions" (Roche, 2001, p. 362) even if the changes cannot be sustained over time due to external factors. Impact can be assessed using quantitative or qualitative measures. In the case of academic research, scholars at the University of North Texas developed a list of 56 indicators of impact to demonstrate the extensive quantitative and qualitative dimensions of research impact (Center for the Study of Interdisciplinarity, 2011). The list includes rabble rousing, muckraking, protests and lawsuits as "seemingly negative indicators" (Holbrook, Barr, & Brown, 2013, para. 1), emphasising that research impact manifests in a multitude of ways.

The ARC definition of impact suggests that research impact is real-world impact, and occurs as an extrapolation of scholarly impact – *beyond contributions to academia* (ARC, 2016) – rather than inclusive of scholarly impact. Yet there is evidence that the Australian government does not have a common perception of impact. For example, the 2016 Budget Statements issued for the Australian Department of Education and Training note that "government outcomes are the intended results, impacts or consequences of actions by the government on the Australian community" (Commonwealth of Australia, 2016b, p. 22). There is evidence in the literature that outcomes and impact are used synonymously (Khazragui & Hudson, 2015; A. I. Walter, Helgenberger, Wiek, & Scholz, 2007), despite

efforts to distinguish between them (Boaz et al., 2009). As suggested by Harding (2014), impact may be better understood as an outcome's "much broader effect" (para. 5) that is often personal and difficult to measure objectively.

The logic model's linear causal relationship between research and impact, reflected in the ARC definition of research impact, has been extensively challenged in the literature (McCormack, 2011; Walker, 2016), with contemporary understandings emphasising the dynamic, interdependent and integrated nature of impact (Engebretsen, Sandset, & Odemark, 2017). However, the logic model continues to be used to conceptualise how research impact is generated from research knowledge. A range of assessment frameworks based on the logic model are discussed in Chapter 2.

Delimitations of scope

This research seeks to explore the lived experience of research impact using the Digital Futures CRN as a case study. Three delimitations of research are evident.

First, the research uses a single case study approach to explore research impact in an in-depth way (Yin, 2013). The multidisciplinary nature of the five projects within the Digital Futures CRN provided access to researchers across a range of disciplines, with a diversity of research experience and project team affiliation. The selected case study is representative of research programs at Australian universities (Yin, 2014). Although phenomenological research does not seek to generalise findings to a population (Michael van Manen, 2012), the five themes of research impact, revealed in this study, may reflect a possible human experience of research impact (Michael van Manen, 2012) given the diversity of research participants.

Second, the research explores perceptions and experiences of higher education research impact shared by research executives, institutional leaders, senior research officers

and researchers. The research avoids assessing the worth of the impact shared by the research participants by focusing on the meaning of impact, rather than the value of impact. As noted by H. Davies et al. (2005), impact and worth are easily conflated. It is less challenging for judgements of impact to focus on economic value which is able to be measured (Zwick & Cayla, 2011). For this reason, the data collection process was carefully devised so that interviews and focus groups captured data on perceptions and experiences of research impact without seeking participant perspectives on the value of research impact.

Third, the study excludes end-user perspectives of research impact. End-users are understood to be those individuals or groups benefitting from the research knowledge who are "beyond the academic realm" (Donovan, 2008, p. 48). Research participants varied in their ability to identify end-users of research, reinforcing the indirect, intangible, unexpected and endless influences of research that were revealed in this study. The research findings suggest that the term end-user is a misnomer given that research builds upon research. In Chapter 5, exploring knowledge beneficiary perspectives of research impact is suggested as an opportunity for further research.

Definition of terms

Logic model terminology, used throughout this thesis, is defined according to the ARC (2016b, p. 1):

- Research inputs: Research inputs are the financial, human, material and knowledge resources used to deliver a research intervention;
- Research outputs: Research outputs are the products (including traditional and non-traditional research outputs), services or results (eg. report) produced as a result of undertaking research;

- Research outcomes: Research outcomes are the effects or manifestations of research and research outputs; and
- Research impact: Research impact is the demonstrable contribution that research makes to the economy, society, culture, national security, public policy or services, health, the environment, or quality of life, beyond contributions to academia.

The thesis uses the singular noun of *impact* rather than *impacts*. Although the data suggests that research executives used the plural term (impacts) more often than other research participants, the singular term (impact) is used throughout the thesis. The morphology of impact as evident from singular-plural linguistic discourse markers (Kouider, Halberda, Wood, & Carey, 2006) is outside the focus of this research that seeks to understand perceptions and experiences of impact.

Summary

This chapter has outlined the complexity of higher education research impact, and identified a knowledge gap pertaining to the main research question: *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?* Research impact is a lived experience that varies across individuals, justifying the phenomenological research approach. In this chapter, the role of perception and public good were explored as key concepts framing the research. Variations in the way research impact is perceived highlight the subjective nature of impact assessment activities. A logic model was presented as the conceptual framework for understanding the relationship between scholarly and real-world impact as reflected in the literature. The chapter also provided an overview of the current higher education environment in relation to research impact as background and justification for the research study.

Chapter 2 presents a review of the literature relating to research impact, including a detailed exploration of real-world impact and scholarly impact as contrasting concepts. Key literature is reviewed relating to the research-practice gap that hinders the ability for research knowledge to achieve real-world impact. The role of research collaboration is explored as a way of improving the real-world impact of research, including efforts by government to encourage research that delivers benefits for society. The chapter emphasises the challenging process of assessing research impact, and presents a range of frameworks developed to identify the impact of higher education research. The literature emphasises the need to better understand the influence of research on society.

Chapter 3 details the research methodology, research design and epistemological considerations. The Digital Futures CRN case study is discussed in detail to provide an overview of the research program and the research participants. The chapter explains how a convergent interviewing process was used during Stage 1 to collect data from research executives and institutional leaders. In Stage 2, interviews were conducted with senior research officers and researchers to explore perceptions and experiences of research impact. Focus groups conducted in Stage 3 refined concepts emerging from the interviews. The chapter explains the process for analysing the data, and also includes information about data management and research ethics. The quality and credibility of the research is demonstrated through processes of reflexivity, triangulation and member checking.

Chapter 4 presents the results from analysing the data, supplemented by extracts from the transcripts of interviews and focus groups. Six concepts emerging from the interview data were amended following the focus groups to reveal five themes of research impact: *research is useful for society; research impact is about making a difference; research impact is a nebulous concept; research impact includes scholarly and real-world impact; and research impact is a shared responsibility*. The five themes are presented and discussed with regard to

key literature. The chapter concludes with researcher reflections on the process of collecting and analysing the data.

The final chapter in the thesis – Chapter 5 – presents implications for theory and practice arising from the five themes revealed in the data. Two key contributions to theory are presented. First, that research impact is subjective; and second, that research impact is a process. A new definition of research impact is proposed: *Research impact is the process whereby research knowledge makes a difference to the knowledge beneficiary*. The chapter suggests two implications for practice, in terms of how research is assessed and funded, to encourage research with real-world impact, which makes a difference in the 21st century and beyond.

CHAPTER 2 – LITERATURE REVIEW

This chapter presents an overview of the key literature relating to research impact in higher education, and in particular, explores contemporary perspectives of scholarly impact and real-world impact. Understanding how research knowledge impacts the real-world will help elucidate the complexity of research impact.

The chapter includes an historical narrative of research impact prioritisation and assessment activities from an Australian perspective, and explains how Australian efforts to assess research impact have been informed by work undertaken in the United Kingdom. A range of impact assessment frameworks are reviewed, as evidence of the extensive efforts undertaken to understand how research achieves real-world impact.

The content of this chapter provides a foundation for the research topic and the research methodology as a basis for understanding how this research contributes to the body of knowledge (Levy & Ellis, 2006). The reviewed literature includes journal articles, books, book chapters and conference publications, supplemented by grey literature. Grey literature of "unpublished studies and studies published outside widely available journals" (Conn, Valentine, Cooper, & Rantz, 2003, p. 256) provides valuable information for literature reviews in the form of government documents and newsletters (Curtin University, 2016). The inclusion of grey literature improves research validity by extending literature reviews beyond peer-reviewed documents that may be more readily available (Conn et al., 2003). Information was also sourced from user-generated content, such as academic blogs and academic Twitter, that provide a useful contribution to scientific discussions (Banks, 2009). In critically appraising this literature, I reviewed each item for authority, accuracy, coverage, objectivity, date and significance (Tyndall, 2010).

Literature was identified using lateral terms, in addition to keyword searches, as suggested by Mewburn (2015). Lateral terms included "research utilisation", "research uptake" and "payback", to support key search terms of research impact, scholarly impact and non-academic impact. Literature was filtered using a "cocktail glass approach" (Faff, 2015, p. 325), whereby a broad range of relevant literature was synthesised to identify the most important and critical literature, and this literature was then used to inform an expanded search of literature. This approach was useful as it enabled both a breadth and depth essential for identifying the key literature. The chapter also includes references to seminal works such as *The Idea of the University* (Jaspers, 1959), *The Matthew Effect in Science* (Merton, 1968) and *Scholarship Reconsidered: Priorities of the Professoriate* (Boyer, 1990). These are foundational works that provide useful background for understanding the evolution of universities and their research activities.

The impact agenda, as it relates to higher education research, is topical and dynamic, due to the continuing quest by academic and non-academic stakeholders to understand how research impacts the real-world. For this reason, the literature review was updated progressively throughout the study.

Research and society

In the following sections, the relationship between research and society is explored as a first step in understanding how research knowledge achieves public good.

Research knowledge

High quality, internationally competitive research is necessary to ensure the health, wealth and security of nations (Bauerlein, Gad-el-Hak, Grody, McKelvey, & Trimble, 2010). The ARC (2016b) defines research as:

> The creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies, inventions and understandings [and] could include synthesis and analysis of previous research to the extent that it is new and creative. (p. 2)

Research is the basis for creating knowledge (Hazelkorn, 2013). A spectrum of research extends from curiosity-led basic research to more applied research and business-funded developmental work (Group of Eight Australia, 2014). The Australian Bureau of Statistics (2008) specifies four types of research: pure basic research, which is undertaken to advance knowledge; strategic basic research, which provides broad knowledge needed to solve practical problems; applied research, which is undertaken with a specific purpose in mind to meet a pre-determined objective; and experimental development research, where existing knowledge is used for a new purpose or to improve an existing activity or product.

Traditionally, basic and applied research have been viewed as separate types of research due to being "conceptually and analytically different" (Stokes, 1997, p. 113). However, the perception that basic research leads to applied research, fails to capture the complexity of how research knowledge achieves influence (Stokes, 1997). Such a linear relationship does not adequately reflect the interdependency between the two types of research, whereby societal goals inspire applied research, and applied research can be the stimulus for basic research (Stokes, 1997). Despite this, linear models such as the logic model continue to be used to represent the relationship between research knowledge and research impact.

The role of universities

Universities are noted as "one of civilization's most enduring institutions" (Duderstadt, 2009, p. 11). The contribution made by contemporary universities is diverse and significant:

> Universities are now regarded as crucial national assets. Governments worldwide see them as vital sources of new knowledge and innovative thinking, as providers of skilled personnel and credible credentials, as contributors to innovation, as attractors of international talent and business investment into a region, as agents of social justice and mobility, and as contributors to social and cultural vitality. (Boulton & Lucas, 2011, p. 2508)

Universities have multiple opportunities to deliver benefits for the larger community (Marginson, 2011), and there is an expectation, over an extended period of time, that the research undertaken by universities will achieve public good outcomes (Benneworth et al., 2016; Boulton & Lucas, 2011; Calhoun, 2006; A. Ebrahim, 2013; Eynon, 2012; Jaspers, 1959; B. R. Martin, 2011). As suggested by H. Davies, Nutley, and Walter (2005), there are two ways that research findings achieve real-world impact: instrumental changes in "policy, practices and behaviour" (p. 12), and conceptual changes in "knowledge, understanding and attitudes" (p. 12). These changes are evident in literature demonstrating the multiple influences of research (see, for example: Campbell & Fulford, 2009; H. Davis et al., 2005; Levin, 2011).

Despite a general understanding that universities will advance knowledge "both within and beyond university walls" (Courant, 2015, p. 18), there is suggestion that the public good role of universities may have lessened over recent years (Dill, 2012) due to a neoliberal agenda that changed the relationship between universities and society (Castree, 2010; Lorenz, 2012).

The influence of neoliberalism

The nature of universities in Australia, New Zealand, the United Kingdom, the United States of America and parts of Europe changed rapidly from the 1960s (Lorenz, 2012). The impetus for such transformation was the advent of the post-industrial knowledge economy from the

1960s (Powell & Snellman, 2004), and the emergence of neoliberalism at the end of the 1970s (D. Harvey, 2005; Radice, 2013) that pervaded most western countries (Stratton, 2016). The historical origins of neoliberalism are complex (D. Harvey, 2005), and an understanding of their influence on the higher education sector is necessary to appreciate the operational changes that resulted from neoliberal doctrine (Heath & Burdon, 2015; Radice, 2013; Shore, 2010).

Neoliberalism is characterised by privatisation and commodification, financialisation, management and manipulation of crises and state redistribution (D. Harvey, 2005). Under neoliberalism, efficiency and accountability are prioritised (Emerald & Carpenter, 2015), and "productivity is everything" (Ball, 2012, p. 19). The practical impact of neoliberalism on universities has been captured by Hayes Tang (2014):

> Academia adopts and self-initiates entrepreneurial changes, including pro-competition policies for resources distribution, diversifying and expanding funding sources, enhancing the managerial capacity of academic administrators, embracing market-like and commercial activities on campus and establishing developmental outreach centres which link the academia with outside economies, societies and communities. (p. 300)

Universities have become "big businesses" (Barber, Donnelly, & Rizvi, 2013, p. 27), with an emphasis on being productive, efficient and entrepreneurial (Thornton, 2017). Australian universities that were once "stuffy and conservative" (Marginson & Considine, 2000, p. 2) are more enterprising in the 21st century. Barcan (2013) suggests that a "hybrid beast" (p. 77) emerged when the modernised bureaucratic institution collided with the traditional scholarly community of "gargoyles and graduations" (p. 10).

The growth of neoliberalism was accompanied by a New Public Management (NPM) (Campbell, 2013) that developed in the United States of America and spread to Australia, New Zealand, the United Kingdom and parts of Europe (Lorenz, 2012). The NPM movement

was a radical reform of administrative practices (Hood, 1991) whereby private sector management practices were introduced to the public sector (O'Donnell, Allan & Peetz, 2001). The essence of NPM is cost-efficiency (Lorenz, 2012), and from the 1980s, a culture of audit and accountability pervaded the higher education sector (Campbell & Hwa, 2013). The use of performance indicators to measure academic activities (Thornton, 2017), and the use of rankings by governments, research institutions and researchers (Hazelkorn, 2013), reflects the sector's preoccupation with measuring and quantifying performance.

As university management became focused on "reputation and revenues" (Marginson, 2004, p. 191), a new class of knowledge managers emerged in Australia, New Zealand, Canada and the United Kingdom, "whose job is monitor and measure academic performance and to maximize returns from research" (M. A. Peters, 2013, p. 13). However, the increased need to be accountable burdened academics with bureaucratic control mechanisms (Clark, 2015), and the focus on objective criteria encouraged the manipulation of data by "people who may be skilled at such manipulation but who lack 'concrete' knowledge or experience of the things being made or traded" (Muller, 2009, p. 3). Using metrics to assess the impact of research places a focus on valuing what can be measured, over what is important (A. Kelly, 2014), and does not guarantee there will be benefits to the real-world from research efforts.

There is suggestion that the contemporary *metric mania* (Paulos, 2010) may be rendering academics "calculable rather than memorable" (Ball, 2012, p. 17) by prioritising quantity over quality. Academics are encouraged to be high-performing and target-driven, with a focus on commercialising knowledge for financial benefit. Knowledge becomes a "strategic asset" (Borg, 2015, p. 317) in the form of intellectual property (IP) (Castree, 2010) to be protected and exploited (Hewitt-Dundas, 2012). Although real-world impact is publicly prioritised, university research activities are being influenced by a focus on knowledge with commercial value (C. Allen & Imrie, 2010; Watermeyer, 2014), encouraging practices of

academic capitalism (Slaughter & Leslie, 1997) and *academic entrepreneurialism* (Sum & Jessop, 2013) as academics endeavour to achieve individual, rather than collective, incentives and targets (Olssen, 2016).

Neoliberal doctrine permeates institutions and individuals, influencing how people think about what they do, and their social relationships with each other (Ball, 2012). A focus on performance-driven targets and rewards has challenged the public good intentions of the university (Barcan, 2013; Cuthill, 2012; Olssen, 2016; Shore, 2010), reinforcing individual and institutional aspirations for scholarly impact, that is more easily demonstrated and assessed, at the cost of real-world impact, that may be more difficult to discern.

Scholarly impact

The ARC (2016b) definition of research impact suggests that scholarly impact precedes real-world impact by occurring "beyond contributions to academia" (p. 1). As explained by Daley and Shinton (2014), scholarly or academic impact is "the specific contribution that your research will make to knowledge… [for the benefit of] researchers within your own subject area and those researchers in other disciplines" (p. 69). Scholarly impact is assessed by:

> Counting the number of times a particular article, articles in a particular journal, an individual's entire body of work, the body of work of the faculty in a department or university, or the body of work produced by an entire field of study has been cited in scholarly publications. (Aguinis, Suarez-Gonzalez, Lannelongue, & Joo, 2012, p. 106)

Generating scholarly impact, through dissemination of knowledge, is a key activity of the contemporary university (Evans & Homer, 2014). The quantitative assessment of scholarly impact demonstrates individual and institutional productivity, satisfying neoliberalism's requirement for performativity and commodification (Ball, 2012).

Even though contemporary definitions of research impact suggest that scholarly impact is not adequate for research impact (ARC, 2016b), there is evidence in the literature that the term "research impact" is used interchangeably with scholarly impact (see, for example: Chavda & Patel, 2016; Leydesdorff, Zhou, & Bornmann, 2013; Marks, Marsh, Schroer, & Stevens, 2013; Shashank Rao, Iyengar, & Goldsby, 2013). Such use of the term reinforces literature suggesting that impact terminology is not well understood (Penfield et al., 2013), highlighting the need to better understand research impact.

Publish or perish

Across the higher education sector, scholarly activities continue to be influenced by the academic philosophy of *publish or perish*. Publish or perish reflects the pressure on academics to disseminate research findings in peer-reviewed publications to "develop and sustain a research career" (Doyle & Cuthill, 2015, p. 671). The publish or perish phenomenon has historical origins dating back to 1665 (Tobin, 2002), however, the phrase was formally documented in an academic context by Logan Wilson in 1942 in the book *The Academic Man: A Study in the Sociology of a Profession*:

> Because of the individual researcher's necessity for maintaining his status or heightening his visibility in order to enhance chances for horizontal or vertical mobility, intellectual inquiry, unlike the growing of mushrooms, is not carried on in hidden recesses away from the public gaze… The prevailing pragmatism forced upon the academic group is that one must write something and get it into print. Situational imperatives dictate a 'publish or perish' credo within the ranks. (Wilson, 1942, p. 197)

Literature suggests that academics want their research to achieve a real-world impact and make a difference (Chubb, 2014; Eynon, 2012). However, academics are required to achieve scholarly impact for reward and recognition purposes (Reich, 2013). Scholarly outputs, such as books, book chapters, journal articles and conference publications (ARC, 2015c), are the

"bankable unit of academic capital" (Truex, Cuellar, Vidgen, & Takeda, 2011, p. 3), hinting at the reward and recognition received by academics who demonstrate extensive scholarly productivity. The scholarly outputs of research inform decisions made by universities with regard to "recruitment, retention and re-appointment, promotion, funding and tenure" (Truex et al., 2011, p. 2), with the success of a researcher determined by the number of publications achieved in "peer-reviewed, indexed, high impact journals" (Agarwal et al., 2016, p. 296). It is generally accepted across academia that those with the most publications and longest curriculum vitaes (CVs) will benefit in terms of promotion and tenure (Neill, 2008) and influence and prestige (Harnad, 1995). Although academics bemoan measures of scholarly impact (Moriarty, 2016), they continue to publish in high impact factor journals to maintain their careers. A range of phrases attest to the publish or perish imperative that prevails in 21st century scholarship: "visible or vanish" (Lamp, 2012), "promote or perish" (Tsitas, 2013), "be discoverable or die" and "be cited or suffer" (Enslin, 2013).

The pursuit of scholarly impact by researchers and research institutions has created a dysfunctional scholarly publishing system (Borgman, 2007; Remler, 2015), and is overloading contemporary scholars who read more publications yet spend less time on each one (Priem & Hemminger, 2010). In late 2014, there were estimated to be just under 35,000 active scholarly peer-reviewed journals (English and non-English language) publishing approximately 2.5 million articles per year (Ware & Mabe, 2015). However, many scholarly articles remain unread or uncited (Eveleth, 2014), and given that "practitioners rarely read articles published in peer-reviewed journals" (Biswas & Kirchherr, 2015, para. 3), scholarly impact is not a good indicator of longer term impact (Wooding, Hanney, Pollitt, Buxton, & Grant, 2011).

An understanding of scholarly impact is important in order to comprehend how scholarly impact contributes to real-world impact. The next section provides an overview of

the key metrics which are used to measure scholarly impact, and are traditionally used to rank researchers, research groups, institutions and journals (Agarwal et al., 2016).

Bibliometrics and altmetrics

Whilst it is argued that scholarly impact is an ineffective way to judge the value of research (Hammersley, 2013), academic metrics continue to be used by the international higher education sector for assessing research (Ma & Ladisch, 2016; Qin, 2010). Evidence of scholarly productivity is easy to capture (Bozeman & Sarewitz, 2011) so there is a tendency to count outputs as a way of demonstrating impact (Milat, Bauman, & Redman, 2015; Weitkamp, 2015). Routine assessments of scholarly impact tend to rely upon bibliometric and altmetric data.

Bibliometrics. Bibliometrics include measures such as number of research publications, citation counts, number of downloads (including *h*-index), journal impact factor, article-level metrics, and author rank (Agarwal et al., 2016). As noted by Galligan and Dyas-Correia (2013), research metrics have been used traditionally for "filtering out only the most significant and relevant material from the huge volume of academic literature produced" (p. 56).

Key bibliometric measures are explored below.

A **citation** (either bibliographic or web) occurs when "one published work 'cites' or directly refers to another published work, including the full reference of the latter within a reference list" (Nightingale & Marshall, 2012, p. 60). The importance of a research article is routinely measured by counting the number of times the article has been cited (Zhu, Turney, Lemire, & Vellino, 2014), with Cronin and Overfelt (1994) suggesting that citations may be perceived positively as "rewards, tokens or gifts" (p. 166) or negatively as a "tax [or] royalty payment" (p. 166). However, the decision by an individual to cite the work of another may be

random and unpredictable (Cronin & Overfelt, 1994), with citation-based bibliometrics generated on the basis of awareness of work or the popularity of an author (Najman & Hewitt, 2003). In addition, citation rates vary across disciplines making it difficult to compare researcher performance (Albion, 2012; Bordons, Fernandez, & Gomez, 2002; Rafols, Leydesdorff, O'Hare, Nightingale, & Stirling, 2012).

Despite acknowledgement that citation-based bibliometrics are a "crude estimate" (Najman & Hewitt, 2003, p. 76) of a scholar's quality of output, and that they should not be used solely for determining the contribution made by research (Sarkar & Seshadri, 2015), citations remain an accepted way of measuring scholarly impact on the basis that highly cited papers are usually those that make a key impact in the field (Silke & Schmidt-Petersen, 2015). However, citation counts are not an effective way to assess real-world impact which may be less easily measured than scholarly impact.

Impact factors are also used to assess scholarly impact. The impact factor of a journal measures how frequently articles in the journal are cited (Saha, Saint, & Christakis, 2003). Despite being quantitative and objective, impact factors have been widely criticised for being statistically flawed (Seglen, 1997), methodologically unsound (Brembs, Button, & Munafo, 2013) and open to manipulation (Curry, 2012; Power, 2006). As noted by Priem and Hemminger (2010), it is illogical to assess the scholarly impact of an article using the scholarly impact of a journal. Furthermore, attempts to infer the scholarly impact of a researcher based on the impact factor of journals where the researcher publishes are flawed given that impact factors "measure the visibility and quality of journals, not the quality of the researcher" (Javey, 2012, p. 6529). As recommended in the *Metric Tide Report*, the use of metrics must be carefully managed in a research system that "displays a degree of complexity that is difficult to reduce to simple numbers" (Wilsdon et al., 2015, p. 58).

There is concern that reliance upon impact factors to assess the influence of research may discourage researchers from pursuing research with real-world impact. A focus on impact factors may be a disincentive to pursue risky research that has longer publication timeframes (Alberts, 2013), and contribute to research being undertaken for the wrong reason (Dance, 2013). The impact factor, originally conceived by Eugene Garfield as a bibliographic system for science literature, was never intended to be used for assessing scholarly impact (Garfield, 2005).

Altmetrics. A range of new metrics – altmetrics, webometrics, cybermetrics, scientometrics and informetrics – complement bibliometrics in measuring research impact (N. A. Ebrahim, 2016). In the 21st century, academic communication has become "faster, more interactive, and more open" (Dunleavy & Mollett, 2012, para. 1). Electronic networks have changed the way scholars create new knowledge, publish their ideas and subject them to peer-review (Cronin, 2010). Using digital technology, academics can access an unprecedented quantity of knowledge and information (Ayanso, Cho, & Lertwachara, 2014), collaborate with geographically-dispersed researchers (Dale, Newman, & Ling, 2010), engage in "scholarly skywriting" (Harnad, 1990, p. 342), and use social media to "disseminate, cite and discuss research" (Brown, Cowan, & Green, 2016, p. 639). Altmetrics may be an effective way to assess the impact of research on society (Ram & Rameshwar, 2016), by tracking scholarly influence through web-based communication behaviours of publishing, posting, blogging, scanning, reading, downloading, glossing, linking, citing, recommending and acknowledging (Cronin, 2010, p. 196). The opportunities for web-based communication to facilitate real-world impact are being embraced by researchers in Australia and overseas.

Real-world impact

As outlined in Chapter 1, the ARC (2016b) continues to prioritise research with real-world impact as evident in its definition of research impact. The definition states that research impact occurs *beyond contributions to academia* suggesting that the influences of research extend further than creating knowledge within academia (Chandler, 2014). Rather, impact is about changing, influencing or affecting society at an "individual, community or global" level (Chandler, 2014, p. 3). The ARC definition is aligned with the United Kingdom's HEFCE definition of research impact:

> An effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia. (HEFCE, 2012, p. 48)

However, the HEFCE definition further notes the multiple dimensions of impact, including the soft impacts of research:

> Impact includes, but is not limited to, an effect on, change or benefit to: the activity, attitude, awareness, behaviour, capacity, opportunity, performance, policy, practice, process or understanding; of an audience, beneficiary, community, constituency, organisation or individuals; in any geographic location whether locally, regionally, nationally or internationally. (HEFCE, 2012, p. 48)

Whilst acknowledging the tangible and intangible impacts of research, the HEFCE definition excludes contributions to academic research and knowledge, stating that these "impacts on research or the advancement of academic knowledge within the higher education sector (whether in the UK or internationally)" (HEFCE, 2012, p. 48) are assessed separately within non-impact categories of outputs and environment. As such, the HEFCE definition of research impact excludes scholarly impact, and prioritises research influence outside or beyond academia (Collini, 2009; Penfield et al., 2013).

The Australian and United Kingdom definitions of research impact, that exclude scholarly impact, suggest that real-world impact is the ultimate objective of research. In seeking to achieve real-world impact, literature recognises the need to move research findings "from the research environment into the real world" (Lum, Todd, Porter, & Matha, 2016, p. 3). The following sections explore this process by reviewing the mechanics and challenges of the research-practice relationship.

The research-practice relationship

In order for research to achieve impact, there must be some influence on government policy formulation and implementation, government practice, local authority policy and practice, institutional practice, training approaches, best practice guidelines, research partnerships and researchers themselves (Marcella, Lockerbie, & Cameron, 2015). The opportunity for research to influence in such a diversity of ways reflects the scholarly and real-world dimensions of impact. H. Davies et al. (2005) suggest that real-world impact requires that research findings influence "policy, managerial and professional practices, social behaviour or public discourse" (p. 12). This perspective reflects a general assumption that outcomes are improved when policy and practice are based on research evidence (Hammersley, 2014; Meagher, Lyall, & Nutley, 2008; I. Walter, Nutley, & Davies, 2003).

As evidenced from the literature, the lexicon of impact suggests there is a need for research knowledge to be operationalised for the benefit of society. From the 1950s onwards, and with a noticeable increase from 1993 to 2013, many publications focused on *using research*. As noted by Jackson (2014), there was a general understanding in the 1990s that research findings would be handed over for implementation by those in the real-world. From 2000 onwards, the terms *translating research* (Marzano, 2003; Shokar, 2014) and *knowledge translation* (K. Jones, Armstrong, Pettman, & Waters, 2015) became popular in recognition of

the fact that research often requires interpretation prior to implementation. A range of other terms including *knowledge production* and *evidence utilisation* were used during the same period. An emphasis on university-community collaboration (Finkelstein, 2001, p. 100) was reflected in terms such as *knowledge mobilisation* and *engaged scholarship* that were used frequently between 2010 and 2014 (Buchanan, 2013; Cuthill, 2010; Ellwood, Thorpe, & Coleman, 2013; McCormack, 2011). Knowledge mobilisation suggests distributing and re-shaping knowledge to suit contexts (Abou-Zeid, 2002), whereas engaged scholarship recognises the need for multiple knowledge systems to be included in the process of creating knowledge (Van de Ven, 2007).

Other terms used at various times include *knowledge transfer* (H. Davies, Nutley, & Walter, 2008; Geuna & Muscio, 2008; Hewitt-Dundas, 2012), *knowledge translation* (Bowen & Graham, 2013; Grimshaw, Eccles, Lavis, Hill, & Squires, 2012) and *knowledge exchange* (Cuthill, O'Shea, Wilson, & Vijoen, 2014). *Knowledge interaction* and *knowledge intermediation* reflect less-linear production-use models of how knowledge is transferred and used (H. Davies et al., 2008, p. 190). More recently, *translational research, implementation science* and *dissemination science* have become new fields of study that recognise the need for research knowledge to be put into action (Munro & Savel, 2014, p. 5). Translational research is a continuum of research that focuses on integrating scientific discoveries into clinical applications, and ensuring that research is driven by clinical need: “bench to bedside and back to bench” (Homer-Vanniasinkam & Tsui, 2012, p. 1). *Sustainability science* is a term specifically used to describe programs where scholars and practitioners co-produce knowledge to solve complex interdisciplinary problems (Clark & Dickson, 2003; König, 2015). The diversity of terms suggests that “knowledge-to-action thinking” (Nutley, Morton, Jung, & Boaz, 2010, p. 135), in terms of how research achieves real-world impact, has progressed through three generations as distinguished by Best and Holmes (2010): linear

models that focus on transfer and dissemination of knowledge; relationship models that focus on collaboration and exchange of knowledge; and systems models that focus on integration and mobilisation of knowledge.

According to Buykx et al. (2012), in excess of 90 terms have been used in the literature to describe how research knowledge achieves influence, confirming suggestions that research impact terminology is varied and confusing (Brewer, 2011; Penfield et al., 2013). Such confusion exacerbates efforts to foster and demonstrate real-world impact, encouraging researchers to claim scholarly impact which is more easily identified. There is a prevailing need to better understand experiences and perceptions of research impact, as this study seeks to do.

The research-practice gap

Evidence of real-world impact is apparent in the disciplines of education (see, for example: Gersten & Dimino, 2001; Marzano, 2003; Nisbet, 1981; Ozga, 2004; Slavin, 2002) and health (see, for example: Balakas & Sparks, 2010; Brownson & Jones, 2009; Glasgow, 2013; Haines & Donald, 1998). Nevertheless, scholars generally lament the delayed or nil application of research for the benefit of society (Hammersley, 2005; Shokar, 2014; Steffens et al., 2014), suggesting frustration with achieving real-world impact from research knowledge. The *research-practice gap* phenomenon became prominent in the late 1950s (Tkachenko, Hahn, & Peterson, 2016), and is noted as being common to all areas of science (Spilsbury & Nasi, 2006).

An extensive body of literature highlights problems in transferring research knowledge to policy and practice (see, for example: B. A. Anderson, 2015; Bowen & Graham, 2013; Grimshaw et al., 2012; Hemsley-Brown & Sharp, 2003; G. P. Martin et al., 2011; Mutemeri & Chetty, 2013; Rolfe, 1998; Shokar, 2014; Vanderlinde & van Braak,

2010). In the case of health research, K. E. Smith, Stewart, Donnelly, and McKendrick (2016) note that "a lack of solution-orientated research, a lack of focus on broader social determinants of health, issues of lobbying by others with competing interests and concerns of a limited public mandate to implement policies that reflect research findings" (p. 269) restrict the influence of health research on policymaking in the United Kingdom. In the case of educational research, papers by Biesta (2007, 2010) lament continuing challenges in achieving evidence-based practice in the United Kingdom. Even prior to this, in 1998, the Chief Inspector of Schools in the United Kingdom noted that much educational research is "at best no more than an irrelevance and a distraction" (Hammersley, 2005, p. 318).

There is further evidence of research-practice gaps in the fields of business and management (Tkachenko et al., 2016) that date back many years (Beyer & Trice, 1982). In the case of research conducted by business schools, there have been ongoing concerns that research impact is limited due to research being irrelevant to practice (Bennis & O'Toole, 2005; Dostaler & Tomberlin, 2013; Skapinker, 2008), and failing to generate commercial value (Hitt & Greer, 2011). Vicari (2013) notes a lack of collaboration whereby "academics do not turn to managers for inspiration for their research and managers do not consult academics on theories to develop models and strategies" (p. 173). Lindblom and Cohen (1979) suggest the problem may be a simple one of communication, whereby suppliers of research are not listened to, and users of research do not get to hear what they want to listen to.

Despite efforts to prioritise and encourage real-world dimensions of research impact, there is evidence of an academic-practitioner disconnect (M. Marshall, 2014) between those who produce the knowledge and those who use the knowledge (McCormack, 2011). Although Tinkler (2016) asserts that academics have been wrongly criticised for being disconnected from the real world, a range of terms reflect an enduring distinction between the

world of research and the world of policy and practice (Furlong & Oancea, 2005; Marsh, 2010). Such terms include *academic-practitioner* (Steffens et al., 2014), *research-practice* (Nutley, Walter, & Davies, 2003; Tkachenko et al., 2016), *science-society* (Hobolt, 2015; S. Smith, Ward, & House, 2011), *science-policy* (Spilsbury & Nasi, 2006), *theory-practice* (Boyer, 1990; Steinheider, Wuestewald, Boyatzis, & Kroutter, 2012), *knowledge to action* (Lum et al., 2016), and *gown and town* (Brockliss, 2000, p. 147). The two communities perspective reflects "research, on the one side, and politics, policymaking and other forms of social practice, on the other" (Harris, 2015b, p. 1).

Irrespective of whether the separation between research and practice may be a "false dichotomy" (Nutley et al., 2003, p. 132), or more perceived than real (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003), there is suggestion that the research-practice gap may be widening (Marsh, 2010; Mutemeri & Chetty, 2013), despite efforts since about 1985 to establish tighter links between research, practice and policy (Furlong & Oancea, 2005). More recently, the term *valley of death* (D. Butler, 2008) has been used to describe the gap between research and application (S. F. Roberts, Fischhoff, Sakowski, & Feldman, 2012). Likewise, the term *death by research* (Oldham, 2013) captures the systemic research-practice challenge whereby a large volume of research is published but never contributes to improved practice.

The collaboration imperative

There is a need to reduce the research-practice gap so that research knowledge can achieve real-world impact. Ensuring research is made authentic requires "connectedness" (Boyer, 1990, p. 16) and building bridges to span the gap (Nutley, 2003). As suggested by Van de Ven and Johnson (2006), the research-practice gap may be addressed through engaged scholarship efforts where knowledge is co-produced, rather than transferred.

The collaboration of researchers and practitioners improves the opportunity for research to achieve practical impact (Steinheider et al., 2012; Wessells et al., 2017), by ensuring that the knowledge produced from research is relevant and therefore "fit for purpose" (Boaz & Ashby, 2003, p. 15). As noted by Tinkler (2012b), "policymakers explicitly want academic expertise rather than necessarily the results of a specific piece of research" (para. 5), hinting at the need to translate research results to policy (P. Davis & Howden-Chapman, 1996), and involve research users in the process of research (Morton, 2015a; Nutley, 2003).

Interdisciplinary collaboration is noted as especially necessary for solving society's *wicked problems* (Head, 2008) and *grand challenges* (Barber et al., 2013; Colquitt & George, 2011). As suggested by Amey and Brown (2005), research across disciplinary boundaries delivers results that are "more innovative and consequential" (p. 30) than less-collaborative efforts. Complex problems such as ageing, poverty and security lack definitive solutions (Zivkovic, 2015) and are better solved through contributions from a range of fields rather than a single-science approach (Garner, Porter, Borrego, Tran, & Teutonico, 2013; Siedlok & Hibbert, 2014; A. Weiss, 2007; Winckler & Fieder, 2012; Wong, 2014). Collaboration across many disciplines is credited as advancing research in space travel and genetics (Friedman, Friedman, & Frankenstein, 2013).

Collaboration is recognised as an effective process for improving the science-society interface (Pettigrew, 2001; Tkachenko et al., 2016), and reducing the theory-practice gap to achieve real-world impact from research (Armstrong & Kendall, 2010; Hemsley-Brown & Sharp, 2003; Yuan et al., 2016). As noted by Lomas (2000), "early and ongoing involvement of relevant decision makers in the conceptualization and conduct of a study is the best predictor of its utilisation" (p. 141). The contemporary imperative to collaborate (Bozeman & Boardman, 2014) requires academics to engage with public, private and community sector

stakeholders in research endeavours (Cuthill, Warburton, Everingham, Petriwiskyj, & Bartlett, 2011; van den Besselaar, Hemlin, & van der Weijden, 2012).

As discussed later in this chapter, the Australian government is encouraging collaboration as a key activity to help ensure research achieves real-world impact. However, despite collaboration being encouraged by government (Commonwealth of Australia, 2015b), and required by funding agencies (Lee & Bozeman, 2005; Pohl et al., 2010), Australia is noted as falling behind in industry collaboration (Pyne & Birmingham, 2016). It is possible that efforts to encourage collaboration are being undermined by a neoliberal agenda that promotes "competitive individualism" (B. Davies, 2005, p. 7), evident in the way researchers and research institutions are assessed and rewarded.

The next section explores the global impact agenda that seeks to encourage research with real-world impact.

The impact agenda

As explained in Chapter 1, the need for quality research able to impact policy and practice has been long recognised. Despite efforts to assess the socio-economic benefits of research, there remains a lack of understanding about how science really impacts society (Godin & Doré, 2004).

The impact agenda – "the whole gamut of initiatives related to knowledge exchange and public engagement that have been articulated in recent years" (Stella, 2014, p. 105) – seeks to demonstrate how university research delivers benefits for society (Eynon, 2012). The United Kingdom White Paper entitled *Realising our Potential* (Office of Science and Technology, 1993) documented the concept that publicly-funded research should be planned with societal benefits in mind to originate the impact agenda in the United Kingdom (Ferguson, 2014). Across the globe, the impact agenda has been gaining momentum since

release of the *2006 Warry Report*, published by the Research Councils United Kingdom (RCUK) (Payne-Gifford, 2013). The report specified an action plan of knowledge transfer strategies to deliver, and demonstrate delivery of, increased economic impact through activities of leading, influencing and engaging (Warry, 2006). One of the responses to the report was that, from 2009 onwards, RCUK required all funding applications to include an *impact plan* (Dance, 2013; Payne-Gifford, 2013) which is one of the assessment frameworks reviewed later in this chapter. The impact plan was intended to focus researcher attention on real-world impact by seeking early identification of the potential impact of funded research. Whilst other countries have demonstrated similar interest in seeking to understand the real-world benefits of research, the United Kingdom is recognised as a leader in this area (Holmes & Clark, 2008), and has inspired efforts in countries such as Australia.

The Australian context

Australia has a strong history of research with real-world impact including "spray-on skin, automated agriculture, contamination removal from natural gas streams, the Cochlear hearing device, enhanced ore recovery using floatation technology and anti-viral and cervical cancer vaccines" (Universities Australia, 2015, p. 6). As suggested by the Chief Executive of Universities Australia, in addressing the *Australian Financial Review Higher Education Summit*, Australia's national wellbeing is "inextricably linked to ideas, curiosity and research, and the ability to translate this into real economic and social value" (Robinson, 2015, para. 7).

The following sections review Australia's research context, and impact assessment processes, as background for understanding the implications arising from this research, that are presented in Chapter 5.

Excellence in Research for Australia

The ARC manages the Australian government's public investment in research and development, and provides advice to the Australian government on research matters (ARC, 2013). The ARC administers two key programs: the National Competitive Grants Program (NCGP) and Excellence in Research for Australia (ERA).

The NCGP comprises the ARC Discovery and ARC Linkage funding streams which fund multiple activities to support researchers and research activities (ARC, 2015e). Funding is provided for research deemed to be nationally significant in terms of meeting priority areas. Australia's research priority areas are discussed later in this chapter.

The other program, ERA, is a research evaluation activity which assesses the quality of research undertaken at eligible Australian institutions against world standards (ARC, 2015f). Although ERA primarily assesses research quality, it is anticipated that future rounds of ERA will be extended to include research impact, as explained in the next section.

Knowledge of the ERA process is useful for appreciating how research is assessed in Australia. The first full round of ERA took place in 2010, with subsequent rounds in 2012 and 2015 (ARC, 2015d). Guidelines for ERA 2010, ERA 2012 and ERA 2015 required eligible institutions to report activity data in terms of research outputs, research income, applied measures and esteem measures (ARC, 2009, 2011, 2014).

The data required by ERA, on research outputs and research income, is informed by the Higher Education Research Data Collection (HERDC) that is an annual reporting requirement for all Australian universities (ARC, 2015a). HERDC requires eligible higher education institutions to report publications data, as well as research income from Australian competitive grants (Category 1), other public sector research income (Category 2), industry and other research income (Category 3), and cooperative research centre research income (Category 4) (Commonwealth of Australia, 2016a). Publications data includes books, book

chapters, journal articles and conference papers that have been validated through a peer review process. The peer review process, whereby the scientific community assesses research quality (Boaz & Ashby, 2003; Priem, 2013) is "the lynchpin of the quality assurance system" (Cronin, 2010, p. 28). Publication data provides evidence that new knowledge is highly credible (Spilsbury & Nasi, 2006) even though "the very idea of quantifying scientific impact is misguided" (Priem, 2013, p. 439). In the case of applied measures, institutions report data on patents, registered designs and plant breeder's rights (ARC, 2014). For esteem measures, institutions report data on editorships, fellowships and memberships (ARC, 2014). Data are quantitative rather than qualitative, emphasising the metric focus of the process. ERA 2015 assessed contributions from 67,579 researchers from 41 Australian institutions (ARC, 2015f).

The HERDC data on research outputs and research income has also been used to partially inform the allocation of research block grants (ARC, 2015a), which are allocated to Australian universities to support research and research training. However, from 2017, research block grants will be allocated on the basis of research income and Higher Degree by Research (HDR) student completions, without consideration of research publication counts (Department of Education and Training, 2016). The removal of publication data is expected to reduce publish or perish incentives, and encourage research with financial and social benefits (Knott, 2015).

The results of ERA 2015 indicate that Australia performs well in sciences (mathematical, physical, chemical, environmental, agricultural and veterinary, medical and health, psychology and cognitive), engineering, law and legal studies, and history and archaeology (ARC, 2015b). Although Australia produces research of high quality, Australian researchers are noted as being less successful in commercialising research knowledge (Pyne & Birmingham, 2016). Despite a considerable focus on research impact, both Australia and the United Kingdom have failed to appear in the 2015 Top 100 Global Innovators Report that

lists the most innovative publicly-funded research institutions (Thomson Reuters, 2015). The Australian government is promoting university-industry engagement in an effort to improve the real-world impact of research.

Impact and engagement

Australia has been active since 2004 in seeking to understand how public expenditure on university research achieves real-world benefit (Donovan, 2008). Australian efforts to assess research excellence have been informed largely by work undertaken overseas, particularly in the United Kingdom (Watermeyer, 2014) where most recent attempts have relied upon case study approaches (Marjanovic et al., 2009). The nation's influence is evident in multiple Australian government documents referencing work being undertaken in the United Kingdom. For example, see the discussion paper *Assessing the Wider Benefits Arising from University-based Research* (DIICCSRTE & Australian Research Council, 2013) where the preamble states that any new framework for assessing research will be informed by the United Kingdom's Research Excellence Framework (REF), particularly with regard to learning lessons from the REF for the benefit of an improved Australian framework. The United Kingdom's REF is discussed later in this chapter.

The Australian government recognises the effectiveness of assessment approaches being undertaken in the United Kingdom. In 2016, the Australian government released an *Engagement and Impact Assessment Consultation Paper* that included reference to the REF, recognising its effectiveness in creating "the desired incentives for universities and researchers… to focus more strongly on [real-world] benefits when planning and conducting their research" (ARC & Department of Education and Training, 2016, p. 3). However, the paper also noted that any framework, developed by the Australian government for assessing the benefits of research, should be mindful of the burden to institutions in the United

Kingdom of complying with the 2014 REF case study approach (ARC & Department of Education and Training, 2016).

Government activity would suggest that Australia's impact agenda is also a political agenda. Efforts to understand the real-world impact of research are continually compromised due to changes in government and political campaigning. Australia has a history of rolling back initiatives when changes in government occur. For example, prior to ERA, government efforts had focussed on developing a Research Quality Framework (RQF). The RQF was a unique assessment exercise noted as being "a truly comprehensive and methodologically diverse impact audit" (Donovan, 2008, p. 49). Development of the RQF dates back to 2004, when it was first proposed by the government as a tool to improve the way the government allocated university block funding, by assessing the excellence of research and "the wider benefits of academic research for the nation" (Donovan, 2008, p. 49). The RQF was an innovative approach to assessing impact, in that the framework sought to identify the wider impact of research through qualitative and contextual assessment. Although it was intended for use in 2008, a change of government in 2007 saw the RQF shelved at the end of that year amid concerns relating to the cost and design of the evaluation process (Donovan, 2008). The current system of ERA was proposed by the incoming government as an improvement on the RQF, specifically with regard to developing a more robust approach for assessing impact that is less contextually dependent and easier to verify (Donovan, 2008).

There is yet more recent evidence that Australian government decisions, relating to the impact of publicly-funded university research, have been used as a campaigning platform by election candidates. As reported by Lane (2013), prior to the September 2013 federal election, a member of the opposition criticised the government for providing ridiculous grants for research, citing examples of urban media art and religious-reproductive research as projects that were wasting taxpayer dollars. Comments such as this highlight the challenge

faced by arts and humanities researchers in seeking to justify the contribution of their research to society (Shachar, 2013)

Successive Australian governments have been active in endeavours to understand and assess the impact of research. This section presents a five-year history of consultation papers, policy documents and assessment trials as testimony to Australia's commitment to encouraging research with real-world impact.

Excellence in Innovation for Australia

In 2012, the Australian government initiated an Excellence in Innovation for Australia (EIA) trial to understand and assess the broader impact of university research on society, the environment and the economy (Clement & Creagh, 2012). EIA had arisen from a review undertaken by the Australian government in 2011 to investigate "the degree to which the current public investment model for research is effective to meet the government's aspirations, as well as the opportunities to further maximise the returns from the government's investment in research" (DIISR, 2011b, p. 4). The review had been undertaken from February to July 2011 in response to a changing research sector that included greater competition for limited research funding, and increasing calls that research should address economic, social and public good needs (DIISR, 2011a). The findings of the *Focusing Australia's Publicly Funded Research Review* were announced in November 2011. One of the key recommendations was that the government should explore developing a "research impact assessment mechanism, separate from ERA, to evaluate the wider benefits of publicly funded research" (DIISR, 2011b, p. 7) to demonstrate the value of investing in research activities.

Evidence suggests that the Australian government perceives innovation as a real-world impact of research. The EIA trial sought to measure university research in terms of the "innovation dividend" (Group of Eight & Australian Technology Network, 2012, p. 2), and explore how such measurement could support the ERA process by assessing the non-

academic impact of Australia's publicly funded research activities (Morgan Jones, Castle-Clarke, Manville, Gunasekara, & Grant, 2013, p. 1). The year-long trial was informed by 162 case study submissions from twelve Australian universities (Group of Eight & Australian Technology Network, 2012). The report on the trial noted that case studies were an effective way to demonstrate and communicate impact, with the potential for case studies to be used to supplement impact assessment exercises (Group of Eight & Australian Technology Network, 2012). The panels assessing the case study contributions noted that there was "a definite need to focus university research more on 'real world' impact" (Group of Eight & Australian Technology Network, 2012, p. 18). In the same year, ERA 2012 recognised Non-Traditional Research Outputs (NTRO) so institutions could submit policy documents as research outputs for the disciplines of economics and studies in human society (ARC, 2012).

The wider benefits from research

Subsequent to the EIA trial, the Australian government released a discussion paper in June 2013 entitled *Assessing the Wider Benefits Arising from University-based Research* (DIICCSRTE & Australian Research Council, 2013). The paper sought public comment on using "research benefit case studies" (DIICCSRTE & Australian Research Council, 2013, p. 9) to provide evidence of non-academic research impact, as a supplement to quantitative research engagement data for assessing the wider benefits of university-based research. It was proposed that an independent evaluation of the submitted case studies would supplement the traditional research-reporting metrics of publications, patents and grants. Once submissions had been reviewed, the Department of Industry and the ARC intended to release a detailed analysis of the issues raised, and develop a document outlining "the basic elements of an assessment of research benefits and pathways to benefit" (DIICCSRTE & Australian Research Council, 2013, p. 20). The pilot exercises were anticipated to take place in 2014, and precede the department releasing a public report in the second half of 2014 on the

outcomes of the pilot exercises and a proposed way-forward for full-scale implementation. However, the Labor Party lost the federal election in September 2013, disrupting the planned activities. A detailed analysis of the issues raised during the public consultation period has not been released. The anticipated pilot exercises were superseded by the new government's focus on innovation and engagement explained in the following sections.

A focus on innovation for social and economic benefit

The challenge to identify the real-world impact of research continued under the Liberal-National Coalition government. On 18 March 2014, the Australian Senate referred an inquiry into Australia's innovation system to the Senate Economics References Committee with the reporting date set as the first sitting day of July 2015 (Parliament of Australia, 2014). Particular reference was made to "the importance of translating research output into social and economic benefits for Australians, and mechanisms by which it can be promoted" (Parliament of Australia, 2014, para. 4). The inquiry sought to address challenges posed to Australian industries and jobs by increasing competition in innovation, science, engineering, research and education.

In April 2014, Universities Australia, the peak body representing Australia's 39 comprehensive universities, released a *Keep It Clever* public awareness campaign to promote the role of universities in securing the nation's future prosperity (Barrett, 2014). Universities Australia subsequently commissioned research to analyse how universities contribute to Australia's economic and social wealth (Deloitte Access Economics, 2015). The report entitled *The Importance of Universities to Australia's Prosperity* analysed and assessed the quantitative and qualitative benefits generated by Australian universities, concluding that university research impacts economic and social prosperity, and that "the existing stock of all knowledge generated by university research is estimated to account for almost $160 billion in 2014" (Universities Australia, 2015, p. 30).

The Australian government's focus on innovation and commercialisation was emphasised further in August 2014 when the Industry Minister Ian Macfarlane suggested that government-allocated research funding should be based on patents rather than papers (Macfarlane, 2014). Minister Macfarlane stated that commercial outcomes would be improved if grants were allocated on the basis of how many patents a researcher had registered, rather than on the number of scientific papers published (Bita, 2014). Australia's system for assessing and funding research has received ongoing criticism. As suggested by Shergold (2011), "there remains a chasm between research and influence and between the policy intellectual and the policy practitioner" (para. 14). Much Australian research is lost-in-translation as evidenced by "a major gap between what we know and what we actually apply" (Garrett, 2016, p. 8), and fails to achieve real-world impact.

A further discussion paper entitled *Boosting the Commercial Returns from Research* was released by the government on 29 October 2014 as part of its Industry Innovation and Competitiveness Agenda. The paper sought feedback from the research sector and industry on how to "improve Australia's economic performance through better translation of research into commercial outcomes" (Department of Education & Department of Industry, 2014, p. 21), noting the value in setting national research priorities as a strategy for ensuring research is targeted to areas of national interest. Research funding priorities are discussed later in this chapter.

These efforts by the Australian government to understand the impact of research on society suggest there exists ongoing frustration with Australia's inability to transfer research knowledge for real-world impact, albeit with a focus on innovation and commercialisation.

Research engagement and collaboration

In March 2015, a report by the Australian Academy of Technological Sciences and Engineering (ATSE) suggested that research engagement was a preferred option to research

impact due to challenges with assessing the ultimate impact of research (ARC & Department of Education and Training, 2016). The ATSE definition of research engagement highlights the ongoing nature of engagement as an "interaction between researchers and research organisations and their larger communities/industries for the mutually beneficial exchange of knowledge, understanding and resources in a context of partnership and reciprocity" (ARC & Department of Education and Training, 2016, p. 6). Since release of the ATSE report, engagement has become a key contemporary theme for the Australian government, evident in a focus on research collaboration (Commonwealth of Australia, 2015b). In the United Kingdom, engagement is also being explored to understand the interactions between researchers and non-researchers, and how levels of public engagement differ across the disciplines (Hamlyn, Shanahan, Lewis, O'Donoghue, & Hanson, 2015).

On 26 May 2015, the Australian government announced the *Boosting the Commercial Returns from Research* strategy. The strategy included 14 actions to ensure Australia's future competitiveness by achieving commercial returns from publicly-funded research (Minister for Education and Training, Minister for Indusry and Science, & Health., 2015). A strong theme within the strategy was "creating stronger incentives for research-industry collaboration" (Department of Education & Department of Industry, 2014, p. 22). Two months later, in July 2015, the government announced a review of university funding and policy as part of its *Boosting the Commercial Returns from Research* strategy. An issues paper released in August 2015 noted the problematic nature of impact assessment due to the delayed and non-linear relationship between discovery and implementation (Watt, 2015b). The issues paper stated the need for increased collaboration, providing examples of successful long-term research-industry partnerships such as Silicon Valley in the United States of America, and Cambridge Science Park in the United Kingdom (Watt, 2015b). The paper sought responses by 18 September 2015 to a number of issues raised, including how to

improve the way research impact and university-industry engagement are measured. The final *Report from the Review of Research Policy and Funding Arrangements (Watt Report)* was released in November 2015. One of the recommendations was the development of an "impact and engagement assessment framework" (Watt, 2015a, p. 75) as a way of assessing research impact to ensure university research benefits society. It was proposed that the framework should include both quantitative and qualitative measures, and be guided by lessons of the United Kingdom. The report suggested piloting an impact and engagement model in 2017, with a new framework implemented as a companion to the existing ERA process in 2018 (Watt, 2015a).

National innovation and science agenda

On 7 December 2015, the Australian government's *National Innovation and Science Agenda* was released to encourage Australia's innovation system (Prime Minister & Minister for Industry Innovation and Science, 2015). Within the Agenda, collaboration is noted as one of four key pillars, providing a framework for Australia's innovation policy. The other pillars are culture and capital, talent and skills, and government as exemplar (Commonwealth of Australia, 2015b). As part of the Agenda, the Australian government announced the development of a framework to "examine how universities are translating their research into economic, social and other benefits and incentivise greater collaboration between universities, industry and other end-users of research" (ARC & Department of Education and Training, 2016, p. 2). Although the *National Innovation and Science Agenda* seeks to encourage world-class research in partnership with industry (Commonwealth of Australia, 2015b), there are concerns that the Agenda may adversely impact social sciences research, by promoting research with short-term perspective that lacks longer-term value (Jayasuriya & Johnson, 2016).

Impact assessment measures

Continuing its focus on research impact, the Australian government announced in March 2016 that there was a need to better understand the "engagement and impact of research conducted in our universities to ensure we are providing the right incentives, culture and practices to foster collaborative research that returns economic dividends and importantly, improves the lives of all Australians" (Pyne & Birmingham, 2016, para. 4). A Steering Committee, co-chaired by executives of the ARC and the Department of Education and Training, was established to "develop a process that uses clear and transparent measures of non-academic impact, and industry and end-user engagement, to assess our nation's university research performance and inform future funding structures" (Pyne & Birmingham, 2016, para. 6).

There is expectation that future rounds of ERA will be influenced by government efforts to introduce a national system for assessing impact and engagement. In preparation for this, a technical working group has been established to provide advice on engagement and impact assessment measures that will be piloted in 2017 and included in ERA 2018 (Matchett, 2016). These measures will be additional to performance and incentives measures that are also being developed. The *Engagement and Impact Assessment Consultation Paper,* released by the government in May 2016, sought feedback on a framework to measure the impact and engagement of university research (ARC & Department of Education and Training, 2016). The paper referenced case study methodologies being utilised in the United Kingdom for understanding impact. The *Engagement and Impact Assessment Consultation Paper* proposed a pilot assessment in 2017, with the first national assessment expected to take place in 2018 (ARC & Department of Education and Training, 2016). Feedback on the discussion paper was due on 24 June 2016 which was just prior to the federal election held on 2 July 2016. The Liberal-Coalition Party retained government, and in late 2016, plans were

announced to conduct a pilot exercise during 2017 as part of the government's continuing efforts to assess engagement and impact (ARC, 2016d).

The continuing discourse relating to the higher education sector, and public investment in research, proves that real-world impact remains a social and political issue in Australia.

The United Kingdom's Research Excellence Framework

As noted previously, Australian perspectives in relation to research impact have been largely informed by activities undertaken in the United Kingdom, where the assessment of research excellence is used as a basis for allocating research funding (Watermeyer, 2014). The United Kingdom is recognised as the first country to introduce performance-based research funding, with its Research Selectivity Exercise in 1986, that evolved into the Research Assessment Exercise (RAE) in 1989, 1992, 1996, 2001 and 2008, and was revised as the Research Excellence Framework (REF) in 2014 (Geuna & Piolatto, 2016).

The REF assesses the quality of research in UK higher education institutions (HEFCE, 2014a). In the United Kingdom, responsibility for funding and regulating universities and colleges rests with HEFCE, that jointly administers the REF. HEFCE defines research impact as:

> An effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia… [and] includes, but is not limited to, an effect on, change or benefit to: the activity, attitude, awareness, behaviour, capacity, opportunity, performance, policy, practice, process or understanding of an audience, beneficiary, community, constituency, organisation or individuals in any geographic location whether locally, regionally, nationally or internationally… [and] includes the reduction or prevention of harm, risk, cost or other negative effects. (HEFCE, 2012, p. 26)

The definition notes the intangible elements of research impact by recognising the opportunity for research knowledge to affect attitudes, awareness and understanding. Such intangible dimensions of impact, such as influencing the work of other scholars, or influencing teaching content, are more generally considered relevant to humanities (Collini, 2012). As noted by Shachar (2013), arts and humanities research in Australia is often challenged to justify its contribution to society. Scholarly impact, as a form of research impact, is also noted by the Research Councils of the United Kingdom (RCUK). The RCUK, a strategic partnership of the United Kingdom's seven Research Councils, states that research impact can include academic, economic and societal impact (Research Councils UK, 2014). In contrast, the ARC definition of research impact suggests that real-world impact is more than scholarly impact (ARC, 2016b).

In 2014, for the first time, the United Kingdom's REF assessment process accepted case study submissions as evidence of research impact, in an attempt to recognise the broader contribution of research, and explore ways to assess research impact beyond academic metrics (HEFCE, 2014b). Impact was assessed on the basis of *reach and significance,* and contributed 20% to each university's research quality profile. Research outputs (such as publications) were assessed on *originality, significance and rigour*, and contributed 65%. Research environment (such as infrastructure) was assessed on *vitality and sustainability,* and contributed 15%. Submissions for each of the three elements of outputs, environment and impact were assessed by expert panels comprising academic members and research users (HEFCE, 2014). Submissions were allocated a star rating ranging from one-star to four-star, with a four-star rating denoting world-leading or outstanding quality and being the highest possible achievement (HEFCE, 2011)[2].

[2] Further information about the United Kingdom REF process is contained in the document entitled *2014 REF Assessment Framework and Guidance on Submissions* which may be accessed at http://www.ref.ac.uk/

Impact submissions were prepared using case study templates and were restricted to four-pages per case study. In preparing the submissions, institutions were advised to select examples of impact where excellent research made a "distinct and material contribution to the impact taking place" (HEFCE, 2011, p. 29). One case study was permitted per submission, plus an additional case study for every 10 Full Time Equivalent (FTE) staff. The case studies described impact that had occurred in the period 1 January 2008 to 31 July 2013, due to research that had been conducted in the period 1 January 1993 to 31 December 2013 that contributed to the impact (HEFCE, 2012). The case study template required institutions to provide a summary of the impact, research underpinning the impact, references to the research, details of the impact, and sources to corroborate the impact (HEFCE, 2012). A case study submitted by the University of Southampton (Appendix A) demonstrates how institutions reported evidence of research impact in the 2014 REF. The University of Southampton's submission on *Influencing Policy and Practice in Non-medical Prescribing (NMP)* explains how over 19,000 nurses and 2,000 pharmacists benefitted as a result of research conducted on the quality, safety and acceptability of non-medical prescribing of medicines to patients. The research achieved a 4-star rating for impact. It is noticeable however, that despite attempts by the REF to encourage research with real-world impact, the case study submission included six research publications and two research grants as evidence, emphasising the enduring link between real-world impact and scholarly impact, and reinforcing the quantitative and qualitative dimensions of impact.

The 2014 REF reviewed a total of 1,911 submissions made by 154 United Kingdom universities in 36 sub-based units of assessment, including 191,150 research outputs and 6,975 case studies (HEFCE, 2014b). In the case of impact, 84% of submissions demonstrated outstanding or very considerable impacts from research, reflecting "productive engagements with a very wide range of public, private and third sector organisations, and engagement

directly with the public" (HEFCE, 2014b, p. 2). Multiple impacts were evident across the topics of health care services, business and industry, technology commercialisation, informing government policy, parliamentary scrutiny, community and local government, and print, media and publishing (J. Grant, 2015). The analysis revealed the multidisciplinary nature of research, and extensive geographical spread of research impact, concluding that "the societal impact of research from UK Higher Education Institutions (HEIs) is considerable, diverse and fascinating [and] any attempt to define a standard route to research impact could be counterproductive" (J. Grant, 2015, p. 66).

Whilst the REF has been praised for encouraging researchers to consider public engagement at an early stage of their research (Jump, 2014), there has been some criticism of the process whereby case study submissions still relied upon mostly quantitative methods for assessing research impact (Greenhalgh & Fahy, 2015). Quantitative data fails to capture the full extent of research impact (Marginson, 2014), or the diversity of academic influence (Tinkler, 2012a). The case study approach has also been criticised for being burdensome to individuals and institutions (Marcella, Lockerbie, & Bloice, 2015), due to being time-consuming and resource-intensive (Farla & Simmonds, 2015; Watt, 2015a). Furthermore, there has been suggestion that the process encouraged institutions to manipulate the case studies submitted in order to optimise results (A. Kelly, 2014), such as reporting research impacts that were direct and relatively short-term (Redman et al., 2015). Other concerns relate to submission criteria, and the time lags for impact to occur, such that "some research will remain invisible, regardless of its relevance and impact" (M. Jones, 2015, p. 296). Aware of REF criticism, work is being undertaken to determine whether departmental H-indices may be a less onerous approach, and yet be equally effective in generating similar results to the REF (Jump, 2014). The next REF is scheduled to take place in 2021 (HEFCE, 2017).

Although the United Kingdom is actively seeking to understand the real-world impact of research, and is leading efforts with case study approaches, the nation's approach is not perfect. However, work undertaken in the United Kingdom continues to guide Australian endeavours to understand how research influences society.

Funding research

The university research sector has become increasingly competitive (Byrne, Sage, & Mullally, 2016; Hayes Tang, 2014; Jorm, 2015), due to an overall decline in the amount directly allocated by government to university research (Auranen & Nieminen, 2010; Geuna & Martin, 2003; Kutinlahti, 2005). More intense competition for research funds reflects the impact of neoliberalism on the higher education sector. There is an increased expectation that universities should be self-financing (Lynch, 2015), and resilient in terms of being adaptable, resourceful and efficient (Karlsen & Pritchard, 2013). The influence of neoliberalism on the higher education sector continues to distract universities from a focus on achieving public good. The irony that universities are expected to be more transparent and accountable at the same time as government funding is reduced has been noted by Thornton (2017).

In Australia, the government's investment in research and development is split across four areas: research activities such as CSIRO; business sector support such as research and development (R&D) tax measures; higher education sector funding that includes ARC funding and university block funding; and multi-sector investment for research in areas such as health, energy and the environment (Commonwealth of Australia, 2015b). The ARC provides funding for university research through the ARC Linkage scheme that seeks to promote research collaboration for economic, social or cultural benefit (ARC, 2016c), and the ARC Discovery scheme that supports individual researchers or research teams to undertake fundamental research (ARC, 2016a). In 2016-17, the Australian government will allocate

$746 million to these two research funding schemes (Australian Government, 2016a). However, the funding schemes are highly competitive. In 2016, 31.1% of ARC Linkage applications were funded, which is 12% fewer than were funded in 2015 despite a 4% increase in the number of applications submitted (ARC, 2016c). In 2016, the ARC Discovery scheme funded just 18% of the 3,500 proposals submitted, with over half of the approved projects addressing areas identified as research priorities. Research funding priorities are discussed in the following section.

The Australian government's approach to funding a range of research programs demonstrates its commitment to research as a conduit to national prosperity. However, since 1996, the Australian government's investment in research and development, as a proportion of total budget spending, has been declining (Ting & Phillips, 2014), such that the level of contribution made to fund the indirect costs of research is less than leading OECD countries (Jayasuriya & Johnson, 2016). There is suggestion that, in seeking to encourage applied research, the Australian government's sequence of funding cuts has been detrimental to basic and fundamental research (Nogrady, 2016).

Australia and the United Kingdom are among several countries that assess the quality of publicly-funded research, to inform the allocation of performance-based funding for research activities (H. P. McKenna, 2015). Performance-based funding refers to the strategic allocation of grants to universities on the basis of deliverables and outputs (Hewitt-Dundas, 2012). In 2016-17, the Australian government will invest approximately $1.7 billion in research block grants to support higher education research activities and research training (Commonwealth of Australia, 2016b, p. 63). Since 2004, there has been a decline in research block funding as a proportion of total university income for Australian universities (Watt, 2015a).

Competitive-based approaches to funding are intended to encourage enhanced research performance (Auranen & Nieminen, 2010), so that the impact of publicly-funded research is evident. However, Rogers et al. (2014) warn that attaching financial incentivisation to impact may affect the nature and process of contemporary research, by prioritising research with economic value to those outside the research institution. There are concerns that efforts by governments, to encourage research with demonstrable short-term impact, may have a longer-term negative impact on the quality of research by influencing how research institutions undertake research (Spence, 2013). As noted by Castree (2006), academic research is funded because it is deemed important or profitable, rather than for potential long-term benefits. Auranen and Nieminen (2010) suggest that "strong funding incentives may have unintended and negative system-level consequences, such as the emphasis on quantity instead of quality, orientation to less innovative, mainstream research and weaker societal impacts in the long run" (p. 831). An enhanced understanding of the real-world impact of research may support government with allocating research funding to projects where the impact of research may be less apparent.

In an effort to encourage research that addresses real-world issues, the Australian government has established national research funding priorities.

Research funding priorities

The Australian government introduced research funding priorities in 2014 as a strategic approach to better focus Australia's research effort (Australian Government, 2016b). In 2015, the government's *Strategic Science and Research Priorities* were food, soil and water, transport, cybersecurity, energy, resources, advanced manufacturing, environmental change and health (Australian Government, 2016b), with 83% of proposals approved for ARC Linkage projects in 2016 allocated to areas of research priority (ARC, 2016c).

There is concern that specifying areas of research priority – deemed by government, rather than researchers, to be worthy of research – may threaten "knowledge for knowledge's sake" (Chubb, 2014, p. 23). Rather than being driven by intellectual curiosity, contemporary academic research tends to be driven by national priorities (Hazelkorn, 2013), with researchers externally instructed as to where their research efforts should be expended. Direct interference in the way research funding is allocated may present an assault on university autonomy (Collini, 2012), and be demeaning to academics who no longer get to ask their own questions (Slater, 2012).

In Australia, funding programs promote research activities that address identified priorities and deliver pre-determined outcomes, thereby increasing the pressure on research institutions to move from fundamental research to applied research that produces short-term benefits for society. Favouring applied research, with impacts that can be more easily measured (Cameron, 2014), may draw funds away from blue-skies research (Dance, 2013) where impact is often not immediately apparent (Marcella, Lockerbie, & Bloice, 2015; Wood, 2014). The impact of blue-skies research is often achieved through the work of others (Marcella, Lockerbie, & Bloice, 2015), in a way that is unrelated to the original research goals (White, 2015). As an example, the wool industry's development of crystallography techniques was a precursor to discovering the structure of deoxyribonucleic acid (DNA) (Ridley, 2015).

Although it is important to consider issues deemed important by the public when determining research activities, it is unwise to assume that what is important now, will still be important in the future (Mulholland, 2015). It is difficult to predict the future requirement for research knowledge and, as noted by Boulton and Lucas (2011), "today's preoccupations are inevitably myopic, often ephemeral, giving little thought for tomorrow" (p. 2510).

Assessing research impact

Understanding the real-world impact of academic research is becoming increasingly important to those from within and outside the sectors in which it originates (Gartner, Cox, & Jeffery, 2013). Researchers and research funders are seeking to better understand how publicly-funded research achieves real-world impact (Molas-Gallart, 2014; Williams et al., 2009). As proposed by Guthrie et al. (2013), there are four purposes for evaluating research: to advocate the benefits of research; to demonstrate accountability in terms of funds expenditure; to analyse the effectiveness of research; and to allocate limited funds in the most effective manner.

Assessing research demonstrates the value derived from investing in research, helps to ensure future investment is allocated to high-quality high-impact research, and supports researchers with understanding how to enhance the impact of their own research (Bell, Shaw, & Boaz, 2011). Research assessment exercises encourage researchers and research institutions to consider the end use of research and strive for impact (Redman et al., 2015), even though it may be difficult to determine the ultimate impact of a particular research activity (W. Grant & Harris, 2012).

Literature suggests a holistic approach, encompassing quantitative and qualitative measures, when seeking to understand the real-world impact of research (Eynon, 2012; Khazragui & Hudson, 2015). However, the reality is that research assessment activities tend to focus on scholarly impact (Given et al., 2015), as evidenced by efforts to count "dollars, people, publications and patents" (W. Grant & Harris, 2012, para. 12). The limitations of these quantitative approaches are widely recognised, particularly with regard to using impact factors to assess research quality (Seglen, 1997), and using co-authorship to measure collaboration (Katz & Martin, 1997). Counting publication outputs and citations does not

provide a full picture of impact, as impact has multiple dimensions, including public and community benefits (Sainty, 2015).

Quantitative approaches fail to capture the incremental or cumulative nature of impact that is non-tangible and diffuse (Godin & Doré, 2004), and are insufficient for demonstrating value and accountability (Carpenter et al., 2014). Furthermore, academic metrics tend to privilege "the physical, life and medical sciences… [and] countries where English is the national language" (Hazelkorn, 2012, para. 2). As noted by Stella (2014), assessing the impact of arts, humanities and social science is challenging due to the fact that "knowledge exchange beyond the academy is more difficult to determine or capture and the utility of any output difficult to quantify" (p. 106). When evidence of impact is less obvious (Meagher et al., 2008), there is a reduced perception of public good (McGuigan, 2013).

Linear models of impact reinforce the notion that research impact is dependent upon research outputs. However, real-world impact is complex and multi-dimensional. Impact may be direct or indirect (John, 2013), explicit or implicit (Chandler, 2014), visible or invisible (Sumner, Ishmael-Perkins, & Lindstrom, 2009), planned or unplanned (Levitt et al., 2010), and immediate or long-term (Sumner et al., 2009). Each of these dichotomies hints at inadequacies of assuming a linear approach to impact, and challenges the logic model as a framework for understanding how real-world impact occurs.

Challenges and complexities

Assessing the real-world impact of research is a difficult and time consuming process (Hobolt, 2015; Watt, 2015a; Weitkamp, 2015). In assessing impact, there is a need to consider the indirect influences of research such as informing perspectives and stimulating ideas (C. H. Weiss, 1977a). However, such impacts are not always apparent, and may be difficult to encapsulate and substantiate due to a reliance on anecdotal evidence that is "generally

considered less persuasive than quantitative evidence" (Marjanovic et al., 2009, p. 19). As emphasised by Payne-Gifford (2013), assessing the impact of research is more than "telling the nice stories" (p. 15), even though this may be required when advocating for researchers and the expenditure of public funds.

Impact assessment exercises range from quantitative approaches of *counting beans* to qualitative approaches of *cherry picking* (Hansen et al., 2013). Despite a range of methods, some impacts of research are less apparent, difficult to assess and generally excluded from impact assessment activities. As discussed earlier, case study approaches to assessing impact, such as the REF process in the United Kingdom, still require institutions to submit quantitative data of publications and grants as evidence of impact (University of Southampton, 2014).

When assessing the real-world impact of research, Morton (2015a) suggests there are three notable challenges – timing, attribution and context – reflected in literature by Penfield et al. (2013), K. E. Graham, Chorzempa, Valentine, and Magnan (2012) and Adam et al. (2012).

Timing

Timing is a key consideration when assessing research impact (Meagher et al., 2008; Morton, 2015b; Morton & Fleming, 2013). The benefits from research may be slow to emerge and hard to quantify (Buykx et al., 2012). In referencing logic model terminology, D. A. King (2004) suggests there are notable lags between research funding, research outputs and research impact. Knowledge is assimilated through a range of processes such that impact may be "indirect and gradual" (Levin, 2011, p. 16). Although some research has immediate impact, other research may require years or decades "before the true value becomes apparent" (University of Oxford, 2015, para. 2), particularly in the case of blue-sky research (Cadogan, 2014). The process to impact has been described as "an odyssey" (Conlon, Gill, Tyler, &

Oeppen, 2014, p. 33) and "long, tortuous and difficult" ((Wong, 2014, p. 422). Such descriptions capture the complicated and frustrating process of achieving impact from research that is also evident in terms such as *research valley of death* and *lost-in-translation* discussed earlier in this chapter.

The time lag between research and impact has been estimated as ranging from 15 to 20 years (Buxton, 2011; Daley & Shinton, 2014), and extending to three decades for medical interventions (L. Allen, 2012). In the case of research that influences attitudes, Buykx et al. (2012) suggest that the impact on decision making may not be evident until a much later time. The fact that the *ultimate impact of research* may take many years to emerge (Buxton, 2011; Husbands, 2014) complicates efforts to trace impact back to specific research activities (Khazragui & Hudson, 2015).

Attribution

The impact of research may be the result of multiple research activities, with impact arising from the aggregation of research knowledge. Analysing the attribution between research and impact is no easy task (Bornmann, 2012; Spaapen & van Drooge, 2011; Timmer, 2004; Wolf, Lindenthal, Szerencsits, Holbrook, & Heß, 2013). Impact is not independent, and may be attributable to a number of factors, rather than isolated to one particular research activity (Penfield et al., 2013). Research is an incremental process, with each piece of research knowledge serving as a foundation for further research (L. Allen, 2012). It may be difficult to determine to what extent a specific piece of research contributed given the incremental nature of research (Guthrie et al., 2013), particularly in the case of indirect and latent impacts that arise from research that contributes to the "ever-expanding pool of knowledge" (Kostoff, 1994, p. 430). The challenge of establishing a direct correlation between research and impact has been noted by Sarli et al. (2010) who attempted to go "beyond citation analysis" (p. 17) to reveal the impact of research. Furthermore, the impact arising from research may also be

serendipitous making it difficult to trace results back to specific research activities (Meagher et al., 2008).

Context

Understanding the context in which the research is undertaken is an important consideration when assessing research impact. As noted by Morton (2015b), social, political, environmental and economic factors can act as barriers or enablers of research impact. The uptake of research may depend upon whether the research topic is deemed to be a government priority at the time the research knowledge becomes available (Newson et al., 2015), and whether the political environment is favourable to the research (Harris, 2015b). The challenge of influencing policy has been noted by Spilsbury and Nasi (2006) who attribute the delayed acceptance of research knowledge to "either a cautious response to the uncertain predictive capabilities of science or dangerous procrastination fuelled by political or economic interests" (p. 194), hinting at the multiple stakeholders involved in the process of achieving research impact.

Researchers play an important role in engaging with those who use the research to ensure the research is relevant and applicable (Morton, 2015b). However, assessing the impact of research is a subjective process that varies according to the perceived usefulness of research knowledge (Bastow et al., 2014a), that may not be immediately apparent (University of Strathclyde Humanities and Social Sciences, 2014).

Assessment frameworks

A wide range of approaches and methods guide the assessment of research impact, including case studies, episode studies, frameworks, contribution analysis, outcome mapping and social network analysis (UK Collaborative on Development Sciences, 2013). The impact of research may be identified using either a forward tracking approach (from research to

policy/practice), or a backward tracking approach (from policy/practice back to research) (Boaz et al., 2009; Morton, 2015b). Whilst a combination of these approaches is possible (Lakey et al., 2013; Morton, 2015b), forward tracking tends to be more common than backward tracking (Hilderbrand, Simon, & Hyder, 2000). Government efforts, such as the United Kingdom's REF assessment process, use case study submissions as backward tracking approaches. Such pathway approaches rely upon logic models that link research to impact by mapping causal relationships (Spilsbury & Nasi, 2006), and have been used as the basis for many impact assessment frameworks.

A range of frameworks has been developed to understand and assess impact in Australia and the United Kingdom. Examples of the types of frameworks that have been developed are presented in Table 1.

Table 1

Sample of frameworks for assessing research impact

Framework	Overview
Research Impact Pathway Table (ARC)	The Research Impact Pathway Table developed by the ARC is based on a logic model understanding of impact: inputs, activities, outputs, outcomes and impact. The ARC recommends that funding applicants use the pathway table when developing impact statements to accompany funding applications (ARC, 2016e).
Pathways to Impact (Research Councils UK)	The Pathways to Impact was developed by the Research Councils of the United Kingdom (RCUK) as a way of encouraging research funding applicants to consider the broader impacts of research when developing funding submissions. The Pathways to Impact has been an essential component of all RCUK funding applications since 2009 (Payne-Gifford, 2013).
Impact of the Social Sciences Project (LSE Public Policy Group)	Over a three-year period, the Impact of the Social Sciences Project, funded by HEFCE in the United Kingdom, investigated "the impact of academic work on government, business and civil society" (Tinkler, 2012a, para. 5). Findings from the project culminated in a Handbook for Social Scientists and a book entitled *The Impact of the Social Sciences: How Academics and Their Research Make a Difference* (Bastow et al., 2014a). The work outlines primary and secondary impacts of research, compares research impact across social science and STEM fields, and notes the role of intermediaries in helping research to achieve impact (Bastow et al., 2014a).
CIFOR Impact Pathway (Centre for International Forestry Research)	The CIFOR Impact Pathway uses a logic model approach to mapping research outputs to impacts. The pathway distinguishes between planned outcomes and intended impacts, and also notes the role of intermediaries in achieving the planned outcomes (Spilsbury, 2000).
Godin and Doré's Framework	The Godin and Doré Framework identifies 11 dimensions of impact categorised into five categories of impact, and uses a bottom-up approach to assessing the impact of publicly funded research (Godin & Doré, 2004).
Buxton-Hanney Payback Framework	The Buxton-Hanney Payback Framework was developed in 1996 and since then has informed many research assessment processes. The framework identifies impact in terms of payback across five categories: knowledge production; benefits to future research and research use; political and administrative benefits; health sector benefits; and broader economic benefit (Buxton & Hanney, 1996).
Morton Pathway to Impact	The Basic Pathway to Impact developed by Morton uses a research contribution approach to understanding impact. The contribution mapping approach focuses on processes and contributions of research uptake, research use and research impact (Morton, 2015b).

These frameworks highlight a diversity of approaches to capturing the influence of research on society. Some frameworks focus on categorising impact in terms of type; others focus on categorising impact according to the extent of influence. More detailed information about these frameworks, including diagrams, is contained in Appendix B.

Literature suggests that health research is especially fraught in terms of delayed or nil uptake of research knowledge for clinical application (D. Butler, 2008; S. F. Roberts et al., 2012; Wong, 2014). A number of health-specific frameworks are testament to the discipline's efforts to assess the effectiveness of the research-practice relationship, with Cruz et al. (2017) identifying twenty-four unique methodological frameworks for assessing the impact of healthcare research. Two examples are the *Research Impact Framework* (Kuruvilla et al., 2006; Kuruvilla, Mays, & Walt, 2007), and the *Health Services Research Impact Framework* (Buykx et al., 2012). The Research Impact Framework identifies four broad areas for assessing health research: research-related impacts, policy impacts, services impacts, and societal impacts (Kuruvilla et al., 2006; Kuruvilla et al., 2007). The framework provides key descriptive categories within each of these broad areas, to help researchers identify and describe the impact of their research. The Health Services Research Impact Framework records evidence of impact of primary health care research, by distinguishing between dissemination (producer push) and uptake (user pull) research impacts (Buykx et al., 2012).

The frameworks reviewed in this section have been presented to demonstrate contemporary approaches to understanding and assessing the real-world impact of research. As noted by Ovseiko et al. (2012), assessing impact is feasible, however there is an opportunity to improve current methods. Given "the variability and the complexity" of how research influences society (Bornmann, 2012, p. 673), there may be value in combining the best features of many existing frameworks, rather than attempting to develop a new tool

(Hansen et al., 2013). A better understanding of the perceptions and experiences of research impact is a necessary requirement in seeking to develop an improved framework.

The contemporary dilemma

The literature reviewed in this chapter suggests that contemporary researchers and research institutions are caught between private benefit and public good in their endeavours to achieve both scholarly impact and real-world impact. Producing research outputs, such as publications, remains important for individual and institutional credibility (Aguinis et al., 2012; Harris, 2015b; Hojat, Gonnella, & Caelleigh, 2003; Reich, 2013; Stergiou & Lessenich, 2014). However, achieving real-world impact is equally important. Contemporary academics have a "responsibility to perform" (Ball, 2012), and demonstrating how research achieves impact is evidence of productivity (D. Kelly, Kent, McMahon, Taylor, & Traynor, 2016, p. 8).

Real-world impact is no longer a chance outcome of research (Chandler, 2014), but rather an expectation (Molas-Gallart, 2014), and an aspiration (H. P. McKenna, 2015; Y. Taylor, 2014). More frequently, researchers are being required to justify their work (Côté & Allahar, 2011), by providing descriptions of impact in grant proposals, project reports and press releases (Kuruvilla et al., 2006). The pressure for impact may be prioritising projects with short-term demonstrable outcomes (Weitkamp, 2015), and encouraging academics to "sensationalise and embellish impact claims" (Chubb & Watermeyer, 2016, p. 6) in the quest to secure research funding. Literature is peppered with marketing vernacular. Academics are "hustling and hawking their wares" (Olssen, 2016, p. 137) in an effort to market the products of research so as to influence society and generate impact (Collini, 2012). There is suggestion that the university has adopted characteristics reflective of a bazaar where disciplines are "wares" (Maskell & Robinson, 2012, p. 169), and contemporary academics are pressured to deliver research income as "the goods" (Chubb & Watermeyer, 2016, p. 2).

At the same time, academic departments have become skilled at promoting their achievements in research assessment exercises (Collini, 2009), by manipulating data and optimising submissions. Academics and universities are rewarded on the basis of scholarly impact that informs decisions about hiring, promoting and tenuring (R. L. Taylor, 2015), and allocating performance based research funding (ARC, 2015c). The outputs of academic research are evidence of activity (Watermeyer, 2014), and universities have become obsessed with rating and ranking research (Shore, 2010, p. 27). Yet, at the same time, academics and universities are expected to achieve real-world impact. The literature suggests that contemporary academics are expected to "do it all" (Ferguson, 2014, para. 4), and contemporary universities are challenged to be "everything to everybody" (Denman, 2009, p. 24), in terms of being socially responsible, yet also conducting research into "the most theoretical and intractable uncertainties of knowledge" (Boulton & Lucas, 2011, p. 4).

Although there is suggestion that neoliberalism may be in ruins (Grantham & Miller, 2010), the doctrine continues to impact the contemporary higher education sector (Olssen, 2016) due to the resilience of embedded neoliberal practices (Cahill, 2014; Lather, 2010, 2012). However, neoliberalism may not be solely responsible for issues in the sector. Academics must bear responsibility for failing to resist neoliberal governance, and rather, respond by "sacrificing scholarly integrity" (Chubb & Watermeyer, 2016, p. 1). Researchers have become "complicit with the system they protest" (Chubb & Watermeyer, 2016, p. 9), evident in the way researchers modify research activities to address externally-determined funding priorities, pursue opportunities to commercialise research knowledge, and seek publication in high impact factor journals.

Despite a focus on the broader benefits of research (Hill, 2015), and impact beyond the academic institution (Hazelkorn, 2015), a culture of publish or perish continues to dominate researcher activity. A prevailing focus on performance data has eroded academic

freedom (Emerald & Carpenter, 2015; Hobolt, 2015), and may be undermining efforts to prioritise and deliver real world impact (Boulton & Lucas, 2011, p. 2514).

Summary

This chapter has presented an overview of the literature relating to higher education research impact, for the purpose of situating this study within a wider body of knowledge. Included in the chapter is an overview of the higher education sector, the prevailing publish or perish imperative, and the influence of neoliberalism on the contemporary university.

Evident across the literature was an inconsistency in the way research impact is understood and articulated. Research funding and assessment agencies, such as the ARC, specify that research impact is the influence of research *beyond* scholarly impact (ARC, 2016b), yet many researchers and research institutions align research impact with scholarly activities. The literature review distinguished scholarly impact from real-world impact, and provided evidence of an apparent disconnection between research and practice.

The chapter discussed the historical and current impact agenda in Australia and the United Kingdom, with the contemporary focus on real-world impact evident in government consultation papers, funding agency guidelines, research institution statements, publications, conference papers and scholarly blogs. However, the higher education sector continues to be influenced by assessment mechanisms that reward scholarly impact, with researchers and research institutions striving to demonstrate productivity and excellence. A number of frameworks were presented as evidence of contemporary approaches to assessing the impact of research on policy and practice.

The literature review has been progressively updated to reflect the dynamic nature of impact assessment, including additions made in November 2016 to capture impact

assessment activities of the Australian government following the federal election in July 2016.

The chapter has highlighted the complexity of research impact, reinforcing the need for further research to understand how research undertaken in higher education institutions delivers real-world advantages. The information in this chapter provides a foundation for understanding the inherent challenges of research impact in an Australian context.

CHAPTER 3 - RESEARCH DESIGN

The literature reviewed in the previous chapter provided background for informing the research design, and developing the research questions. In designing the research, consideration was given to the research philosophy, research methodology and research method (Bryman, 2007; Creswell, 2014). These elements help ensure that evidence is gathered in a way that will enable the research question to be answered "as unambiguously as possible" (de Vaus, 2001, p. 9).

The main research question addressed in this study is: *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?* The research answers the main research question using a phenomenological approach to describe and interpret the *lived experience* of research impact (Max van Manen, 2016). The main research question is informed by two research sub-questions that seek to understand the nature of research impact: *How do researchers and research leaders perceive research impact? How does a logic model approach support understanding of research impact?*

This chapter outlines the theoretical background to the research, describes the research design, and provides a detailed explanation of the research methodology and approach to collecting and analysing the data.

Research framework

Theoretical background

This study is undertaken from a constructivist-interpretivist approach, which is an epistemological perspective of constructivism, and a theoretical perspective of interpretivism (Denzin & Lincoln, 1998). The four elements considered in designing the research are

epistemology, theoretical perspective, methodology and method (Crotty, 1998) as shown in Figure 4.

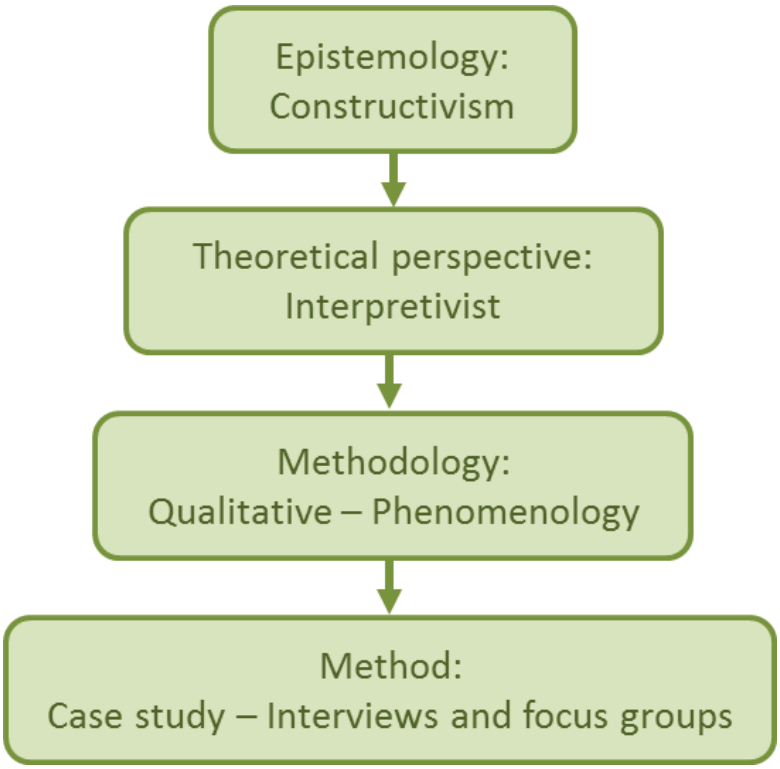

Figure 4. Epistemology, theoretical perspective, methodology and method for this research adapted from Crotty (1998).

Constructivist-interpretivist researchers recognise that reality is subjective and consists of meanings produced by individuals (Hesse-Biber & Leavy, 2010). Research impact is a lived experience that varies across individuals. A constructivist-interpretivist approach is appropriate for this research as it recognises the role of perception and experience in individual assessments of research impact.

The research study relies upon participant perspectives in exploring the lived experience of research impact. However, reality is co-constructed, in that researchers interpret meanings that others have about the world (Lincoln, Lynham, & Guba, 2011). Research findings have the potential to be influenced by a researcher's own background and experiences in terms of how data is analysed and interpreted (Creswell, 2014). In much the

same way as participants construct meanings of their own experiences, the process of interpreting those perspectives will be shaped by the researcher's experiences (Creswell, 2014) and beliefs (Guba, 1990).

As a researcher, my *worldview* has been informed by my discipline orientation, past research experiences and key researchers in my field (Creswell, 2014). These influences guide how research is undertaken in a practical sense (L. D. Peters, Pressey, Vanharanta, & Johnston, 2013). The assumptions and beliefs that I bring to the study are evident in my epistemological position (Hesse-Biber & Leavy, 2010):

1. First, there are "multiple realities" (Laverty, 2008, p. 13). Lived experience is a reality for each individual, and no two experiences are alike (Söderhamn, 2001). This research explores the lived experience of research impact from an individual perspective, to reveal five themes of research impact that are "more commonly assented to" (Guba & Lincoln, 1989, p. 86). These themes reflect how people see the world, rather than conclude how the world is (Gibbs, 2007).
2. Second, lived experience is informed by beliefs, expectations and attitudes, where thoughts and actions give rise to meaning (Gilgun, 2012). Experiences of research impact will vary according to researcher discipline, experience, beliefs and biases. These are internal factors influencing research participant perspectives of research impact.
3. Third, people cannot be separated from context (Gilgun, 2012). Perceptions and experiences of impact will not remain constant, and will be affected by factors influencing how impact is assessed, such as timing and context (Morton, 2015a). However, it is still possible within a phenomenological study to "describe an essential finding that is intrinsically general" (Giorgi, 2006).

The single case study approach explores research impact from the perspective of higher education research executives, institutional leaders, senior research officers and researchers to reveal five themes of research impact.

The co-construction of reality suggests an iterative, rather than prescriptive, approach to collecting and analysing data (J. Smith, Larkin, & Flowers, 2009). Such a back-and-forth process is effective for revealing lived experience, where meaning changes according to context (J. Smith et al., 2009). The methodology and method for this research study are discussed in the following sections.

Research methodology

Research that is constructivist relies significantly upon qualitative field research (Crotty, 1998) to build rich descriptions of complex circumstances (C. Marshall & Rossman, 2006). Qualitative research is often stimulated by "real-world observations" (C. Marshall & Rossman, 2006, p. 25) that encourage the researcher to explore a particular phenomenon such as research impact. The purpose of such research is to illuminate the experiences of people (C. Marshall & Rossman, 2006) to reveal "the meaning individuals or groups ascribe to a social or human problem" (Creswell, 2013, p. 4).

The qualitative research approach of hermeneutic phenomenology was selected as an appropriate methodology for exploring the lived experience of research impact (Max van Manen, 2007). Phenomenology recognises the existence of multiple realities (Hesse-Biber & Leavy, 2010), with the lived experience encompassing "the ordinary and the extraordinary, the quotidian and the exotic, the routine and the surprising, the dull and the ecstatic moments and aspects of experience as we live through them in our human existence" (Max van Manen, 2014, p. 39). Even though the phenomenon of research impact may be socially shared (Dahlberg & Dahlberg, 2004; Wertz, 2005), each individual's reality is influenced by

expectations and previous experiences (A. D. Smith, 2005). However, it is possible to recognise "recurring aspects of the meaning of a certain phenomenon" (Max van Manen, 2014, p. 352), such as research impact.

The origins of phenomenology date back to the 18th century, and the philosophical works of Edmund Husserl (1859 – 1938), Martin Heidegger (1889 – 1976) and Maurice Merleau-Ponty (1908 – 1961). Edmund Husserl is credited as the founder of phenomenology and his work *Logical Investigations* is considered to be the first true phenomenological work (Sokolowski, 2000). However, the application of phenomenology varies between Husserl and Heidegger. Husserl's approach of transcendental phenomenology focuses on describing a phenomenon's characteristics, rather than determining a phenomenon's meaning or essence (Tuohy, Cooney, Dowling, Murphy, & Sixsmith, 2013). In contrast, Heidegger's approach recognises that any attempt to describe the lived world involves an interpretation, given that "description itself is an interpretive process" (Kafle, 2013, p. 187). The element of interpretation is the significant difference between the way Husserl and Heidegger approach phenomenology (Seibt, 2012).

This phenomenological study seeks to interpret, rather than describe, the lived experience of research impact through a "'seamless fusion' of the researcher's and participants' perspectives about the phenomenon being investigated" (Matua & Van Der Wal, 2015, p. 25). As such, it follows a Heideggerian approach where interpretation aims to "make sense of what goes on, to reach out for understanding or explanation beyond the limits of what can be explained with the degree of certainty usually associated with analysis" (Wolcott, 1994, p. 10).

Heidegger's hermeneutic phenomenology bridges phenomenology and hermeneutics. Combining phenomenology with hermeneutics avoids a pure phenomenological approach which relies upon intuition without interpretation, and also avoids a pure hermeneutic

approach which interprets text without considering the meaning behind the text (Lindseth & Norberg, 2004). As noted by Todres and Wheeler (2001), phenomenology without hermeneutics lacks in reflexivity and may be superficial, whereas hermeneutics without phenomenology may be theoretically abstract due to a lack of grounding in individual experiences and the potential for over-generalisation.

Hermeneutic methods acknowledge the ontological perspective of French phenomenologist, Maurice Merleau-Ponty (1962), that "we are involved in the world and with others in an inextricable tangle" (p. 454). The inextricable tangle affirms the significance of context in seeking to understand the experience of others, reinforcing this study's constructivist-interpretivist research approach (Bryman, 2007; Lincoln et al., 2011). Hermeneutic phenomenology acknowledges that "lived life is always more complex than any explication of meaning can reveal" (Max van Manen, 2016, p. 18), and therefore does not attempt to identify "a single fundamental truth" (Lindseth & Norberg, 2004, p. 151).

This study seeks to explore the experiences of higher education research executives, institutional leaders, senior research officers and researchers so that the phenomenon of research impact can be understood from the perspective of those who experience the phenomenon (Titchen & Hobson, 2005). Understanding the meaning of research impact will help address concerns that impact terminology is not well understood (Penfield et al., 2013), and support the challenging process of assessing the impact of research (Brewer, 2011; Milat et al., 2015; Wood, 2014).

Research method: Digital Futures CRN case study

The Digital Futures CRN was selected as the case study for this research in order to explore research impact from a "holistic and real-world perspective" (Yin, 2014, p. 4). The selection of a single case study enables research impact to be explored at a deeper level (Yin, 2014), to

identify issues that may not be evident in a multiple case study approach (Denscombe, 2014). As noted by Creswell and Plano Clark (2007), "more than one case study dilutes the overall analysis" (p. 101).

The selected case study was a bounded research program (Creswell, 2013) of five multidisciplinary research projects that operated functionally and structurally under constant conditions of governance, leadership, funding, composition, location, training, timing, access to resources, and key performance indicators. Such controlled variables enabled research impact to be explored in detail whilst minimising variations in research inputs. Exploring perceptions and experiences of research impact, shared by those who experience the phenomenon, will contribute current and relevant knowledge about the phenomenon of research impact.

The Digital Futures CRN operated between June 2011 and May 2016 at the University of Southern Queensland (USQ) located in Toowoomba, Australia. USQ is a regional university with a research vision to deliver global impact through collaborative regional research across a number of priority areas including agriculture and natural resource management, regional development, regional health and well-being, education and digital literacy (University of Southern Queensland, 2015). The Digital Futures CRN was one of fifteen CRN programs funded by the Australian government in 2011 and 2012.

The aim of the CRN program was to "encourage less research-intensive smaller and regional higher education institutions to develop their research capacity" (DIICCSRTE, 2012, p. 4) by partnering with larger research-intensive institutions. A total of twelve projects were funded by the Australian Government in May 2011 to the value of $61.5 million, with a further three projects funded in May 2012 to the value of $19.6 million (ACIL Allen Consulting, 2015). During the Digital Futures CRN, USQ partnered with The Australian

National University (ANU) in Canberra, and the University of South Australia (UniSA) in Adelaide.

The research focus of the Digital Futures CRN was to explore the future in a digital age within three specific sub-themes of social and policy challenges in a digital future, participation in higher education, and technology rich learning environments. The Digital Futures CRN supported five multidisciplinary research projects that were individually funded to encourage interdisciplinary research and inter-institutional collaboration (Table 2).

Table 2

Overview of the five projects within the Digital Futures CRN

Project number and title	Research focus
Project 1 Facilitating mobility	This project researched mobile learning to develop a framework for mobile learning that will assist higher education institutions, learning designers and educators to evaluate the impact and sustainability of mobile learning initiatives within a range of environments.
Project 2 Digital divide	This project investigated the extent of the digital divide in Australia and its determinants in rural and regional communities.
Project 3 Virtual extension	This project developed and tested the effectiveness of a technology rich learning environment to help farmers make complex decisions around climate risk management.
Project 4 Remote laboratories	This project researched innovative ways to build and use Remote Access Laboratory systems in Science, Technology, Engineering and Maths (STEM) education.
Project 5 Connected learning	This project developed and piloted new technology to connect participants through rich online learning communities that satisfy and enhance information requirements.

The research approach explores the lived experience of research impact from the perspective of participants involved in the Digital Futures CRN. Particular attention was given to the unit of analysis in designing the research so as not to confuse the unit of data collection with the unit of analysis (Yin, 2014). The unit of analysis was deemed to be the Digital Futures CRN program, rather than the Digital Futures CRN projects that comprised the program, however the research does not attempt to aggregate individual data to infer project-level or program-level perspectives. To do so, would undermine the phenomenological approach to the research that aims to understand how individuals, rather than groups, experience research impact (Hesse-Biber & Leavy, 2010). Although the data collection process was designed to encourage responses at the program level, rather than the project level, the focus of the research remained on understanding individual perceptions and experiences of research impact. As explained later in this thesis, the findings from the Digital Futures CRN suggest that research impact is a complex and nebulous phenomenon.

Data collection

Phenomenological research requires a data collection method that encourages research participants to share detailed descriptions of the phenomenon being explored (J. Smith et al., 2009). Such descriptions are necessary so the researcher can gain a detailed understanding of the phenomenon to reveal the lived experience of research impact. A three-stage data collection process used interviews and focus groups to collect data on the perceptions and experiences of research impact (Figure 5).

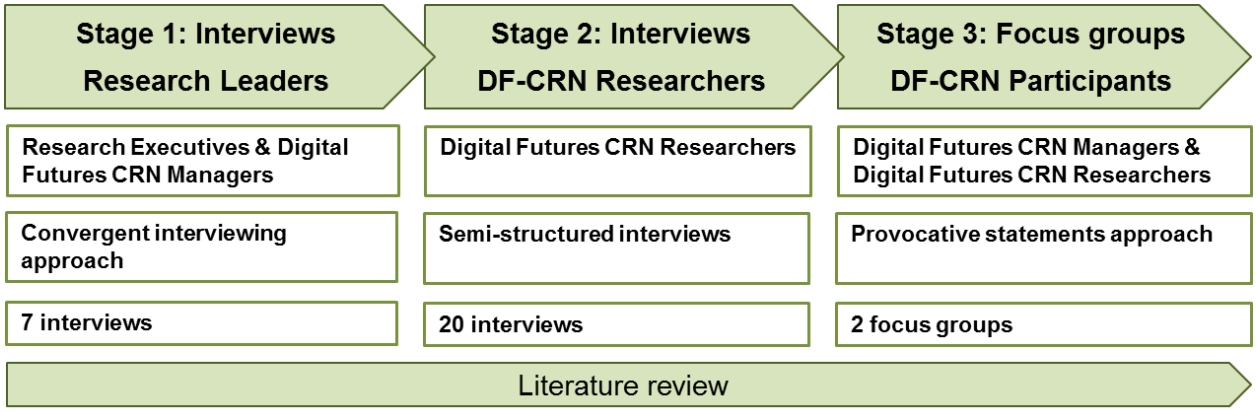

Figure 5. Three-stage data collection.

Interviews and focus groups facilitate extended discussions, and therefore generate rich qualitative data, as research participants share perceptions and experiences on an individual or group basis. Interviews are typically relied upon in phenomenological research (Giorgi, 2009; Gray, 2009) as they encourage detailed participant responses (Patton, 2003) due to the one-on-one interaction, and the opportunity for the researcher to ask questions to seek further information (Bernard & Ryan, 2010). Exploring the lived experience of research impact required a method that would enable participants to provide perspectives in their own words (Kvale, 1996). For these reasons, and because interviews provide the "richest information per unit of time invested" (Guba & Lincoln, 1981, p. 187), interviews were used to collect data on individual perceptions and experiences of research impact during Stages 1 and 2.

Focus groups were used during Stage 3 to enable research participants to discuss findings emerging from the Stage 1 and 2 interviews, and to elicit data that may only become evident through interaction (Ho, 2011) as participants bounce ideas off one another (Vanderford, Gordon, Londo, & Munn, 2014). The group process of exploring shared and contrasting opinions (Bernard & Ryan, 2010), and problematising assumptions can reveal "dramatic changes of heart" (Barbour, 2008, p. 133). In this study, focus groups proved effective in revealing perceptions of research impact that had not emerged during the interviews, such as the potential for research impact to be negative.

In seeking to answer the main research question, there was a need to understand perceptions and experiences of research impact across a range of stakeholders, both internal and external to the Digital Futures CRN. A purposive stratified sampling approach was employed to ensure research participants were familiar with the phenomenon of research impact (Groenewald, 2004), and would be able to provide information to "purposefully inform an understanding of the research problem and central phenomenon in the study" (Creswell, 2013, p. 156). Purposive sampling of research executives, institutional leaders, senior research officers and researchers helped to ensure a wide range of insights was captured within the selected sample (Merriam, 2002). In addition to this, a stratified sampling approach that investigates "samples within samples" (Patton, 2003, p. 5) ensured data was collected from researchers with a diversity of disciplinary orientation, research experience and project team membership.

Two groups were identified as comprising relevant research participants: Research Leaders and Digital Futures CRN Participants (DF-CRN Participants) as shown in Figure 6.

Figure 6. Overview of the research design showing the research participants involved in each of the three research stages.

The Research Leaders group was comprised of Research Executives and Digital Futures CRN Managers (DF-CRN Managers). The Research Executives group included chief executive officers, directors and senior academics from a range of research organisations across Australia. The DF-CRN Managers group included institutional leaders and senior research officers who were directly involved in leading and managing the Digital Futures CRN. The Research Leaders were considered to be *subject experts* (Viswanathan et al., 2014) or *key informants* (S. A. McKenna & Main, 2013; Parsons, 2008). The individuals in this group held positions that provided special access to knowledge about the research system (Ragupathy, Tordoff, Norris, & Reith, 2012), and were selected on the basis of five criteria suggested by Tremblay (1957): (1) holding formal positions in the community, (2) having knowledge relevant to the study, (3) being willing to share this knowledge, (4) being effective communicators, and (5) being unbiased or able to reflect upon their own biases. These criteria were considered important for ensuring that the data shared by the Research Leaders reflected key informant perspectives. The Research Leaders were purposively selected for their knowledge on the topic, rather than because they represented all Research Leaders (Parsons, 2008).

The DF-CRN Participants group included the DF-CRN Managers as well as Digital Futures CRN Researchers (DF-CRN Researchers). The DF-CRN Researchers were the research-active participants within the larger group of DF-CRN Participants; that is, each DF-CRN Researcher participated in research activities such as collecting, analysing or publishing research data (Howard et al., 2013) for one of the five Digital Futures CRN projects.

The DF-CRN Managers group was comprised of institutional leaders and senior research officers from the Digital Futures CRN. Research participants in this group were Research Leaders as well as DF-CRN Participants.

In Stage 1, interviews were conducted with seven Research Leaders to explore perspectives of research impact and identify key topics that would inform development of the research questions for Stage 2 interviews.

In Stage 2, interviews were conducted with 20 DF-CRN Researchers to explore perceptions and experiences of research impact using the Digital Futures CRN as the basis for discussion.

The Stage 1 and 2 interviews were conducted from early December 2014 to mid-April 2015. During this time, there was a period of five weeks during which no data was collected due to the Christmas/New Year holiday period in Australia (Figure 7).

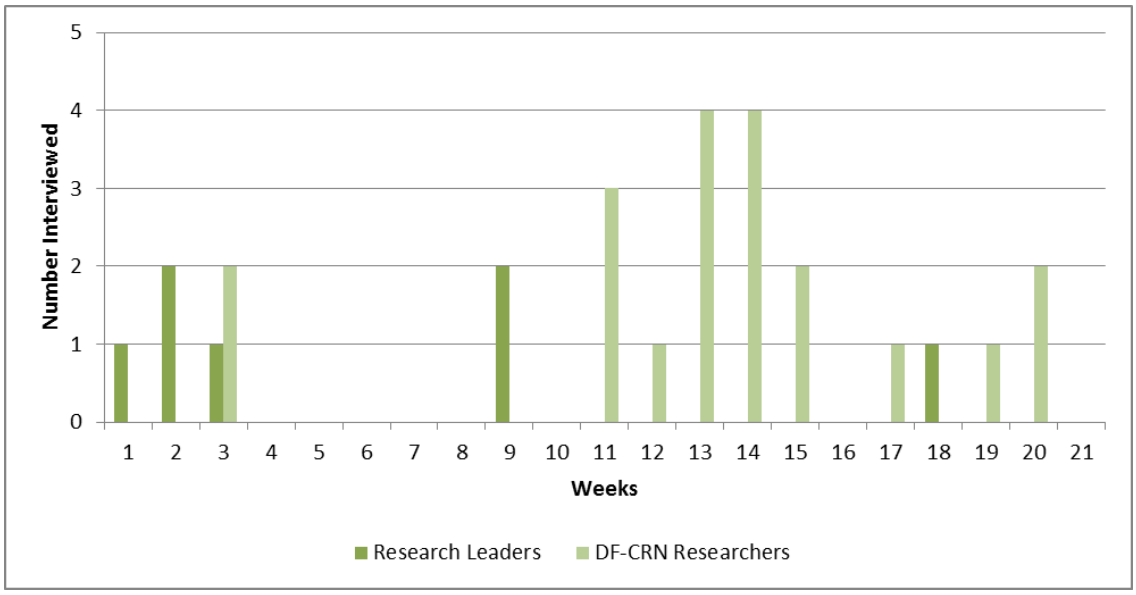

Figure 7. Progress of Stage 1 and 2 interviews over the 20-week period.

In Stage 3, focus groups were conducted with ten DF-CRN Participants to discuss concepts emerging from the analysis of Stage 1 and 2 interview data. The process for analysing data and synthesising the emerging concepts into five themes of research impact is discussed later in this thesis.

Prior to commencing data collection, ethics approval was obtained.

Research ethics

Ethics approval for this research was granted by the USQ Human Research Ethics Committee in September 2014 (HREC Approval Number: H14REA163, Appendix C). Risks for the research were deemed to be minimal with no minority groups identified. The welfare and rights of participants were considered at all stages of the research process, including seeking informed participant consent, providing the opportunity for participants to withdraw from research activities at any time, de-identifying data for research participants, and securely storing all research notes, transcripts and audio-files according to USQ data management protocols and ethics requirements. All ethics documentation emphasised the confidential nature of the data collection process, and highlighted the availability of research findings to participants who indicated they were interested in receiving research findings after completion of the research. All research activities were conducted in accordance with the *Australian Government's National Statement on Ethical Conduct in Human Research 2007* (updated May 2015).

Stage 1: Interviews with Research Leaders

The first stage of data collection involved interviews with Research Leaders. An email was sent to eight Research Leaders seeking their participation in the research. A letter, attached to the email, outlined the research study and the Digital Futures CRN (Appendix D). Research Leaders were also sent a participant information sheet and consent form (Appendix E). Responses were received from all Research Leaders, with a total of seven Research Leaders agreeing to be interviewed. The Research Leader who declined the invitation to participate did not provide details of why such a decision had been made.

The interviews with Research Leaders used a convergent interviewing approach. Convergent interviewing is an efficient process for identifying key issues in areas that are

under-researched (Dick, 2012; Sally Rao & Perry, 2003), and for highlighting issues relevant to a wide range of individuals in a population (Jepsen & Rodwell, 2008). The technique works best with participants that have an expert knowledge of the research area (Jepsen & Rodwell, 2008), such as the Research Leaders selected for Stage 1.

The aim of convergent interviewing is to identify issues of convergence and divergence in a topic area by focusing on information that is mentioned repeatedly (Dick, 1990). A series of structured in-depth interviews are conducted that enable the researcher to progressively refine the interview content after each interview (Given et al., 2015), so that later interviews, although based on the same broad questions, focus on exploring and clarifying issues that became apparent in previous interviews (Bohle, Quinlan, Kennedy, & Williamson, 2004). Questions become more specific as interviews progress, with questions in subsequent interviews focusing on overlapping items, and ignoring items that did not stimulate good discussion. Issues gradually converge by "exploring issues mentioned by multiple interviewees… [and] discarding tangential information, or idiosyncratic material mentioned by single interviewees" (Bohle et al., 2004, p. 22). Convergence is deemed to occur when information is mentioned in multiple interviews. Divergence is deemed to occur when information is only mentioned in a limited way or by isolated interviewees.

The convergent interviews with the Research Leaders were conducted mostly by telephone due to participants being located in Canberra, Sydney and Brisbane. Each interview followed the convergent interviewing process of introduction and rapport building, opening question and response, probe questions and responses, summary and close (Dick, 2012). The initial set of questions posed to participants (Appendix F) were informed by key issues identified during the literature review (Perry, 1998). Key issues included research impact terminology, the contemporary focus on funding applied research, responsibility for achieving impact from research, and barriers to achieving impact from research. Although the

convergent interviewing process suggests discarding low priority information, Dick (1990) recommends that researchers should not ignore issues given high priority by individuals. One such issue was the concept of *end-user*. Despite being mentioned by only one Research Leader during Stage 1 interviews, the concept of end-user was explored during Stage 2 interviews with DF-CRN Researchers due to the significance of comments made by the Research Leader. In Chapter 4, confusion over the end-user of research is discussed and analysed. There was no attempt to explore issues of agreement or disagreement during Stage 1 as this was pursued in Stage 2 interviews. Issues of convergence and divergence are presented in Chapter 4.

The interviews with Research Leaders were audiotaped to ensure that original material would be available for reference during the data analysis process. Each participant provided written consent for this to occur. Due to the interviews being audiotaped, extensive notes did not need to be taken during each interview. This permitted greater engagement with the data, in terms of focusing on verbal and visual cues, to apprehend the meaning afforded to the phenomenon by the research participants (C. Butler, 2015). However, memos were taken to support the ongoing data analysis process by capturing key thoughts and ideas. Memos are "short phrases, ideas or key concepts" (Creswell & Plano Clark, 2007, p. 183) that record what the researcher "hears, sees, experiences and thinks" (Groenewald, 2004, p. 13) during the process of collecting and reflecting on data. Memos help to increase recall accuracy (Middendorf & Macan, 2002) and to highlight significant words and concepts to be explored further.

A detailed coding system supported the process of memo-taking: insightful statements or useful quotes were identified with quotation marks; unusual comments or thoughts were underlined; and information that seemed particularly important to the research participant, evident through being emphasised or repeated, was double underlined. Exclamation marks

were added to indicate surprise at hearing particular comments, with arrows and lines used to link information that appeared to be related. The memos were an effective way to identify key concepts that would be used to inform the data coding process discussed later in this chapter.

Stage 2: Interviews with DF-CRN Researchers

The objective of Stage 2 interviews was to collect data from DF-CRN Researchers on their perceptions and experiences of research impact. An initial target of 20 research participants was set for Stage 2 to ensure data could be collected from a diversity of DF-CRN Researchers. The target was developed on the basis that interviews would be conducted with four DF-CRN Researchers from each of the five research projects. To ensure the target number of interviews was achieved, email invitations were sent to a total of 25 people requesting their participation in interviews. Each email guaranteed confidentiality and included the words "If you agree to participate, could you please reply to this email" (Appendix G). The final sentence was prepared with deliberation, and a nil response was deemed to be a preference not to participate. The email also contained the same participant information sheet and consent form that had been sent to the Research Leaders (Appendix E).

The response rate for Stage 2 interviews was 80% with a total of 20 people agreeing to be interviewed. Interviews with the DF-CRN Researchers were conducted on a face-to-face basis where possible, however five interviews were conducted by telephone due to researchers being located outside the Toowoomba region.

The questions posed to the research participants were informed by the issues of convergence identified from the Stage 1 interviews with Research Leaders. Prior to commencing each interview, research participants were assured that responses provided by them would remain anonymous, and that all data collected would be de-identified.

Participants were also requested to provide written permission to participate in the interview, and authority for the interview to be audiotaped.

Being a colleague of the research participants, there was potential for DF-CRN Researchers to feel pressure to embellish experiences of impact (Chubb & Watermeyer, 2016). In addressing this risk, research participants were advised at the beginning of each interview that the research sought to understand individual perceptions and experiences of research impact (J. Smith et al., 2009), without attempting to assess, measure, judge or value the impact of research. Interviewees were also assured that there were no right or wrong responses to each question.

Interview questions were sequenced so as to progress from broad questions, aimed at exploring researcher perspectives of research, to more specific questions about research impact (Appendix H). The first question asked in each interview – *What do you like most about research?* – was designed to establish rapport with participants (J. Smith et al., 2009) so they would be encouraged to trust the researcher and provide data rich in detail (W. S. Harvey, 2011). After this, questions were grouped according to the issues of convergence identified in Stage 1. Interviewees were given adequate time to reflect on each question and provide a response, to encourage "richer, fuller answers" (J. Smith et al., 2009, p. 65). At times, probing questions and statements were used to encourage interviewees to expand on comments made (Bernard & Ryan, 2010).

At the end of each Stage 2 interview, participants were asked to provide some personal information including highest qualification achieved, years elapsed since obtaining the highest qualification, primary field of research against which they published, and research experience. Participant research experience was captured using research career categories of Research Higher Degree student (including PhD students), early career researcher with less than five years of research experience, mid-career researcher with between 5 and 15 years of

research experience, and senior researcher with over 15 years of research experience. This information was useful when analysing the research data, particularly where researchers discussed scholarly impact with reference to their career pathway.

The primary field of research was captured to determine disciplinary orientation. Responses revealed a vast array of fields of research across the DF-CRN Researchers. Although segregating disciplines into silos of *hard* or *soft* science may be misguided due to a permeability between disciplines (Bastow et al., 2014a), there is value in understanding disciplinary orientation as this impacts the belief systems of researchers (Creswell, 2014). At USQ, researchers are required to identify with one of two faculties. For this reason, the fields of research were synthesised and aggregated against either the USQ Faculty of Business, Education, Law and Arts, or the USQ Faculty of Health, Engineering and Sciences. Nine researchers identified with the Faculty of Business, Education, Law and Arts, and eleven researchers identified with the Faculty of Health, Engineering and Sciences. Understanding the disciplinary orientation of researchers was useful during focus group discussions where disciplinary orientation was evident in the way researchers perceived blue-sky and applied research. Although Stokes (1997) suggests there exists an interdependency between blue-sky and applied research, participants distinguished between these types of research when discussing real-world impact.

Detailed information about the disciplinary orientation, research experience or project team affiliation of the DF-CRN Researchers is not provided in this thesis to ensure the non-identification of interview participants. However, there is value in understanding how interview participants were distributed in terms of research experience and project team affiliation given the purposive sampling approach. There were fewer mid-career and senior researchers in the sample reflecting the overall composition of the Digital Futures CRN. A

lower participation rate of DF-CRN Researchers associated with Projects 2 and 4 reflected smaller project team sizes.

In qualitative research, the intent is to continue collecting data until the concept being explored can be "adequately explained" (Hyde, 2003, p. 48). The individual nature of lived experience means that it is not reasonable in phenomenological research to use theoretical saturation as a basis for ceasing data collection (Gentles, Charles, Ploeg, & McKibbon, 2015). Rather, the interviews with the DF-CRN Researchers continued until similar information was being repeated in each interview (Maxwell, 2005), with no new information emerging in terms of issues or themes (Smith, 2011). This occurred after a total of 20 interviews had been conducted.

Stage 3: Focus groups with DF-CRN Participants

The research design included focus groups with DF-CRN Participants as Stage 3 of the data collection process. The aim of the Stage 3 focus groups was to review concepts emerging from the analysis of Stage 1 and 2 interview data. The focus groups were conducted as part of the iterative process of analysing data.

Focus groups are useful for exploring perceptions relating to a particular topic (Nyamathi & Shuler, 1990). An *unfocused* focus group technique, using naturally-occurring social groups, was employed to minimise the experimental effects of focus groups (Randle, Mackay, & Dudley, 2014). In unfocused focus groups, participants engage in non-directed discussions that more closely replicate everyday life situations (Randle et al., 2014). The moderator provides introductory comments and then takes a passive role, neither guiding discussions nor contributing verbally. The approach has been used since the 1970s (Randle et al., 2014), and is an effective way of encouraging participants to engage in "free-flowing, spontaneous conversation" (Mackay, 2012, p. 47).

Research participants for the focus groups were drawn from the group of DF-CRN Participants that had been interviewed during either Stage 1 or Stage 2. These participants had a good understanding of the research topic, and had already provided individual accounts of research impact during their semi-structured interviews (J. Smith, 2004). Evidence suggests that the social atmosphere of a group influences the narratives produced (McGregor, 2004), so focus group members were carefully selected to ensure participants felt comfortable discussing their own experiences in front of other group members (J. Smith, 2004). The value of the unfocused focus group technique is that participants are known to each other (Mackay, 2012). In composing the focus groups, various sampling strategies were considered, including groups of project team members, groups across project teams, and groups of co-located researchers. After exploring the various options, focus group participants were selected from groups of co-located work colleagues, who had daily on-campus contact with each other.

Invitations were sent by email to a total of ten DF-CRN Participants located across two campuses of USQ (Appendix I). The email contained a participant information sheet outlining the focus group approach, and a consent form (Appendix J). A participation response rate of 100% was attributed to a high level of interest in the research topic arising from Stage 1 and 2 interviews.

Two focus groups were organised to take place in September 2015. The first focus group was held at the USQ Toowoomba campus, and the second focus group was held at the USQ Springfield campus which is located 120 km from the USQ Toowoomba campus. Each focus group comprised five participants with a diversity of disciplinary orientation, research experience, project team affiliation and gender (Figure 8).

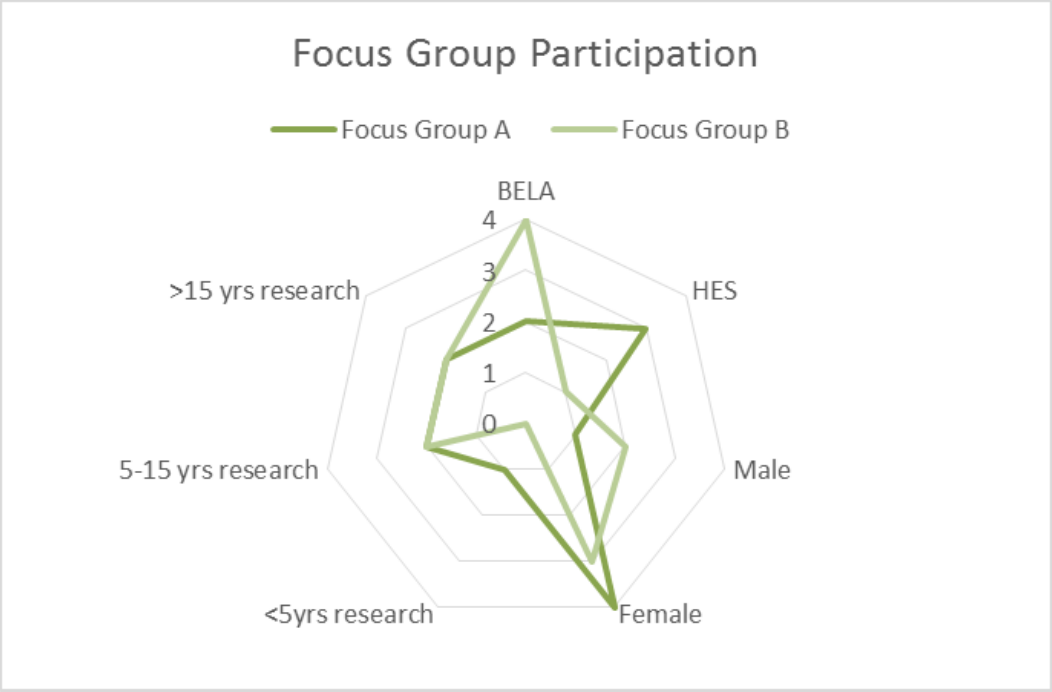

Figure 8. Radar diagram showing key characteristics of focus group participants.

Participants in each focus group were purposively sampled. Miles and Huberman (1994) suggest that collecting data from "persons known to have a strong bias" (p. 270) is a good way to verify conclusions and strengthen data validity. For this reason, each group included one representative from the DF-CRN Managers group who were proponents of the Digital Futures CRN.

At the beginning of each focus group, participants were asked to confirm their familiarity with each other, and were requested to provide written ethics consent to participate in the focus group, and approval for the focus groups to be audiotaped. Following this, participants were provided with an overview of the unfocused focus group technique, and the provocative statements approach that would be used within the focus group. The provocative statements approach requires participants to be provided with challenging statements to stimulate group discussion and encourage participants to share stories (Oetzel, Simpson, Berryman, Iti, & Reddy, 2015). Provocative statements are an effective way to

elicit strong discussion on topics (Wellings, Branigan, & Mitchell, 2000). The technique was used by Boyer (1990) when seeking academic perspectives on the value of multidisciplinary work; Boyer provoked discussion by suggesting that such work is soft and should not be considered scholarship.

The provocative statements (Figure 9) were developed from analysing Stage 1 and 2 interview data. The evolution of the provocative statements is addressed in Chapter 4.

Figure 9. Provocative statements provided to focus group participants.

Each provocative statement was distributed to participants just prior to being discussed so that participants would not be distracted by having multiple statements in front of them. The statements were strategically sequenced to funnel participants towards issues that were potentially more sensitive (J. Smith et al., 2009). For example, the final statement – *"Researchers care more about impact factors than making an impact on the world"* – sought to stimulate discussion about the contemporary motivations for research, and explore the potential for scholarly impact to be pursued at the expense of real-world impact (K. M. Smith, Crookes, & Crookes, 2013).

The focus groups were not intended to achieve consensus, as each participant has a unique lived experience of research impact. Rather, the focus groups were intended to facilitate discussion of the concepts revealed during Stage 1 and 2 interviews, and highlight any shared perspectives. Although Randle et al. (2014) suggest that no time limit be set, focus groups were designed to take 60 minutes so that busy researchers would be more inclined to participate. Despite no intervention by the moderator, each focus group reached a "natural conclusion" (Randle et al., 2014, p. 26) within 60 minutes when the group had completed discussing the six provocative statements. Appendix K contains the focus group running sheet.

Data management is an important research activity. The next section explains the process for transcribing and de-identifying research data.

Data management

Audiotape files from the interviews were transcribed verbatim using the services of an external professional transcribing agency. Hermeneutic phenomenological analysis supports verbatim transcription so the full text can be reviewed prior to being dissected, and then reviewed and interpreted as a full text again (Benzein, Norberg, & Saveman, 2001). Once

transcribed, each interview transcript was reviewed against the audio recording, and where necessary, amendments made to correct text, complete missing information and expand abbreviations added by the professional transcriber.

Participant data was de-identified immediately following each interview to ensure data remained confidential and anonymous. Participant codes were used for naming memos, audio files and transcriptions, with interview participants given contracted identifiers (e.g. L1), and focus groups participants given gender-neutral identifiers (e.g. Ray).

A process of thematic analysis was used to analyse the data collected during Stages 1, 2 and 3.

Thematic analysis

In phenomenological research, the process of analysing data is iterative rather than linear. The researcher moves backwards and forwards through "a range of different ways of thinking about the data, rather than completing each step, one after the other" (J. Smith et al., 2009, p. 28). The researcher collects and analyses data concurrently (Michael van Manen, 2012), gliding between empathy and suspicion (J. Smith et al., 2009) in seeking to understand the meaning of lived experience. The concurrent approach to collecting and analysing data is more productive than delaying data analysis until after data collection has ceased, and enables the final stage of analysis to become a time for ordering ideas that were previously developed (Ely, Vinz, Downing, & Anzul, 1997).

The aim of thematic analysis is to identify, analyse and report patterns within the data that capture important aspects relating to the research question (Braun & Clarke, 2006). As suggested by Ely et al. (1997), themes do not reside in data but rather "reside in our heads" (p. 7) in the way we consider and conceptualise the data. Throughout the process, the researcher must avoid applying prescriptive methods of analysis (Giorgi, Fischer, & Von

Eckartsberg, 1971), and instead, remain flexible and responsive to the phenomenon by engaging with any unanticipated issues that may emerge (Eatough & Smith, 2006). As noted by J. Smith and Osborne (2003), interpretations of impact are complex due to a "double hermeneutic" (p. 53) whereby the researcher attempts to make sense of the participant who is making sense of the research topic. These comments recognise the constructivist-interpretivist approach to this research study, and the role of the researcher in co-constructing reality.

For this study, data collected during interviews and focus groups was analysed over a period of eighteen months. A six-step process guided the data analysis: (1) reading and re-reading, (2) initial noting, (3) developing emergent themes, (4) searching for connections across emergent themes, (5) moving to the next case, and (6) looking for patterns across cases (J. Smith et al., 2009). These six steps provided a clear structure for condensing units of meaning into statements and themes.

The hermeneutic cycle of reading, reflective writing and interpreting (Laverty, 2008) aims to identify "chunks" (J. Smith et al., 2009, p. 91) of data that can be expressed as themes capturing the research participant's words as well as the researcher's own interpretation. As suggested by J. Smith et al. (2009), meaning was deciphered from the data in three ways: from part of a sentence (one word or several words); from a whole sentence; or from an entire exchange (a full interview or focus group discussion). For example, a word has meaning within the context of the whole sentence, and the meaning of a sentence becomes apparent by aggregating the meanings of individual words (J. Smith et al., 2009). The process of describing, comparing and relating data (Bazeley, 2013) seeks to reveal similarities in experiences between participants (M. Walter, 2013). The importance of dissecting text in hermeneutic phenomenology is noted by J. Smith et al. (2009), who suggest that "to understand any given part, you look to the whole; to understand the whole, you look to the

parts" (p. 28). Findings need to be viewed "in relation to one another and against larger theoretical perspectives" (Ely et al., 1997, p. 160) such as the researcher's emergent views or the body of literature. For this reason, the literature search continued for the duration of this study, in order to extend research knowledge, clarify understanding and explore emerging dimensions of research impact.

The process of coding data supports qualitative analysis (Gibbs, 2007; Maxwell, 2005), and is a key activity in analysing phenomenological data (Bazeley & Jackson, 2013). Coding assigns "tags or labels" (Coffey & Atkinson, 1996, p. 26) to the data, and when done on a progressive basis, rather than being delayed until the end of data collection, supports the process of ongoing analysis (Miles & Huberman, 1994). Codes were developed from the "conceptual framework, list of research questions, hypotheses, problem areas, and/or key variables" (Miles & Huberman, 1994, p. 64) of the study, as well as from the concepts emerging from the data.

Cognisant of comments by C. Butler (2015) that transcripts focus on content at the expense of context, early analysis of data focussed on the audiotapes rather than the transcripts, to avoid any loss or misunderstanding that may occur when tone is absent. Listening repeatedly to audiotapes helps to develop a holistic sense of the interview and familiarity with the words of the participants (Groenewald, 2004). Again, memos were taken while listening to the audiotapes to capture decisions made and conceptualise theory (Birks, Chapman, & Francis, 2008).

Qualitative data management software – NVivo – supported the process of analysing data. NVivo is a useful tool for organising and managing qualitative data (Bazeley & Jackson, 2013) as it offers affordances in terms of speed, visual representation of data, consolidation of data into one database, and consistency of coding (Holliday, 2007). NVivo facilitated the process of applying codes to sections of data, enabling data to be organised prior to a more

detailed analysis (Wertz, 2005), and facilitating the process of retrieving and comparing similarly coded text (Gibbs, 2007). The coding activity continued throughout the process of theorising and analysing data with new codes emerging, codes evolving into other codes, and some codes becoming less relevant to the phenomenon of research impact (Gibbs, 2007). However, although data coding is an important activity in terms of analysing text, the coding process does not suffice as data analysis (Bazeley & Jackson, 2013). As noted previously, context can be lost when focussing on text alone so "researchers should engage with audio, video, or field-notes alongside the text" (C. Butler, 2015, p. 173), rather than rely on transcripts alone. For this reason, audiotapes were played during the process of coding data to identify audible communication cues – "ironically/sarcastically/enthusiastically" (C. Butler, 2015, p. 173) – that may not have been apparent from text alone.

Research quality and credibility

Bryman (2007) argues that quantitatively-grounded measures of reliability and validity are less relevant in the case of qualitative research. However, there remains a need to judge the quality of qualitative research as a basis for establishing research credibility (Patton, 1990).

In the following sections, the quality and credibility of this study are demonstrated across three dimensions – reflexivity, triangulation and member validation (Shenton, 2004) – to show how the research method, in its application, supports the conclusions reached (Maxwell, 2002).

Reflexivity

Reflexivity is an important process whereby a researcher recognises his or her own impact on the research process (Chan, Fung, & Chien, 2013; Kuper, Lingard, & Levinson, 2008). As noted by Jasper (1994), "the researcher comes to the phenomena with a set of preconceptions

and experiences which may influence the way the experience is described by the participant, and the way the data are used, interpreted or analysed" (p. 311). Being reflexive helps researchers to recognise any pre-conceptions, biases and theoretical perspectives they may be imposing on the research being undertaken (Kleiman, 2004). Reflexive self-awareness enables the researcher to carefully manage the dual processes of restraining pre-conceptions and exploiting pre-understandings (Finlay, 2008). Whilst hermeneutic phenomenology does not require researchers to "bracket" (set aside without abandoning) their own theories or pre-conceived notions during the process (Crist & Tanner, 2003), it is good practice for researchers to acknowledge, in an explicit way, any biases (Boaz & Ashby, 2003) and assumptions (Kafle, 2013) that may influence the research process.

The process of being reflexive enabled me to identify how my individual perceptions of research impact had been influenced by institutional policies and practices that emphasise the importance of scholarly impact. Although research institutions, funding agencies and government are articulating the prioritisation of real-world impact, there remains a strong focus on scholarly impact driven by reward mechanisms in the higher education sector. This perspective had influenced my own attitudes relating to the phenomenon of research impact. Although I assumed that real-world impact surpassed scholarly impact in terms of achieving public good, I was biased towards scholarly impact as evidence of researcher credibility when assessing research impact. Acknowledging this assumption and bias in an explicit way was enlightening. I committed to restrain my pre-conceptions of research impact during each interview and focus group by remaining "empathetic, neutral, nonjudgmental and appreciative" (Patton, 2003, p. 8). However, I also endeavoured to immerse myself in the participants' worlds (Wertz, 2005) to share their experiences, ideas and concerns (J. Smith et al., 2009).

Triangulation

Triangulation refers to the observation of research issues from two or more different sources, different times, different places or different people (Flick, 2004). The use of triangulation supports research credibility by determining whether research findings are consistent (Yin, 2014). In this study, data triangulation and methodological triangulation are evident.

Data triangulation focuses on the sources of data, and is an effective way to identify data discrepancies, and may be useful for highlighting distorted or concealed perceptions (Wells, Hirshberg, Lipton, & Oakes, 2002). The purposive sampling approach employed in this research is evidence of data triangulation. Collecting data from DF-CRN Participants with a diversity of disciplinary orientation, research experience and project team affiliation strengthened the validity of the research findings by corroborating evidence across a range of perspectives (Creswell, 2014). In addition, data was collected from Research Leaders, further strengthening triangulation by extending the sources of data. The process of "comparing and cross checking the consistency of information derived at different times and by different means" (Patton, 1990, p. 559) supports the integrity of qualitative analysis. Data triangulation is also evident in the way evidence was compared across multiple sources, including extant literature, which is noted as a particularly effective strategy for case study research (Riege, 2003; Yin, 2013). An extensive literature review, including material from key informants in the field, strengthened the process of data triangulation by corroborating research findings (Yin, 2014).

Methodological triangulation aims to illuminate inconsistencies in research findings by revealing "real-world nuances" (Patton, 1990, p. 556). In exploring perceptions and experiences of research impact, data was collected using interviews and focus groups. The focus groups conducted in Stage 3 revealed perspectives about the public good role of research that conflicted with data collected during Stage 2 interviews. In doing so, the focus

groups proved effective as a process for methodological triangulation in researching the phenomenon of research impact.

Member checking

Member checking is the process of verifying information with the target group of research participants (J. Smith et al., 2009). The process is noted as an effective way to establish the integrity of research (Lincoln & Guba, 1985) by minimising the opportunity for measurement bias (Miller & Dingwall, 1997).

Member checking occurred during Stage 3 when focus groups were used as a forum for reviewing concepts emerging from the data (Miles & Huberman, 1994). During the focus groups, participants discussed provocative statements that encapsulated the concepts revealed from analysing Stage 1 and 2 interview data. Participants were able to support or challenge the concepts according to whether they reflected the common experience of focus group participants (Guba & Lincoln, 1981). Member checking does not seek convergence on one concept (Seale, 1999). Rather, member checking seeks to explore multiple perspectives (Seale, 1999), and provide an opportunity for research participants "to correct errors of fact or errors of interpretation" (Simon & Goes, 2010, p. 1). Such correction occurred during the second focus group when research participants challenged public good perceptions of research by suggesting that the impact of research may not always be beneficial for society.

Summary

This chapter has explained the theoretical background to the research, and argued that phenomenology is an appropriate choice of methodology for exploring the lived experience of research impact. The main research question – *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their*

research? – will be answered using the Digital Futures CRN as a case study. The Digital Futures CRN is a thematically bound research program that provides access to researchers with a range of disciplinary orientation, research experience and project team affiliation. A single case study was selected to minimise external influences on the research, and enable a deeper exploration of the phenomenon of research impact.

The qualitative research design uses interviews and focus groups to collect data from research executives, institutional leaders, senior research officers and researchers. In Stages 1 and 2, interviews are conducted with Research Leaders and DF-CRN Researchers to explore perceptions and experiences of research impact. In Stage 3, focus groups are held with DF-CRN Participants to discuss concepts emerging from the interviews.

The next chapter presents an analysis of the interview and focus group data, supplemented with extracts from the transcripts of research participants. The chapter explains how six concepts emerged from analysing Stage 1 and 2 interview data, and how these six concepts were synthesised into five themes of research impact following the Stage 3 focus groups.

CHAPTER 4 – RESULTS AND ANALYSIS

This chapter presents the results of the data collected during Stages 1, 2 and 3 when interviews and focus groups were conducted, and reports on the themes arising from analysing that data. The content of this chapter supports rigour in reporting qualitative research (Houghton et al., 2015) by articulating the decisions made in the process of reaching the research conclusions (Bazeley & Jackson, 2013). Such detail is especially necessary where research is undertaken by a sole investigator, since the process of analysing and interpreting data is influenced by a researcher's background, biases, assumptions and experience (Platts, 1993).

As outlined in Chapter 3, a process of thematic analysis (J. Smith et al., 2009) guided how the research data was described, analysed and interpreted (Wolcott, 2001). In this chapter, five themes of research impact are revealed: *research is useful for society; research impact is about making a difference; research impact is a nebulous concept; research impact includes scholarly and real-world impact; and research impact is a shared responsibility*. These themes capture a common construction of reality (Guba & Lincoln, 1989) to generate knowledge about how people experience the phenomenon of research impact (Hesse-Biber & Leavy, 2010). However, the themes do not make "existential claims" (Giorgi, 2009, p. 4), or imply a commonly-shared reality, as this would undermine the theoretical approach of constructivist research (Gibbs, 2007).

The five themes of research impact were synthesised from six concepts that emerged from analysing Stage 1 and 2 interview data. According to Newman (2001), an emergent concept is "a concept that arises as the result of a process of emergence" (p. 1). The six emergent concepts were: *research impact is good for society; research impact is about making a difference; research impact may be difficult to discern; research impact is*

challenging to assess; research impact includes scholarly and real-world impact; and research impact is a shared responsibility. This chapter presents the six emergent concepts, and explains how the emergent concepts were synthesised following the Stage 3 focus groups to reveal the five themes of research impact.

During the process of thematic analysis, NVivo qualitative data management software was utilised to facilitate the dissection of transcripts to identify emergent concepts (J. Smith et al., 2009) and interrogate the data for associations (Bazeley & Jackson, 2013). NVivo visualisations are included in this chapter to facilitate data comprehension, by exploring words used by participants and modelling theoretical connections (Bazeley & Jackson, 2013). The visualisations complement the process of thematic analysis by enabling data to be compared across different groups (DePaolo & Wilkinson, 2014), however they are not used in isolation for content analysis due to their focus on text without context (McNaught & Lam, 2010).

In this chapter, data is presented according to the three stages of research that were undertaken. In Stage 1, Research Leaders were interviewed to explore their perceptions and experiences of research impact, and refine the questions posed to DF-CRN Researchers in Stage 2. In Stage 2, DF-CRN Researchers were interviewed about their perceptions and experiences of research impact. In Stage 3, DF-CRN Participants, who had been interviewed during Stages 1 and 2, participated in focus groups to discuss the concepts emerging from the analysis of Stage 1 and 2 interview data.

Throughout the chapter, extracts from interview and focus group transcripts are provided to compare and contrast perceptions and experiences of research impact. These extracts have been carefully selected to avoid making generalisations on the basis of exotic but untypical examples (Gibbs, 2007), but to present the lived experience of research impact as expressed by individual research participants. The extracts are verbatim and contain textual

dysfluencies (C. Butler, 2015) to present an "objective and accurate account" (Kassin, Kukucka, Lawson, & DeCarlo, 2016) of what transpired during the interviews and focus groups. In discussing the data, literature is also referenced to provide insight into the relevance of the findings.

Analysis of interview data (Stages 1 and 2)

During Stages 1 and 2 of the data collection process, interviews were conducted with Research Leaders and DF-CRN Researchers to explore their perceptions and experiences of research impact. In this chapter, extracts from interview transcripts have been coded to ensure the anonymity of participants. The Research Leaders interviewed in Stage 1 are denoted using the prefix L. The DF-CRN Researchers interviewed in Stage 2 are coded using prefixes (S, M, E, P) that reflect the research experience of each participant (Table 3). No further details are provided about the disciplinary orientation, research experience or project team affiliation of the DF-CRN Researchers to support non-identification of the participants.

Table 3

Coding of Stage 1 and 2 interview participants

Interview participant group	Interview participant code
Research Leaders	L1 L2 L3 L4 L5 L6 L7
DF-CRN Researchers	
Senior researchers (more than 15 years research experience)	S1 S2 S3 S4 S5 S6
Mid-career researchers (5 – 15 years research experience)	M1 M2 M3
Early career researchers (less than 5 years research experience)	E1 E2 E3 E4 E5 E6 E7 E8
Research Higher Degree Students	P1 P2 P3

As outlined in Chapter 3, Research Leaders were interviewed during Stage 1 of the data collection process to explore their understanding of research impact. Data were collected from Research Leaders using a convergent interviewing technique that necessitated a process of ongoing data analysis, iterating between collection and interpretation (Bohle et al., 2004). The data collected were used in two ways. First, to elucidate perceptions of research impact held by Research Leaders that could be compared and contrasted to the perceptions of DF-CRN Researchers; and second, to identify issues of convergence and divergence that would be used to refine the interview questions posed to DF-CRN Researchers during Stage 2 of the data collection process.

Analysis of the interview data from Research Leaders revealed a convergence of issues relating to accountability for achieving impact, determining the finish of research, and achieving research impact. There was also evidence of convergence around who has, or should have, responsibility for ensuring research findings benefit society, and uncertainty over who has, or should have, responsibility for assessing research impact. During the interviews, there was evidence of confusion in the use of impact terminology such as outputs and outcomes.

The data revealed a divergence of issues relating to quality of research, the relationship between research quality and research impact, negative characteristics of impact, and the logic model approach to understanding impact. Whilst quality was understood in terms of methodological rigor necessary for research excellence (Boaz & Ashby, 2003), there was little suggestion of any relationship between research quality and research impact, and no reference to quality of impact. The convergent interviewing technique suggests that issues of divergence do not need to be explored in later interviews due to the issues being deemed less significant to the research participant (Dick, 1990). For this reason, Stage 2 interview questions explored research impact without seeking to understand whether impact was good

or bad. It was not until Stage 3 focus groups that negative impact emerged as a consideration in assessing the impact of research.

During Stage 2 interviews, issues of divergence would not be addressed, however Dick (1990) suggests giving special consideration to issues revealed as high priority by individuals in convergent interviews. One such issue was the concept of end-user in relation to research impact. The ARC (2016b) defines the end-user as "the person(s) or organisations(s) that will use or benefit from the product or service arising from the research" (p. 1). One Research Leader had suggested that the end user may not always be the person benefitting from the research findings, providing the example of a child (end-consumer) who benefits from a cereal choice made by the mother (end-user of the knowledge):

> It's a bit hard to say the end-user all the time… there's multiple people … it's always really hard to tell… often hard to differentiate which stakeholders you're talking about when you ask that question [about end-user]. (L2)

The Research Leader's comment reflects a perspective proposed by Pratt, Merritt, and Hyder (2016) who suggest there are three categories of people that participate in the research impact process: "research producers, research users and research beneficiaries" (p. 218). In an example provided by Pratt et al. (2016) for health research, the group *research beneficiaries* would include people such as patients, whereas the group *research users* would include policymakers and practitioners. The relevance of the Research Leader's comment, questioning the notion of end-user, became apparent during Stage 2 interviews when DF-CRN Researchers emphasised that research has no end. The notion of end-user tends to imply there is a final point beyond which research has no impact, whereas the literature notes that "research is a never-ending process" (Jha, 2014, p. 6), suggesting that research impact may be enduring.

During the convergent interviews, Research Leaders were asked *Have you got any comments about how best to assess the impact of research?* The comments made by one Research Leader reveal the anguish surrounding the impact agenda, and the dilemma of contemporary impact prioritisation and assessment activities:

> I think that the people who want to bring in performance metrics in this area need to be forced to clarify why they think this is important. Is it because politicians and bureaucrats need to have some arguments to justify public funding of research? …we have to go along with this kind of game if you like, this sort of charade, to demonstrate that we're taking accountability seriously. So I accept the need to do that up to a point, but I think my view is that we already do too much of that, we don't need to do it anymore. (L3)

The same Research Leader suggested that research needed to be relevant, emphasising that researchers should be able to determine their own research priorities:

> I've always been a believer in doing relevant research, but I want to be the judge of what is the relevance, and why I'm choosing to do certain kinds of research that I call relevant, rather than being forced on some sort of straightjacket to take someone else's priorities as the privileged areas on which research is to be done and other things that are not to be done. …I think that the language of significance and importance should be a much better proxy for talking about impact because we then have a range of arguments we can draw on, about contributing to understanding, contributing to a field of research, and academics themselves, can judge whether someone is doing something that's genuinely original or novel or interesting or significant, or something that's boring and narrow and repetitive and not really expanding the mental universe. (L3)

This comment was mirrored during Stage 2 interviews with the DF-CRN Researchers, and reinforces literature in Chapter 2 suggesting that responsibility for determining research priorities does not rest entirely with those outside academia (Collini, 2012).

The following sections report the results of a detailed analysis of data collected during Stage 1 and 2 interviews with the Research Leaders and the DF-CRN Researchers. The research findings, revealed from analysing data collected during the two stages, have been grouped into six emergent concepts (Newman, 2001): *research impact is good for society; research impact is about making a difference; research impact may be difficult to discern; research impact is challenging to assess; research impact includes scholarly and real-world impact;* and *research impact is a shared responsibility*. The six emergent concepts were synthesised following Stage 3 focus groups and amended to reveal five themes of research impact.

The first emergent concept is *research impact is good for society*, however this concept was later amended to *research is useful for society*.

Research impact is good for society

Across all interviews there was evidence that researchers aspire to achieve social good (Chubb, 2014). One Research Leader suggested that impact manifested in two forms being "public good and economic benefit" (L4), reflecting the social and financial dimensions of research expenditure (Gibbons et al., 1994). Researchers acknowledged the value of research for society, with strong statements made by those with more extensive research experience. One senior researcher shared the personal and social value of research noting that "doing research that changes the world is the key, is what keeps me going" (S4). A mid-career researcher emphasised the thrill of research with broader benefit, suggesting that real-world impact surpassed scholarly impact in terms of personal satisfaction:

> I enjoy when my research is used somewhere to make some informed decisions. In a broader – in a bigger way that when society gets benefits… The end goal is to do something good - produce something good out of the research, for the society, and for the humanity… Honestly I am not interested in producing like hundreds and hundreds

> of papers. My target is to do something which is good for the humanity. Because at the end of the day when I am retired I won't be judged that I have written hundreds of papers, but I will be judged on what I have done for the society. (M1)

Such comments reflect the vocational aspects of academic work (Barcan, 2013), and reinforce perspectives that universities have a civic mission to improve the public good (Cuthill, 2012). In seeking to understand more about the benefits of research, DF-CRN Researchers were asked to complete the sentence *Research makes the world a better place because… ?* Comments revealed a broad range of benefits from research, yet also reflected an uncertainty as to the exact impact of research, with participants qualifying responses with the clause *I think*. One mid-career researcher suggested that research "enables us to be more effective people I think" (M2). An early career researcher noted the role of research in solving real-world problems:

> I think it makes the world a better place because essentially you have people out there who have the skill set to find the answers to questions or problems that plague society when they either arise, or as society begins to increasingly recognise that they actually are problems that need some sort of answering. (E8)

The comments of DF-CRN Researchers were echoed by the Research Leaders who more confidently noted the ability for research to support broader enquiry. One Research Leader recognised the research question as being the driver of research activities:

> …[asking] those questions which can challenge us and then make us motivated and provide different perspectives which is interesting, and can prompt conversations and real insight into things that we might just take for granted. (L6)

The real-world impact of research was articulated by another Research Leader in terms of *the bigger picture* when noting the wider benefits of research:

> The way to make research worthwhile is to think about how you can do more than just benefit yourself. I think that's the biggest thing because some – the fact is you've

> got to look at the bigger picture and for me, where I am in my research and I suppose career and things, the more people I can benefit, the more excited I get because it means I've got not necessarily impact but it means that you're having some influence, hopefully for the better. (L5)

There was evidence that the objectives of research varied between early career researchers and senior researchers. Whereas an early career researcher noted the benefits of research from an individual perspective that "it helps us understand our world and each other; we can make the world a better place for everyone" (E4), a senior researcher conveyed the broader objectives of research that "it gives us new direction and hope for managing the massive challenges in the world such as famine and food security and natural disasters" (S4). These comments reflect the immediate and future benefits of research evident in the literature.

In seeking to understand how research impact manifests, interview transcripts were analysed to explore words used by the research participants when explaining the role of research. A variety of words were used to describe how research makes the world a better place, including "finds", "makes", "helps" and "gives" that hinted at the active role of research, with words such as "new", "better", "problems" and "ideas" highlighting the innovative aspects of research. Participants suggested that research impacts "people", "place", "lives", "the world" and "society" by "answering", "solving", "discovering", "providing", "finding new ways" and "making discoveries for progress". The discovery aspects of research were noted by early career researchers, with one participant stating that research was "the process of discovering new information" (E7). Comments from this cohort highlight the role of research in creating knowledge to solve real-world problems:

> Research makes the world a better place because, without it, we wouldn't learn new things, we wouldn't make discoveries, we wouldn't have cures for cancer, we wouldn't – we wouldn't know how the world exists, I guess, without research. (E3)

> I enjoy coming up with a question and a problem that I can see there's a real need to find an answer to, and I enjoy the process of looking into what's gone before, what we understand, looking across disciplines as well, so I can sort of bring hopefully a novel view to some problems, or the problems that I'm looking at. (E1)

> I enjoy the problem solving, I like to find an interesting problem, a difficult problem, a complex problem, and just start kind of picking at it and reading around it… I don't really know much about and then it piques my interest and I start reading around it and then I bring the theoretical and methodological approaches that I've been trained in, to start to unpack it. So that's what I love, I love that kind of the thrill of having a problem and trying to work out something that you can find the answers, something that you don't know, something that you can apply, some solution to an issue. (E2)

These comments by early career researchers reveal the interrogative nature of research in seeking to find out new things and solve problems. Literature suggests that the quest for knowledge is motivated by being intellectually dissatisfied (Collini, 2012), or simply curious (Jaspers, 1959), as noted by one early career researcher:

> It's not potentially what we do, but it's that thirst for knowledge, and that curiosity about the world, I think, that drives a lot of what science does and broader science. (E1)

However, for one senior researcher, the purpose of research was not necessarily to solve a problem, but to broaden the expanse of knowledge without a purpose in mind:

> Research isn't necessarily about determining solutions. It's about investigating welcome solutions, but for other people to apply solutions, they need that evidence and that knowledge from research… not every piece of research is about solution finding. Some of it is about exploring; it's about discovery as well as creating solutions – it's about discussing what the problem's base is, as well as what the different possible solutions might be, even if they turn out not to be the right one – the one that's chosen - there might not even be a solution at all, but they are just a possible thing – they should be investigated and explored. (S6)

This comment reinforces a broader perspective of research presented by Fenster (2014), that research delivers public benefit in terms of sharing enthusiasm for scientific discovery and the questions that underpin it. Another senior researcher presented a similar perspective of research, highlighting the opportunity for research to incite enthusiasm:

> Most people have a curiosity about the world around them, and most people appreciate learning something new, and sharing the excitement of a new discovery, even ones that have no direct benefit on them. So, for example, the discovery of new planets around other stars has absolutely no economic benefit, at least in the short term, but there is huge public and community interest, a voracious appetite for knowledge about these new worlds and new discoveries. (S5)

There was evidence across all interviews that research delivers a broad range of benefits, from expanding the knowledge base, to solving societal problems. Research participants reinforced the role of researchers in making discoveries and providing solutions. The academic as "trustee of the public good" (Barcan, 2013, p. 79) was implicit in comments from research participants emphasising the importance of achieving real-world impact from research activities. Although research was perceived as delivering public good outcomes, this perspective was challenged during the Stage 3 focus groups when participants suggested that research did not always support public good objectives.

Research impact is about making a difference

Research Leaders and DF-CRN Researchers were confident that research should make a difference, and that the process of making a difference is the essence of research impact. Nine research participants used the phrase "making a difference" (P2; E2; E3; E5; E7) or "make a difference" (L6; P1; M3; S2) when describing the real-world impact of research. Other research participants used terminology related to making a difference such as "see a difference", "the difference I make", "different view and approaches", "do things differently"

and “think in a totally different way”. Early career researchers were aspirational in seeking to make a difference, explaining “I want to make a difference with health outcomes, or safety, or how people experience something, so that’s what I want to achieve with the research I’m doing” (P1), and “What I perceive as research impact is – is making a difference to – to people I’m working with” (P2). These comments by early career researchers were echoed by senior researchers, with one senior researcher suggesting that “I guess, in a broad sense, impact is making a difference” (S2). There was little discussion of research impact in terms of value or worth, suggesting that real-world impact does not have economic dimensions, and is unable to be quantified in terms of magnitude. There was also evidence of reluctance to specify how research makes a difference, suggesting that impact may be challenging to describe in terms of attributes.

When explaining the relationship between research knowledge and society, participants suggested that research makes a range of different contributions. As noted by Research Leaders, the role of research was “contributing to understanding, contributing to a field of research… to an academic body of knowledge” (L3) so that research knowledge can “contribute to the conversation” (L6) by extending knowledge around a topic of interest. DF-CRN Researchers also perceived the real-world impact of research as contributing, recognising the role of research in “contributing something to human knowledge in the big picture” (E6), “contributing to the community and society” (S3), and “contributing to policy development” (S2). The notion of contributing extended to scholarly impact, with researchers stating there was a need to make “a contribution to my field” (E2) and “a contribution to the literature” (P2). An early career researcher suggested the purpose of research was “contributing something to human knowledge in the big picture, uncovering things that haven’t been known previously, however small” (E6), reinforcing the broader benefits of research.

Research participants used a variety of verbs to conceptualise the relationship between research and research knowledge: “build upon”, “gain”, “improve”, “broaden”, “increase”, “expand”, “add to”, “establish”, “ascertain”, “acquire”, “extract”, “apply”, “discover”, “find”, “develop”, “create”, “uncover”, “explore”, “provide” and “advance”. Impact was conceptualised as the process of “transforming”, “improving”, “changing” or “making better”. As evidenced from the data, research knowledge makes an impact when it is “applied”, “disseminated”, “published”, “distributed”, “presented”, “contributed” and “shared”. The notion of sharing research knowledge was apparent in phrases such as “sharing of data” (L5), “sharing information” (E2), “sharing some of my research” (E5), “sharing IP” (L3), and “channels it’s been shared with” (E3). These comments recognise that research knowledge needs to be made available in order for society to benefit from the research knowledge.

In addition to recognising the public good intentions of research, participants acknowledged there was a need to achieve scholarly impact, reflecting comments by Flyvbjerg (2012) that “getting published and being cited” (p. 170) is encouraged by “the culture and incentives of academic institutions” (p. 170). Participants recognised the peer-review process as the primary mechanism for validating research knowledge. One Research Higher Degree student reinforced the need to make a scholarly contribution through “a peer review accepted contribution into journals and chapters” (P2), with an early career researcher noting that scholarly awards were “evidence that the work that I was doing, and the research that I was doing, was contributing because it was recognised by my peers” (E4). One researcher stated that scholarly impact would “contribute to my university’s ERA” (E6), reinforcing perspectives that scholarly impact, as evidenced by research outputs, demonstrates research excellence (ARC, 2015c). Despite a contemporary emphasis on real-

world impact, the peer-review process that assesses scholarly impact continues to be an accepted method for assessing the quality of research knowledge and researcher performance.

Research Leaders and DF-CRN Researchers used a range of terms when discussing research impact. Using Nvivo, word frequency queries were generated to explore the words used most frequently in interviews by Research Leaders and DF-CRN Researchers (Figure 10). Text mining supplements the in-depth analysis of transcripts by exploring ideas (Bazeley & Jackson, 2013), and is a useful process for reviewing how words are used, and for comparing responses across categories of research participants (DePaolo & Wilkinson, 2014).

Figure 10. Word frequency queries showing words used most frequently by Research Leaders (left) and DF-CRN Researchers (right) when discussing research impact.

The word frequency queries revealed that Research Leaders used the noun *research* more frequently than DF-CRN Researchers who used the verb *researching* more frequently. This difference suggests two dimensions to research – research as a verb, and research as a noun. This was a key finding from the data that prompted efforts to explore research impact as a process, rather than a product, informing the re-conceptualisation of research impact in Chapter 5.

The data reinforces the role of the researcher in contributing research knowledge to make a difference, and the role of the university in contributing to public good. Research participants were adamant that real-world impact is apparent when research knowledge makes a difference. Yet the quest to make a difference manifests in both scholarly and real-world impact, with scholarly impact perceived to be a form of real-world impact. This was a strong theme across interviews, and was later reinforced in the focus groups.

Research impact may be difficult to discern

Research participants, across all levels of research experience, were less confident responding to the question *How will you know when your research has had an impact?* Responses highlighted the intangible nature of research impact, suggesting that real-world impact was achieved when researchers collaborated with community, industry or university organisations, and when researchers worked closely with research participants during data collection activities.

The DF-CRN Researchers emphasised that making a real-world difference occurs when knowledge is imparted, irrespective of the production of more tangible research outputs. According to the DF-CRN Researchers, a real-world benefit accrues to research participants in terms of an increased awareness of research objectives, methodologies, hypotheses and previous research findings. One early career researcher noted the role played by the researcher in sharing research knowledge to impact individual perspectives and attitudes, suggesting that "even if it just has impact on one person, it still has impact" (E7). This perspective supports comments by Eynon (2012), who notes the subtle way in which researchers impact the real-world:

> It is important to recognise that we all hope to make a difference of some kind, and often do – through our teaching, conversations with colleagues and our research and dissemination – but these 'impacts' are wide-ranging and often subtle, diffuse and

> difficult to measure. In reality, our activities are often not easily translatable or directly aligned with the kinds of impact that are currently being required from academia to prove the worth of our endeavours. (p. 1)

Comments from research participants highlighted the challenging and complex process of seeking to understand the impact of research on the real-world, with one early career researcher noting an inability to do so due to the absence of concrete measures:

> I will have no idea at any point in this project whether what we've been doing with [research participants] has impacted… we get as close to understanding the impact as we can, but there won't be any concrete understanding of it. (E6)

Another early career researcher was equally perplexed, suggesting that it may not be possible to assess impact:

> That's a really, really hard one. I don't know the answer to that. Like I would love to have the opportunity to do an evaluation, where I can maybe survey 20 or 30 organisations who had something to do with, and ask them basically if anything has changed in relation to some of the work we've talked about. I don't know how I would talk to individuals other than do another review of [the group] or something like that. I don't think the impact of my work will be able to be measured [at group level], but I think it could be potentially picked up at organisational level. (E5)

One Research Leader hinted at the problematic nature of assuming a linear relationship from research to impact:

> I suppose I can't say a direct line that it will benefit, because we don't know in the end whether it will benefit, but what the researcher needs to do is actually do enough research to make sure that the research they're doing, before they even start that research, is something that is new research, shall we say? … Impact can take many, many years but asking the why question is really important; why would you undertake this research? Is the topic that you are researching something that is on the question of everyone's lips, or is it adding to providing a different perspective on research that has already been done; so you can't – you don't know that you will benefit research, but by at least finding out as much as you can about the topic that

> you are researching, and seeing that if it is something that is of value, or of providing, or maybe an issue within the community, or a topic of discussion that's global, then in that way, yes you're assuming that it will have some impact, but at least you are doing that research that sort of will have a result, or will maybe influence others, or actually just contribute to the conversation, because that is also an impact. (L6)

As outlined in Chapter 2, logic model approaches are frequently employed when seeking to understand the impact of research. The perspective presented by the Research Leader, as to how research influences the real-world, challenges the logic model's linear approach to understanding impact. One early career researcher suggested that research impact is more of a ripple than an impact:

> I guess, to me it's kind of like the visual imagery is of dropping a ball in a pond and having the waves ripple out in all directions. Research impact is something that can be in the tiny levels, from the most miniscule of other researchers in your department knowing about what it is you're doing, and being in some way informed by your ideas, through to doing foundational research that affects the way that national government policy happens, that radically changes how the country runs, or the world runs. (E6)

The ripple effect of research is noted in the literature (Grant, 2012), with the impact of research perceived as a gradual and incremental process. This perspective was reinforced by a senior researcher who noted the challenge of anticipating the impact of research:

> I think all research has the elements of purely increasing the stock of knowledge, and you don't know how someone else might make use of that – whether it's as ideas or whether it's something they can apply, and if it's just ideas it may lead onto another project, or another question, or another discovery that you can't predict (S6)

Research participants were confident that research builds upon research. As suggested by one senior researcher, it is difficult therefore to know when a particular piece of research may have impact:

> A researcher is always researching… [an eminent researcher] won a Nobel Prize ultimately from going to a university cafeteria and noticing a plate spinning in an unusual way that it was spun by one of the students. And he actually connected that with his knowledge of a field called quantum electrodynamics, but we won't bother with the details here. Essentially he learned, that was a prompt stimulus for him to think about the motions of sub atomic particles in a new and interesting way, and eventually he developed a whole new field of research called quantum electro dynamics and quantum chromo dynamics. So you never, never know where inspiration comes from. (S5)

These comments reflect the ongoing nature of research, evident in comments by another senior researcher that "you just never know when that little bit of research is going to be required to be used in some other way, and so the research actually goes on, even if it's not under the same umbrella" (S4). The ongoing nature of research was emphasised in other comments including "you never finish research... it always goes on, there's always something new you can add" (M2), and "with academic research it's not supposed to end. It's supposed to raise new questions… which raise new opportunities" (E7). The concept of research having no end was especially emphasised by one early career researcher:

> I mean, how do you know when you've finished your research? It's never finished. No, it's never finished. It's – because every question begets new questions. I don't – yeah, that's what it is. That's my answer, is it comes back to, you haven't finished research. It's that activity of uncovering knowledge. You haven't finished until you decide to stop. (E6)

The perspective presented by DF-CRN Researchers was supported by Research Leaders who noted that "I don't think research ever stops, to be honest" (L6), and "that's the interesting thing about research, is it really is never ending, there's always refinements that can go on, but also open up new avenues to further do more and more research" (L7). These comments reflect literature suggesting that "science is a journey, not an end" (Jaspers, 1959, p. 39), and highlight the challenging process of assessing impact. If research builds upon other research,

then it may be infeasible to attempt to attribute real-world impact to one specific research activity.

Despite affirming that all research knowledge is useful in terms of providing a base for other research, participants did note that "an average piece of research…shouldn't steal oxygen from other things" (E6), suggesting that some research "should cease at times if you're not finding anything new" (L5) or when "the mission's fulfilled" (L4). These comments highlight a perspective that research should not continue just for the sake of doing research. Rather, there needs to be an underlying scholarly or real-world purpose to justify the research activity. However, as noted by Boulton and Lucas (2011) and Mulholland (2015), it is difficult to predict the future value of research knowledge, suggesting that research should not be justified on the basis of anticipated impact.

Interviews with the Research Leaders revealed a more practical approach to identifying the end of research. When asked *What do you believe signals the end of research?*, one Research Leader noted commercialisation activities as the ultimate objective:

> I think that's quite a difficult question to define, but perhaps looking at different steps in the process to take an idea to market is one way to try and define some sort of boundary. (L1)

As explained in Chapter 2, the Australian government is encouraging the commercialisation of research knowledge in an effort to ensure research knowledge achieves real-world impact (Macfarlane, 2014). The comment by the Research Leader reinforces commercialisation as the end-point of the research pathway to impact. Another Research Leader shared a similar pathway understanding of research:

> So, in some ways, there's not really an end of research, there's simply – maybe it's the closing of a pathway that was a viable way to go in that particular area. But what that did… it then suggested that there are other pathways that may be more viable… a

> little bit like you deflect from a particular pathway to another direction to actually continue on. (L5)

Despite literature suggesting that the juxtaposition of research into traditional categories of pure and applied research (or hard and soft research) is an inadequate way to categorise research due to the contemporary interrelatedness of each (Bastow et al., 2014a), participants distinguished between hard and soft sciences, and between pure (blue-sky) and applied research, when discussing research impact. Participants were confident that impact varied according to the type of research conducted, highlighting disciplinary differences, and suggesting that pure and applied research generated different types of impact. An example of artwork was provided by one participant to demonstrate real-world impact from research that is neither pure nor applied:

> …[artwork] might not have the kind of impact we are talking about, you now, the metric impact, the bibliometric impact, it can have another kind of impact, like when you watch a movie and if it satisfies you, you sort of feel 'oh what a good time I have had'. (S3)

Although participants confirmed that both pure and applied research were necessary, there was a pronounced over-justification of pure research by researchers identifying with the Faculty of Health, Engineering and Sciences, with one senior researcher emphasising that "research has value even when it is esoteric, even when it is pure, because it is adding to our knowledge about ourselves and our place and universe" (S5). A Research Higher Degree student noted the requirement for pure research to be applied to be beneficial, stating that "research that is meaningful for me has some sort of practical outcome" (P2).

These comments suggest that research knowledge needs to be useful to individuals, groups, communities or society to achieve real-world impact. However, as indicated in the data, it may take time for the usefulness of research knowledge to become apparent (University of Strathclyde Humanities and Social Sciences, 2014), making it difficult to

discern the impact of research, and highlighting the complexity of impact assessment processes.

Research impact is challenging to assess

The issue of time was revealed as a key challenge in seeking to assess research impact. DF-CRN Researchers noted they were "too busy doing things to assess [impact]" (E6), reinforcing literature that contemporary researchers are managing multiple work pressures of "teaching, researching, publishing, and competing for limited sources of funding, coupled with pursuing career aims and ambitions" (Homer-Vanniasinkam & Tsui, 2012, p. 5). Other impediments to achieving impact from research included "having the mental space to do it, because so much of your day is taken up with admin and managing and applying for money" (E2).

The contemporary emphasis on real-world impact, and its effect on researchers and research activities, was a concern for DF-CRN Researchers and Research Leaders, particularly in terms of encroaching on academic freedom. One researcher expressed frustration with the focus on impact where "the challenge is to keep going, and to keep asking the questions which might have impact, even though very few of them turn out to" (S6). As noted by Emerald and Carpenter (2015), contemporary academics are reporting lower levels of job satisfaction due to a loss of autonomy, and this was evident in the research data. One early career researcher made reference to the neoliberal university's focus on auditing performance by suggesting that "this whole metric driven thing is in a way pushing people to do stuff that they're not ready for" (E2). A senior researcher shared similar concerns:

> We are in a utilitarian regime, where we have to justify the possible uses, but that shouldn't be the sole thing which drives us to exclude the deeper questions or the wider questions. (S6)

One Research Leader noted the contemporary practice of directing research efforts, suggesting that "the focussed research agenda at the university is about doing impactful research, and having research priorities, so you do have researchers that feel threatened" (L6). There was some criticism of universities for focussing on short term Key Performance Indicators (KPIs), which only serve to encourage a myopic approach to research:

> An inability to accept that great outcomes may take some time to appear, so you'll do research, and you'll have your results, and I want to be able to see those measurable results, but you'll do it within 6 months or within the funding. An inability to see beyond a funding stream, and so an inability to ask the question what happens if that research isn't continued, rather than what happens if it is continued and it's not – and there's not sufficient funding so I think long term vision and short term focus on gains on the magic dollar, on KPI's. (S1)

The data suggests that time is a consideration in doing research and achieving real-world impact. One senior researcher emphasised that good research takes time:

> But the one thing you can do is, if you have the research allowed to continue over the long term you get benefits, because it seems to me the way the human mind works, is that often you need ideas to percolate… a sort of a long term process, where sort of like a fermentation perhaps, like producing a good wine or a good whisky, a lot of good research takes time more than anything else. (S5)

Although it is often presumed that "research can and should *have immediate and tangible effects*" (Castree, 2010, p. 8), research participants supported literature recognising that the impacts from research may not become apparent for many years (Donovan, 2011). One mid-career researcher commented that "if you want to evaluate impact, then it's 5 to 10 years, or 15 years of timeframe, where you can learn your impact" (M1). This perspective was supported by a senior researcher who suggested that research impact isn't quick or sharp:

> The impact of one particular paper, or one year's research, is often impossible to see, even if over 5-10 years that body of research, or that area, or that direction, or that

> team, may be having an impact. Impacts aren't just a sudden bang or its contribution. (S6)

The time for impact to occur was noted as one of the challenges in seeking to understand the impact of research given that impact "happens at so many levels, and over such a long timeframe" (E6), and that the time for impact to occur may vary between the different types of research:

> I mean there can be a significant time delay too, between doing blue sky or pure research, and finding some positive outcome from that. So I don't think it's always black and white. I mean pure research quite often leads to important impact, but it may take a long time to do that. (L1)

As stated by Milton Friedman, who was awarded the 1976 Nobel Memorial Prize in Economics, "the true test of a scholar's work is the judgement that is made not at the time his work is being done, but twenty-five or fifty years later" (Friedman & Friedman, 1998, p. 442). The challenge of assessing how research influences society is evident in ongoing attempts by the Australian government to develop a system for understanding how research achieves real-world impact.

Research impact includes scholarly and real-world impact

Research participants noted publication and dissemination as key activities in seeking to raise awareness of research knowledge, suggesting that researchers "must bear principle responsibility for at least promulgating the research, in an easily understandable way, to as wider an audience as possible" (S5). Research participants emphasised that research knowledge needs to be "there for people to find" (E6) because "if you don't publish it, and if you don't share it, nobody knows about it, so it's not really research. It doesn't exist as far as I'm concerned" (M3). As noted by one senior researcher, research knowledge shouldn't be "sitting on a shelf [but] actually linking with people and being useful to people" (S2),

supporting comments by Dunleavy (2003) that intellectuals must "do more in the world than cause a library shelf to bend a little over a period of years" (p. 42). As suggested by a mid-career researcher:

> Research only is valid if it is published, so if you're even doing research for research sake – if you do blue sky research, then you publish that, and ultimately that will have an impact. It might not have the impact of the broader social impact of society, and all that, but there still will be an impact on the field. (M3)

Across interviews, there was evidence that scholarly and real-world impact were perceived as two dimensions of research impact. However, DF-CRN Researchers and Research Leaders made little distinction between the two dimensions, perceiving scholarly impact as a form of real-world impact, suggesting that efforts to distinguish between the two may be immaterial:

> If I publish a paper, and it then gets cited by a few hundred people, then I'll know that they've actually read it, they've thought about it, and they've used it in their own work. If it gets into the journal, then that's already a first indicator that it's the gatekeepers, the experts, the peer reviewers in any case have decided that this is worth the potential of having an impact to the community. So all of those research metrics are a big indicator, but even moreso at conferences, it's far more direct feedback. (E6)

The accessibility of research knowledge was noted as necessary for achieving real-world impact, with citations suggested as evidence of impact by an early career researcher:

> I suppose it comes back to what I was saying before – who actually goes and reads this stuff? There's obviously the different ways you can measure it. You can look at, well, is my work being cited in a quality journal? So, in other words, I think that's an indication of the impact you're having with your peers. (E8)

DF-CRN Researchers perceived scholarly impact as a conduit to real-world impact, however they also noted individual benefits accruing from the enjoyment of having work published:

> There's a couple of things – seeing your name in print is a big one. So, that for me, is a very real and tangible reward for the research, when you finally get somebody to

> acknowledge that this is useful contribution, and then of course it validates all the hard work that you've done. (E8)
>
> In terms of my personal gain, I feel pretty happy when publications get up, and perhaps this is the – another way that scientific community and society can get benefit out of it. (M1)

There was evidence that researchers enjoyed publishing their work, however there was criticism of the traditional scholarly communication system for its inability to reach practitioners. One Research Leader shared thoughts about the limited audience reached by academic journals:

> The citation metrics are for peer review esteem, so they're entirely to do with how other academics have reacted to an article by citing it in their own work, so that's kind of part of the circular ivory tower kind of notion of academic quality. It's true, as you say, that most purely academic journals are not read by others, for all sorts of reasons, some of it's to do with just the cost and difficulty of accessing the journals, and some of it's to do with the fact that the journal article, in that kind of rigid form, has a number of features that make them difficult to translate and to use for lessons for practitioners. (L3)

The two communities perspective (Harris, 2015b), explored in Chapter 2, that is understood to inhibit real-world impact, was reflected in comments by research participants. One researcher suggested that "as a researcher, that is my job… that the information is disseminated correctly but the [task] of implementation really lies with somebody else, which is beyond the control of the researcher" (P3). Another researcher hinted at the existence of disparate communities of research and practice, suggesting there was a need for research knowledge to be transferred:

> I want to find out stuff that makes life better, and makes life better for individuals, and particularly individuals who are not privileged, who may be disadvantaged, maybe not engaged in the educational process, but who need to know stuff to have

> better lives. So it's all about the knowledge transfer process, that's what I'm interested in. (P1)

Collaborative research endeavours seek to reduce the research-practice gap, and are being promoted by the Australian government to encourage research with real-world impact (Department of Education & Department of Industry, 2014). One senior researcher noted the role of the researcher in helping to bridge the research-practice gap:

> Ideally of course, just publishing the research is the way in which it is disseminated, but knowing that many practitioners or people who might want to apply research don't follow the literature very closely, then it's almost a responsibility to form networks and chains, and conferences are one way in which there is a wider dissemination than there is with published journals. (S6)

The advent of digital scholarship and opportunities to use social media for achieving real-world impact were highlighted by one research participant, who suggested Twitter posts and numbers of followers were evidence of research impact (E5). As suggested by Hall (2014), it may be time for a new metric that captures both the scientific citation performance and social media activity of researchers. Other researchers noted that invitations to deliver presentations and attend meetings were evidence of research impact. One mid-career researcher emphasised the role of networking in seeking to maximise research impact:

> You've got to go beyond simple academic publishing, you've got to make your research accessible, and by doing that, you really broaden the audience that can benefit from it. (M2)

There was also recognition that the stage of a researcher's career influences the extent to which the researcher focuses on scholarly impact:

> I think that people, at different stages of their career, have different answers to that, because if you're an early career researcher, getting something as a conference paper, or potentially an article, is inherently satisfying, worthwhile, and almost a good in itself, and is part of building up, building a CV that's relevant to an academic career.

> I think that people who are a bit more down the track, in terms of a career, necessarily have wider experience and potentially more relationships with academic groups, and start to think more broadly about other ways of doing the work… I think what I would call a portfolio of work, where some of the work is for yourself, some of it is for your academic friends in a particular niche area, an intellectual activity, and some of it is directed at significant university groups and their interests. (L3)

This perspective confirms comments by Mullins (1976) that "toward the end of an active and distinguished career, scientists frequently reflect on their lives' work" (p. 557). Being "academically prominent" (Bastow et al., 2014a, p. 36) increases a researcher's ability to achieve real-world impact (Hobolt, 2015), with one Research Leader noting that scholarly impact is an essential pre-requisite in seeking to influence others:

> But they won't be able to actually do the second step unless they can convince others in the, if you like, the research culture that they have some credibility. So credibility's the first thing that I think a researcher needs to get. (L5)

Word clouds are an effective way to visualise patterns in text (McNaught & Lam, 2010). Using NVivo, word clouds were generated, revealing differences in the way Research Leaders and DF-CRN Researchers discussed real-world and scholarly impact (Figure 11).

Figure 11. Terminology used to discuss real-world impact (left) and scholarly impact (right) by the Research Leaders and DF-CRN Researchers.

The words “community”, “benefit” and “world” featured in the word cloud for real-world impact, whereas “paper” and “journal” featured in the word cloud for scholarly impact. Such a distinction suggests that real-world impact is less academically-focused than scholarly impact.

The data reveals that DF-CRN Researchers acknowledge two forms of research impact – scholarly impact and real-world impact – and that scholarly impact is a form of real-world impact, challenging definitions suggesting that real-world impact is an impact *beyond* contributions to academia (ARC, 2016b). Research knowledge has the potential to deliver benefits for individuals, groups, communities, and society, and should be made widely accessible, however the influence of research may not be immediately apparent. The contemporary imperative for researchers to achieve both scholarly and real-world impact was recognised by the participants in this study.

Research impact is a shared responsibility

Although research participants reinforced the role of the researcher in ensuring research knowledge benefits society, they also noted that it was not the sole responsibility of the researcher. There was evidence that research impact is a shared responsibility across a multitude of stakeholders, including researchers, research institutions, funding agencies, and the government.

Two senior researchers nominated the government as being responsible for real-world impact, as the government is the ultimate beneficiary of research with real-world impact:

> I think the government has a role in supporting and rewarding researchers who promote science and research in particular - and research in general. Because, I think, because research is in the national interest, that it's in the national interest of the government to provide some modicum of support for promotion of research activities to the general population. (S5)

> Look, I guess more broadly hopefully government, in a broader sense, in a long, really long-term sense if, if these things go into helping, to form, contributing to policy development and those things, that, those are the aspirations. (S2)

An early career researcher suggested that research institutions have a more enduring role in seeking to ensure research generates impact, given that researchers will move onto other research projects:

> Well, if I continue to work as a researcher, I think I will have some responsibility to create a legacy for my work, or ensure it's in some format that will live long… But I think there's a limit to the expectation of the individual, depends on your age and whether you continue, like researchers in the funding cycle, the 3-year funding cycle or whatever, and I think it's too much to expect an individual researcher to take that on, if they're on another project that's entirely different… I believe that the university, or the researching organisation, and the funding body should have more responsibility in terms of ensuring a legacy and long term impacts. (E5)

There was also evidence that real-world impact depends on action being taken by those outside academia, with one Research Leader extending responsibility for real-world impact even more widely:

> I don't think you can ever have one person accountable for it. It's like saying there should only be one person accountable for delivering effective health care. At the end of the day, it's large organisations and many, many people and has to be a core accountability to everyone that this is a part of the eco system that we operate in. (L7)

The breadth of those needed to support the achievement of real-world impact is reflected in comments such as "it's really hard to identify an individual, or an individual organisation, it is mostly all of us… it is the responsibility for all of us" (S3), and "basically it's the responsibility of everybody" (P3).

Research participants nominated specific groups of beneficiaries as the end-users of research such as "farmers", "teachers", "nurses", "academics", "students" and "tax payers",

as well as more general categories of beneficiaries such as "society", "industry", "organisations" and "institutions". Participants also used terms such as "the broader world" (E4), "social groups" (S1) and "anyone who's going to be dealing with it… anyone who needs to talk about [it] and that's a lot of people" (M2). There was evidence of reluctance to specify beneficiaries of research in a precise way, with participants qualifying statements about anticipated beneficiaries with terms such as "I guess" (S2), "hopefully" (S2), "I would think" (M2), "my hope is" (P2), "might" (P2), and "I can't sort of think of all encompassing things" (S1). Although research participants were confident that research has impact, they were challenged to articulate the ultimate user of research knowledge, with one early career researcher commenting "so who knows where this thing could go. It could be quite big in reality" (E8).

The value of researcher-practitioner collaboration was evident in comments about the broad range of participants involved in the process of achieving real-world impact. There was evidence that collaboration was an enjoyable aspect of research:

> When it comes to research, I don't necessarily enjoy the whole research process. I like working in a team of researchers, usually everybody contributing some part of their own experience and their own knowledge to an idea or a concept. And then taking that concept, and testing whether it applies in the real world, or whether it has application in the real world, and then either taking it forward to build something useful. (E7)

> I just love working on problems with other people that are interested and interesting. It's like, I think as humans, that's the most satisfying thing we can do, is creative activity as a group. (E6)

Comments by an early career researcher reflected the academic-practitioner disconnect (M. Marshall, 2014), by distinguishing between the role of the researcher and the role of the end-user or knowledge beneficiary in achieving research impact:

> I don't necessarily believe that the researcher is responsible for disseminating information – that's not the researcher's role. The researcher's role is to make sure that they develop a solid, valid, reliable, stable and ethical research product, that there's an answer that comes without bias and without contravening variables. But it's usually, I think, the person who the research is for, who would be responsible for impact. (E7)

Research participants emphasised that achieving impact from research is a shared responsibility across researchers, research institutions, funding agencies and the government. They also noted the role of the end-user or knowledge beneficiary in ensuring research knowledge is adopted and applied. Efforts to encourage collaboration between researchers and practitioners recognise that real-world impact is improved when research knowledge meets the needs of those who will benefit from the knowledge (see, for example: Cuthill, 2010; Wessells et al., 2017).

Analysis of focus group data (Stage 3)

In Stage 3 of the data collection process, focus groups were conducted to seek feedback on the six emergent concepts revealed from analysing Stage 1 and 2 interview data. Participants for the focus groups were purposively sampled from the larger group of DF-CRN Participants that had been interviewed during Stage 1 or 2. This approach ensured that focus group participants were familiar with the research objective, and had already provided perceptions and experiences of research impact on an individual basis.

The focus groups used a provocative statements approach to stimulate group discussion (Oetzel et al., 2015). The provocative statements were generated from the six emergent concepts revealed from analysing Stage 1 and 2 interview data (Figure 12).

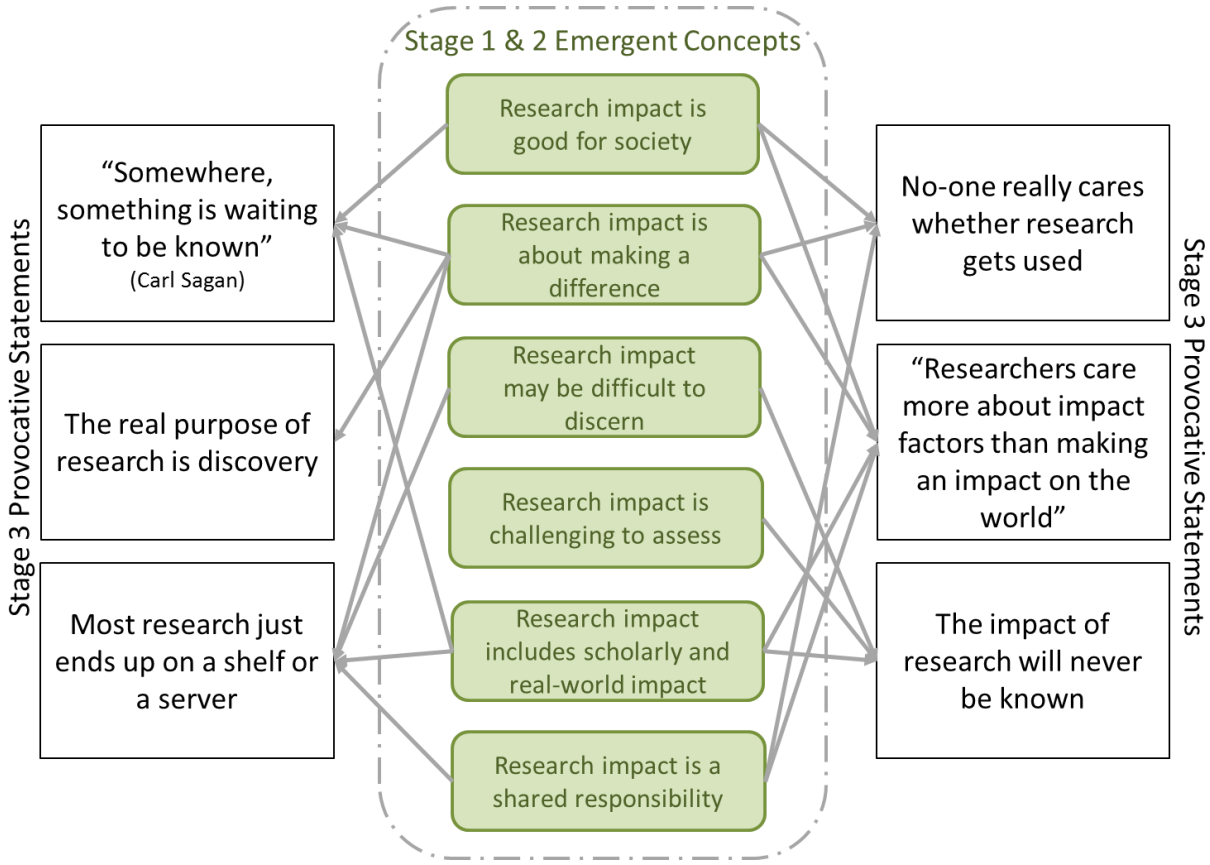

Figure 12. Mapping of the six emergent concepts arising from Stage 1 and 2 interviews with the six provocative statements used in the focus groups.

Each provocative statement related to several of the emergent concepts, yet was deliberately broad to encourage discussion, without revealing the findings that had emerged from analysing Stage 1 and 2 interview data. The provocative statements did not reference the Digital Futures CRN, to encourage participants to provide responses about research impact in general, without constraining discussion to the Digital Futures CRN.

As outlined in Chapter 3, participants for the focus groups were selected from pre-existing social groups, to facilitate free and spontaneous group discussion (Mackay, 2012). The discussions in each focus group were lively, and there was a noted camaraderie as participants engaged in the process of "collective sense-making" (Wibeck, Dahlgren, & Öberg, 2007, p. 249). For the duration of each focus group, participants remained respectful of each other, and made sure that each member of the group had an opportunity to provide

comment. However, there was evidence of disciplinary differences in relation to research impact, and group polarisation arising from disciplinary orientation, whereby participants took a more extreme position as a group, than they would have taken as individuals (Spears & Postmes, 2015). Researchers who identified with the Faculty of Health, Engineering and Sciences focused more on the discovery dimensions of scholarship, with impact understood as knowledge creation, whereas researchers who identified with the Faculty of Business, Education, Law and Arts focused more on the application dimensions of scholarship, with impact understood as knowledge application, reflecting two of the four kinds of scholarship proposed by Boyer (1990).

Within each focus group, discussions were influenced by contextual factors (J. Smith et al., 2009), namely extensive media coverage of different research-related events in the days preceding each focus group. In the case of the first focus group, media coverage focused on a high profile researcher at an Australian medical research facility who had admitted to fabricating scientific results published in major journals (Scott & Branley, 2015). Such scientific fraud challenges the reputation of "scientists as objective seekers of truth" (Fanelli, 2009, p. 1). Participants in the first focus group exhibited concern for research quality, and at times, referenced the pressure on researchers to produce specific research findings.

The second focus group was held the day after the National Aeronautics and Space Administration (NASA) published evidence that liquid water flows intermittently on present-day Mars (NASA, 2015). Participants in this focus group were excited about the research findings, and were enthusiastic to discuss the discovery and knowledge creation dimensions of research, with frequent reference to the work undertaken by NASA. There was less evidence in the second focus group of the pressure on researchers to demonstrate impact. This pressure was evident during the first focus group and remains a contemporary concern (Chubb & Watermeyer, 2016; Olssen, 2016).

The following sections present the results, discussion and analysis of the focus group data. The data from the two focus groups has been combined under each provocative statement, with results presented in the order that the provocative statements were provided to the participants. Where relevant, the narrative account includes details of participant interaction to provide insight as to how the participants sought to understand and conceptualise the topic (Wibeck et al., 2007).

Extracts from focus group transcripts are included in this chapter to "retain the voice of the participant's personal experience" (Shinebourne & Smith, 2009, p. 155). In reporting the data, pseudonyms are used to improve text readability (Table 4). Interviewee codes from Stages 1 and 2 are not used as these may have identified participants due to the intimate nature of the focus groups.

Table 4
Pseudonyms for Stage 3 focus group participants

Focus group	Toowoomba (Group 1)	Springfield (Group 2)
Pseudonyms	Ray, Blair, Alex, Chris, Lee	Kerry, Sam, Pat, Nic, Dale

The selection of gender-neutral pseudonyms further supports non-identification of the participants. No details about the disciplinary orientation, research experience or project team affiliation of the focus group participants are provided to ensure the anonymity of participants.

Statement 1: "Somewhere, something is waiting to be known" (Carl Sagan)

The first provocative statement – *"Somewhere, something is waiting to be known" (Carl Sagan)* – was provided to participants to stimulate discussion about the purpose of research. Quotation marks were inserted to emphasise to focus group participants that the statement

was a third-person quote by the renowned astronomer Carl Sagan, rather than a summary of the research findings to date. The statement was deliberately broad to fulfil two roles: first, as an icebreaker; and second, to encourage wide-ranging perspectives of research. The statement proved effective in putting participants at ease (Wellings et al., 2000), and encouraging good discussion among participants at an early stage of each focus group.

In response to the statement, focus group participants overwhelmingly agreed that the primary purpose of research was the discovery of knowledge. Researchers understood the need to discover and create knowledge, irrespective of discipline:

> There are more things to be known… we may not know everything but surely there are always more things to know… even when you think you know everything. (Kerry)

> It's very much like knowledge for the sake of knowledge… it's interesting… it's like something is waiting to be known… therefore we should go and try to find it out. (Dale)

The data from each focus group supported Stage 1 and 2 interview comments that research is curiosity-driven. Kerry proposed that "science has impact through our innate curiosity… if you are curious about the world around you, there is always more to be known". Ray supported this comment by suggesting that the purpose of research is "to satisfy everybody else's curiosity... whether there is somebody to take your research or not". Although research may be driven by curiosity, there was evidence that research impact was understood in terms of usefulness:

> Research needs to be relevant…there needs to be somebody that will take your research and then use it for decision-making… and when research is relevant… then you will potentially have maximum impact from your research… you want to have some outcomes that are relevant for your stakeholders. (Ray)

The notion of usefulness had been highlighted during Stage 1 and 2 interviews, and was apparent in the way focus group participants distinguished between two types of research: research that answers a specific question for immediate impact; and research that doesn't answer a specific question and may not have immediate impact. Two researchers with science backgrounds recognised the need to "give researchers ultimately the capacity to do blue sky research" (Kerry) which may not have immediate impact as "we don't know what we don't know" (Blair). Such comments reflect the contemporary dilemma of allocating funding to solve today's known problems at the expense of solving tomorrow's unknown problems. These same researchers offered more extensive comments, distinguishing the impacts of pure research from the impacts of applied research in terms of return on investment:

> Funding for research needs to have elements of both pure and applied research… you need both… but don't forget to fund the basic research because the basic research delivers the maximum impact… evidence tells you that, but you don't necessarily know where it's going to come from, so you fund the best researchers as well as you are able to. History shows that investing in scientific research, especially blue sky research, gives you the maximum research impact… the problem is you don't know where and when that research impact comes… as soon as you give authority to funding bodies, politicians, or anyone other than the researchers to dictate where the research goes… that is very limiting. (Kerry)

> This is the thing about blue sky research… that you don't know why you might need to know something… you don't know what the application is…and a number of times that research has led to a whole range of outcomes that couldn't be predicted at the time. (Blair)

Participants were comfortable discussing how the impact of research varies across pure and applied disciplines, with Alex noting that "in health, every research dollar is valuable… and you want outcomes [that you can justify]". Two participants acknowledged that certain research may have unrealised potential until sometime in the future:

> There's research that's right for now, and there's research that's right for later… the world just might not be ready for the research yet, but it will at some stage. (Lee)

> Lessons learnt, I think, by going to the moon, have somehow helped us in terms of breast cancer research. (Blair)

These perspectives stimulated an extended discussion about the contemporary emphasis on research with real-world impact. Comments were made about research being driven by funding availability, and the tendency for contemporary funding programs to favour applied research. Dale expressed concern about "funding bodies that are beholden to politicians and they choose the research", which prompted comments about the allocation of research priorities by governments, and the danger of priority-driven research:

> Isn't true research supposed to start without a specific goal in mind, because you are not trying to direct the outcome of the research... if you try to direct the outcome of your research then you might be imposing too much on that outcome. (Lee)

> How do we know it is worth doing… then that's already putting your own views on the activity. (Alex)

Lee was dubious about government-directed research priorities that are driving the allocation of research funding, suggesting that such an approach encouraged pre-determined results through an underlying message of "we want this outcome; will you please go and prove it for us". As further noted by Lee, it is "easy to nudge a researcher into a specific narrative if you're not careful… true and unbiased research is extremely difficult and very rare".

The data revealed a number of concerns held by research participants. These concerns included the specification of research priorities by external agencies, the contemporary funding of research to deliver pre-determined outcomes, impact assessment processes, and the pressure on researchers to achieve both scholarly and real-world impact. There was evidence that the contemporary focus on productivity, driven by neoliberal practices, is

increasing the pressure on researchers to generate research outputs (such as publications), and reducing the time available for researchers to achieve and assess real-world impact.

Statement 2: The real purpose of research is discovery

The concept of research as discovery had been acknowledged by research participants during Stage 1 and 2 interviews, and was further reinforced during focus group discussions of the first provocative statement.

The second provocative statement – *The real purpose of research is discovery* – sought to clarify the distinction between research and research impact. After some early comments that the second provocative statement was similar to the first, focus group participants engaged in a robust debate about the purpose of research, and how the term is understood. As suggested by Ray, "research has multiple purposes". Responses to Ray's comment reinforced the discovery dimension of research, and reaffirmed that research impact is a lived experience that varies across research stakeholders:

> One person's discovery is another person's ho-hum… at what level is discovery regarded as impactful and insightful… of course that is different for different people. (Kerry)

> There are lots of real purposes… discovery and applied can be considered two different purposes with two different ways of achieving. (Dave)

> But it all comes back to the fact that you are trying to discover something… to become more aware or knowledgeable about something. (Nic)

> Is discovery about a linear accumulation of facts, or it is about new insights and new ways of thinking; it's how you define discovery that is the critical thing. (Blair)

One comment highlighted the link between discovery and application when seeking to achieve impact:

> The real purpose of research… it may not be discovery, but still you need to find answers… you are not always discovering but at least trying to answer some simple applicable solutions. (Ray)

There was further discussion about the uncertain nature of research impact, suggesting that some impact may be serendipitous (Meagher et al., 2008):

> Research may give you a totally different outcome to what you anticipated, and that's how it should be… research twists and turns in different ways. (Pat)

> It may be that the research question doesn't match what you are doing... perhaps the research question hasn't been clarified… often people are doing great research but it takes a while after talking to them to discover what they are doing, as opposed to what may be appearing on a piece of paper. (Kerry)

The notion of research impact that had emerged during Stage 1 and 2 interviews was the act of making a difference. However, discussions in both focus groups suggested that the difference made by research may not always be apparent. Furthermore, the difference may be unexpected or serendipitous. These findings confirm literature noting the "indirect, partial, opaque and long-term" (B. R. Martin, 2011, p. 250) dimensions of impact.

Statement 3: Most research just ends up on a shelf or a server

The aim of the third provocative statement – *Most research just ends up on a shelf or a server* – was to elicit comments about scholarly impact as a form of research impact. The statement sought to explore participant perspectives on literature that suggests some research knowledge contributes nothing to scholarly discourse, and is relegated to the filing cabinet (Maynard, Vaughn, Sarteschi, & Berglund, 2014).

Participants in the second focus group were amused by the provocative statement, with Pat suggesting that "some research will still gather dust, but other research will get

legs". Dale disagreed with Pat's comment, insisting that most research would achieve impact given adequate time:

> The word 'just' is interesting – there's an awful lot of cases where research is worth nothing, and put it on a shelf, and then perhaps 200 years later it is discovered… I like to think that my work is just sitting on a shelf… often we don't know the value of work. (Dale)

The subtle influences of research were noted by Dale who suggested that impact may occur "even if no research output came from that research, but if the researcher's mind is changed". Dale also highlighted the potential for those participating in research activities to be influenced by research knowledge, changing the attitudes and behaviours of research participants (Weitkamp, 2015). Dale's perspective initiated a comment from Kerry that it may be difficult to predict the longer-term impacts of research:

> All research becomes part of the mind of the researcher… research is an innately human activity… research doesn't just end up in those places... and it's not a bad thing to end up on a shelf or a server, as long as it's there for perpetuity, for access, because it may suddenly be very important… we shouldn't try and come up with a universal panoramic way of measuring research impact… research into quantum mechanics is now the core essential science underpinning all of our computer technology today. (Kerry)

In the first focus group, there was an extended discussion that concluded with participants agreeing that being on a shelf was not necessarily a negative issue, and that you never knew when research would achieve an impact. Comments from participants highlighted the value of research sitting on a shelf until the appropriate time, as such research was "still highly available" (Ray), "still able to be accessed" (Chris) and "still out there" (Blair). Lee reinforced that research sitting on a shelf was a good thing, and noted that "libraries have lots of shelves!" This comment reflects the common practice to store knowledge until the knowledge is required for a specific purpose. One participant suggested amending the

provocative statement to "All research ends up on a shelf or server…and sometimes it's useful" (Dale).

The perspective of usefulness had been highlighted during Stage 2 interviews with the DF-CRN Researchers. The incremental process by which research gains usefulness was reflected by participants in each focus group:

> Research is built on research… research is designed to build on research… you can't write a paper without referencing thought leaders that have gone before, and it might end up on a shelf, but the grain of knowledge in each publication will spark a grain of knowledge in another… the original research may end up on a shelf, but the idea will move forward and change and adapt and transform… the only research that ends up being shelved is research that doesn't have findings, and research that doesn't have findings is research that doesn't have proper design… the only research that ends up on a shelf is badly designed research. (Lee)

> Research leads to a changing of people's minds or world view, reality is that the modern world view comes from incremental research… it's an incremental contribution to a very grand enterprise which is to understand the world better and be able to do things better. (Kerry)

In the first focus group, a robust discussion ensued about the need to "action" or "translate" research that may vary across the disciplines, with Blair suggesting that "it comes down to the different disciplines as much as anything". Ray, who has a science background, noted that all research should achieve impact in some way:

> If research is relevant, and it is meant to solve some problems, then research will be actually used in making decisions, and it can be operationalised… even if research is sitting on a shelf... translation into policy… there is always some research that has potential… if research is relevant potentially and that is the sort of research that is usually translated into policy or into some sort of action. (Ray)

Lee, with an education background, became frustrated with Ray's scientific approach and provided an example to demonstrate that research without impact is still valuable research:

> I completely disagree… what about a researcher researching the historical cultural relationships between a small tribe in Papua New Guinea – does that mean his research is less valuable… just because a huge corporation is willing to pay billions of dollars for [such] research doesn't mean that the other research shouldn't be done. (Lee)

The discipline-specific nature of research was discussed at length, with researchers across disciplines (Lee & Blair) concluding that some impact has no financial value yet significant social or humanitarian value. For the first time, there was suggestion that some research may never achieve real-world impact such as "research that doesn't get to publication" (Blair) and "crap research [that] is still going to die" (Pat). These comments recognise the value of the peer-review process in assessing research excellence (Cronin, 2010; Priem, 2013), and reflect a perspective that real-world impact depends upon the dissemination of quality research.

In discussing the provocative statement, focus group participants reinforced the need for research knowledge to be made available, irrespective of whether the knowledge was immediately useful. The availability of research knowledge in any format is paramount in seeking to achieve real-world impact, even if the value of the research knowledge may take some time to be realised.

Statement 4: The impact of research will never be known

The aim of the fourth provocative statement – *Research impact may not be apparent* – was to stimulate discussion about the complex process of identifying and assessing research impact. Participants in each group were less comfortable with this statement, as evidenced by an extensive pause when the statement was distributed. However, after some hesitation, participants in the first focus group were more enthusiastic to discuss the statement than participants in the second group. The first focus group was comprised of more researchers with a science background, and these researchers may have been comfortable discussing the

uncertainty of impact given that literature suggests that blue-skies research, in particular, may require adequate time to generate societal impact (Lakey et al., 2013).

During discussions, research participants emphasised that the value of research knowledge changes with time. As suggested by Lee in the first focus group, "there's research that's right for now, and there's research that's right for later… the world just might not be ready for the research yet, but it will at some stage". Participants in each group provided examples where research knowledge had delivered unforeseen benefits:

> This is the thing about blue-sky research… you don't know why you might need to know something… you don't know what the application is… we've found a number of times that that research has led to a whole range of outcomes that couldn't have been predicted at the time… like Marie Curie looking at radio-active materials… nobody knew where that was going to go. (Blair)

> Research into quantum mechanics, done by obscure people in obscure ways one hundred years ago, is now the core essential science underpinning all of our computer technology today. You can't build an iPhone unless you actually know how quantum mechanics works. (Kerry)

The incremental and enduring influences of research were emphasised by Lee who suggested that "you can never completely quantify the impact of research". Blair agreed, proposing that the full impact of research would never be known, "not in the long term". There was an attempt by Nic to qualify the provocative statement by suggesting "I'd say it's missing a word – it's the full impact of research – I think that you just can't know what's on people's minds or attitudes". This perspective stimulated a discussion about the shared responsibility of achieving impact from research, with Ray noting that "each research will have impact… whether we actually go and realise that impact". The role of research beneficiaries was highlighted by Blair who questioned the purpose of research without real-world impact:

> If research isn't taken up by those that would benefit, then what is the real impact? If it's not adopted, then does it have impact? (Blair)

There followed a lengthy discussion about the lack of research evaluation with Blair commenting that the impact of research was difficult to know as "we don't evaluate it… well not well" and "measuring it is difficult if you don't have baseline data". The challenge of assessing impact was also noted by Ray:

> Complete impact will never be known… but there will always be some impact of research that in most cases we don't measure… some projects only measure the impact assessment… if you don't know what the impact is then you cannot measure it… it is very hard to find out where the impact would be… it could be in capacity building whether they have adopted research or not… many, many challenges in impact assessment… complete impact will never be known. (Ray)

It was at this point that one participant in the first focus group queried the assumption that research impact is always beneficial, with Chris asking "are we assuming that impact is always positive?" This was a moment of enlightenment as it challenged the first emergent concept revealed from Stage 1 and 2 interviews that research impact is good for society. During the discussion that followed, participants in the first focus group acknowledged that research impact could be either positive or negative, concluding that not all research is in the public good. Despite comments suggesting a lack of evidence in assessing whether impact is positive or negative, due to projects not being evaluated, participants agreed that research impact may not always deliver benefits for society.

Statement 5: No-one really cares whether research gets used

The fifth provocative statement – *No-one really cares whether research gets used* – was developed to explore the value of research to society. Participants in the second focus group commented that the statements were becoming increasingly provocative, which they found

amusing rather than intimidating, affirming the value of using a socially-constructed group to encourage the sharing of private opinions (Mackay, 2012).

Early comments from participants suggested that "people" did care whether research delivered benefits. However, there was little reference to specific individuals, groups or communities that constituted "people". A comment by Kerry suggested there may be two groups of people in that "there is a group of people who care whether research gets used, which is a subset of a larger group that don't care about research". Kerry provided further comments about the people that care about research:

> Researchers look for citation, or other measure of research impact, for personal or institutional impact, funding bodies, whether government or industry, donors… they all want to see research impact because they want to see the research being used. (Kerry)

Dale was adamant that people cared too much about research, implying external interference in the research process:

> Currently people care whether research gets cited… in the sense that in the structures in which we do research, they make a point of caring... I think it goes the other way… lots of people really care about whether research gets used, and how it gets used... and try and inflict their view on our research. (Dale)

After some discussion, participants in the first focus group disagreed unanimously with the provocative statement, and listed a range of people that do care about research being used including the public, the researcher, the funding body and the university. There was some suggestion that caring about research was driven by the benefits accruing to individual researchers and research institutions. These comments initiated a discussion about the moral responsibility to care about public expenditure on research, with Alex emphasising that "a lot of people really care [including] the public". Alex's statement prompted Chris to provide a more extensive comment about the factors motivating interest in research:

> All the stakeholders perhaps care, but people who have no involvement with the research, they would not care…if you can't see any personal impact in something [then] people will care less about unless they have a very strong social barometer and tend to care about a lot of things… I think saying no-one really cares is a pretty broad statement, but also it's pretty broad to say everyone cares, because I don't think that is true either. (Chris)

Alex agreed with Chris, noting that value judgements influenced the extent to which individuals and groups cared about research:

> I think there is a degree in how much people care… we care more about the [industry] making money… we care less about the whole person… where people value things more they get money… so caring is associated with value… how much they care. (Alex)

The comment by Alex included a rare reference to value, and prompted a discussion about how research impact is understood. Nic proposed that the term impact, in relation to research, is "misunderstood", reflecting literature suggesting that academics and practitioners are not aligned in their perspectives of research impact (Harris, 2015b). Pat highlighted a disparity in the way focus group participants were interpreting the notion of research impact, providing a personal example to demonstrate confusion experienced when liaising with colleagues about research and research impact:

> Let's do some research means… let's write something rather than go out and find something… When they heard research impact they heard citations… and when I said research impact I meant social change, policy implementation, dissemination, research used outside academia… getting your work out to be used by government and policymakers. (Pat)

This comment reflects literature reviewed in Chapter 2 that research impact terminology is not well understood, with the term research impact used interchangeably with both scholarly impact and real-world impact (Penfield et al., 2013). Kerry, with reference to the focus group

methodology of provocative statements, attempted to distinguish between research and scholarship, highlighting further confusion in research-related terminology:

> I have a provocative question… a lot of people confuse research and scholarship… research is new observations, new experience, new data – not just mining the literature for something interesting – it's going out and getting something that hasn't been observed or studied before… data mining is the borderline between scholarship and research. You are actually discovering something genuinely new but in that case the data already exists. (Kerry)

The link between research and research impact was noted by Blair, who queried the broader intent of research by asking "if we are building knowledge and understanding, is that enough, or does that have to translate to decision making?" In responding, participants shared a diverse range of uses for research from "firing the imagination" (Pat) to "intellectual stimulation" (Kerry), emphasising that the value of research to society is not always evident in changes to policy or practice.

Research participants confirmed that a range of people are committed to ensuring research achieves real-world impact. However, participants were challenged to specify individuals and groups beyond traditional research stakeholders of the government, funding agencies, research institutions and the general public. This suggests that the impact of research may be difficult to identify, and attempts to understand the real-world impact of research are complex due to the incremental process by which research knowledge gains value.

Statement 6: "Researchers care more about impact factors than making an impact on the world"

The final provocative statement – *"Researchers care more about impact factors than making an impact on the world"* – was presented again as a direct quote, without a source being provided, to suggest an external appraisal of researcher priorities. When the statement was

presented to participants in the first focus group, there was laughter accompanied by some humorous comments. Such behaviour helps participants deal with situations of discomfort (Wellings et al., 2000). Once the group had settled, Alex stated that scholarly impact was a precursor to real-world impact:

> You have to care about impact factors in order to have an impact on the world… how you are judged… if you go for an ARC grant or those sort of grants, you are judged a lot on your track record and your impact factors, so if you are wanting that sort of big impact on the world, then you've got to build your impact factors so that you can have that big impact on the world. (Alex)

Participants in the second focus group strongly disagreed with the provocative statement, reinforcing public good ideals and supporting comments by participants in the first focus group:

> I'm reminded of a particular example of a researcher… who focused on doing what he did rather than trying to make his work as relevant and as impactful to the world…and the impact came anyway… rather than being obsessed by impact factors… do the best you can and sometimes you do end up getting an impact but don't be driven by that. (Kerry)

In both groups, researchers acknowledged the importance of scholarly impact for reward and promotion purposes (Bertsimas, Brynjolfsson, Reichman, & Silberholz, 2014; Reich, 2013), emphasising that researchers had no choice but to address the performative aspects of research. However, the disciplinary differences of scholarly impact were noted by Lee, who suggested that "impact factors are so science biased". Again, the distinction was made between two types of research, with Blair providing an individual perspective on the difference between pure and applied research:

> All research makes a difference in our understanding, and some of it is useful… it's whether the research is about answering questions or solving problems I think… and that's fairly fundamental… there are two different streams… pure and applied. (Blair)

In addition to two types of research, comments by Ray reflected the existence of two types of impact in the form of scholarly and real-world impact:

> There is impact factors and there is impact on changing people's lives… and I value the social impact more… if I retired who would care that I had impact factors, but I would care that I had done something good for society. (Ray)

In the first focus group, participants noted that the Internet had changed the way research knowledge is accessed and shared, with reference to Google Scholar that enables immediacy of access. Comments reinforced literature suggesting that digital technology has changed the way researchers operate (Ayanso et al., 2014; Cronin, 2010). Participants acknowledged the opportunity for researchers to use open publishing practices to achieve both scholarly and real-world impact. Focus group participants understood the need to publish research findings so as to maximise readership, regardless of scholarly impact factors. Sam suggested that researchers should "do the right thing, to publish where it will be read". Dale philosophised about the motivation for researchers to achieve scholarly impact or real-world impact:

> Are researchers focused more on their own standing within the culture of researchers, or within their standing within the culture of the whole of society? Is your average researcher aware of their position in society as a whole, and that society allows them to do what they do, or are they quite myopic in feeling that what they're doing is about the recognition of their peers? (Dale)

There was a discussion of journal impact factors in the first focus group, with Blair denouncing their use as a form of academic game-playing, suggesting "they're just metrics in the end and they're probably past their use by date anyway". Lee agreed, suggesting that the contemporary publishing environment rendered impact factors obsolete:

> Impact factors are an outdated concept because they haven't updated their understanding about how people access research any more… with the internet making knowledge so freely available, those impact factors might not necessarily be reflective of what really makes an impact in any case. (Lee)

In the second focus group, there was suggestion that researchers are becoming myopic through their focus on short-term outcomes of publishing rather than long-terms benefits for society. The myopic nature of research activities has been noted by Boulton and Lucas (2011) in reflecting on the contemporary practice to prioritise research activities that address society's identified problems. Across the group, there was evidence of disharmony as to whether researchers could do both, with one researcher noting the dilemma of focusing on real-world impact at the expense of scholarly impact:

> I'm looked down on by other more scholarly researchers because I care more about making an impact on the world than I do about impact factors. (Pat)

In both focus groups, there was acknowledgement that a researcher's stage of career influences the extent to which the researcher focuses on achieving scholarly impact or real-world impact. Academic work is often driven by the need to establish a career (Hope, 2013), rather than make a difference. Senior researchers suggested that impact factors may be more motivating for junior researchers:

> Research impact factors are career motivators for more junior researchers, and when you get to the level of senior researcher, you either want impact factors for your group, or you would like to go and make an impact in the world, before you shuffle off your mortal coil… the average researcher would have an increasing interest in making an impact on the world (Kerry)

> It depends where you are in your career… they probably mean more to young researchers and up-and-coming early career researchers than they do to more established folks who are further on and approaching the end of their career… for me I would much rather know I was making an impact on the world than about impact factors (Chris)

Institutional culture and reward systems encourage scholars to focus on academic exposure rather than achieving public impact (Flyvbjerg, 2012). The sector's "performance indicator culture" (Campbell, 2013, p. 57) driven by neoliberal influences is encouraging academics to

seek publication in high impact factor journals. An emphasis on performance and productivity, reflected in an "increasing need to evaluate and audit" (Campbell, 2013), is encouraging a myopic approach to the way academics plan and conduct work activities (Taylor, 2001), and may be reinforcing the publish or perish imperative. However, Pat, an early career researcher, commented cynically that "in a system that rewards early for impact and not much later, that a vast number of researchers just pretty much tail off into obscurity and time serving". Pat's comments prompted Dale to share thoughts about contemporary processes for assessing research, which encourage scholarly productivity at the expense of real-world impact:

> If you want to know how good researchers are at using money, well, look at how well they use money, as opposed to looking at how well they were able to scrounge publications when they had no funding… which is what the current model does… we have this single model where all of the esteem measures are at one level and it's kind of like the Matthew Effect where it's all creating these vicious and virtuous cycles. (Dale)

Ray was keen to emphasise the dual nature of impact in terms of scholarly impact and real-world impact. In a closing comment, that sought to summarise the first focus group's perception of impact factors, Ray suggested wryly that "in summary, we care about real impact but we also like academic impact anyway".

The discussion of this provocative statement reinforced data from Stage 1 and 2 interviews that stage of career affects the extent to which researchers focus on scholarly and real-world impact. However, even though research participants admitted to enjoying the "glory of appearing in the top titles in the field" (Willinsky, 2006), they were adamant that their research should make a difference in the real-world. Current methods of assessing research impact were revealed as frustrating to researchers, with evidence of confusion around research impact terminology. A comment by a senior researcher during the first focus

group captures the dilemma of research impact: “The question is… how do you define impact?” (Ray)

Five themes of research impact

The interviews and focus groups generated detailed descriptions of research impact to illuminate the lived experience of the phenomenon (C. Marshall & Rossman, 2006). Six emergent concepts were revealed through analysing the interview data from Stages 1 and 2. However, these concepts were synthesised and amended following Stage 3 focus groups.

This section presents five themes of research impact that reflect the lived experience of research impact shared by the research participants: *research is useful for society, research impact is about making a difference; research impact is a nebulous concept; research impact includes scholarly and real-world impact;* and *research impact is a shared responsibility*. Each theme is explained with reference to the data and extant literature.

Theme one: Research is useful for society

The first theme – *research is useful for society* – was adjusted from *research impact is good for society* following Stage 3 of the data collection process. During the first focus group, Blair had suggested that “universities are essentially about public good research”. However, later in the same focus group, Chris challenged this perspective when querying whether impact was always presumed to be positive. The effectiveness of focus groups in eliciting individual opinions that may contradict general understanding has been noted by Liamputtong (2011), and the first focus group had challenged one of the emergent concepts arising from analysis of the interview data.

The divergence of data emerging from the first focus group was explored by scrutinising interview transcripts to understand how participants had perceived the

relationship between research impact and public good. Interpretive researchers are encouraged to spend time pondering data (Wolcott, 1994). Although the public good intentions of research were evident in the data, one Research Leader (L4) had mentioned development of the atomic bomb and its significant negative impact on humanity. Another participant, a mid-career researcher, had provided thalidomide as an example of research with varying ability to deliver public good:

> …thalidomide was used as a drug to treat morning sickness, and that was disastrous, had a really negative impact, but it's a really effective drug for treating leprosy. (M2)

The pendulum impact of thalidomide is noted in the literature. Penfield et al. (2013) recall how variations in the drug's application influenced perceptions of its impact, from positive (treating morning sickness), to negative (controlling birth defects), to positive again (treating cancer). Another example, demonstrating how research impact can vary, is provided by B. R. Martin (2011) who notes that falling vaccination rates (negative impact) were attributable to research suggesting a link between vaccination and autism (positive impact). Although the literature suggests a tendency to conflate impact with benefit, research does not always deliver social advantages (Collini, 2012; B. R. Martin, 2011; Wooding et al., 2007). The real-world impact of research may have a negative impact on society, contradicting perceptions that all research achieves public good.

The data suggest that real-world impact requires research knowledge to be "useful to people" (S2), "useful to academics" (E4), "useful for society" (M1), "useful to the world" (E6) or make a "useful contribution" (E8). The public good ambitions of research are apparent when research delivers benefits by improving understanding, solving problems and changing behaviour. As suggested by Cole and Cole (1974) and Hazelkorn (2015), it is the usefulness of research knowledge that renders it valuable. During the interviews, 15 research participants used the word "useful" when describing how research made a difference to

academics, researchers, people, society, humanity and the world. One senior researcher suggested that research was useful when it "tells us what may be not worth doing" (S6), with a mid-career researcher emphasising that research knowledge needs to be made available otherwise "it's not really useful because…they don't share it with the world" (M3). Research that remains "unknown, ignored or neglected" (Hammersley, 2014, p. 345) is unable to achieve real-world impact.

However, determining the usefulness of research is subjective (Boulton & Lucas, 2011), and this was recognised by one of the Research Leaders:

> It needs to be judged with an open mind about its benefits or potential benefits, even if we don't understand it, that is, the people who are assessing it, we can see the logic of it, and if we can see something as there, that it needs to continue. So I suppose I'm grappling with who does assess that, because… it's a value proposition... it's value-laden judgements... it's cultural capital judgements that are being used in terms of that. It reflects what are dominant values in society at that time. (L5)

The contemporary focus on real-world impact suggests a return to the usefulness of research as recognised by C. H. Weiss (1977a). Research does not necessarily have to deliver public good to be useful and make a difference. Rather, as evident from the data, *useful research* makes a difference.

In responding to the research data, the first emergent concept was amended from *research impact is good for society* to *research is useful for society*. This statement better reflected how research participants had articulated the impact of research, by recognising the potential usefulness of research knowledge, without implying that all research knowledge achieves positive social benefits.

Theme two: Research impact is about making a difference

Research participants were adamant that *research impact is about making a difference*. The notion of real-world impact as making a difference in society is well documented (see, for example: Chandler, 2014; Chubb, 2014; Eynon, 2012; Niederman et al., 2015; Pettigrew, 2001; Phillips, 2010; Staeheli & Mitchell, 2005). Contemporary researchers want their research to have a positive impact (Buxton, 2011), or contribute in a beneficial way (Chubb, 2014). Researchers hope their work "changes lives, improves health, or brings increased stability or sustainability beyond the world of the academic journal" (K. M. Smith et al., 2013, p. 2), corroborating data from this study that real-world impact is dependent upon research knowledge making a difference.

The DF-CRN Researchers understood that, although some research may deliver an immediate impact on research participants, other research will take time for impact to manifest. As noted by Neylon (2011):

> Researchers do want to make a difference to the wider world, even if that difference may be a long way off.… Funding a range of research with no apparent immediate application is critical to making that difference in the long term. (para. 5)

Aware that some impact may take time, DF-CRN Researchers were encouraged to focus on the social value inherent in conducting research, rather than the value arising from the research findings (Baars, 2014), reflecting an understanding that real-world impact is often dependent on the action of others.

The research participants emphasised that research knowledge is always valuable, irrespective of whether it is used, or waiting to be used. This theme recognises the essence of scholarship, whereby research builds on other research, to contribute to the body of knowledge. As suggested by Kerry in the second focus group, research may be perceived as "an incremental contribution to a very grand enterprise, which is to understand the world

better, and be able to do things better". However, DF-CRN Researchers appreciated the need for research knowledge to be made available in order to make a difference, and noted that research knowledge that is sitting on a shelf or server may be eventually useful.

The DF-CRN Researchers insisted that each research activity extends the body of knowledge, and even though one particular research project may cease, the research concept or idea may be picked up at some time in the future "when it may suddenly [become] very important" (Kerry) to inform the body of knowledge and generate new research. This perspective is reinforced by Ridley (2015) who notes that no less than 23 people, including Thomas Edison, are credited with inventing the lightbulb.

Implicit within the phrase *making a difference* is the notion that change occurs. Real-world impact requires a change in knowledge, attitudes or behaviour that can occur at an individual, group or community level. As suggested by Bayley (2016), in discussing the UK's research assessment process, "impact is the provable effects of research in the real world… in its truest form, 'impact' is the protected description of the resulting change" (para. 2). However, research participants acknowledged that change may not always be apparent, particularly in the case of individual changes in knowledge or attitudes that C. H. Weiss (1977a) suggests is the enlightenment function of research use. Therefore, assessing the impact of research is a complex process due to the nebulous nature of research impact as outlined in the next section.

Theme three: Research impact is a nebulous concept

The data suggests that research impact may be difficult to discern, and challenging to assess. These were two emergent concepts revealed from analysing Stage 1 and 2 interview data, suggesting that *research impact is a nebulous concept*. Participants confirmed that research may influence the real-world in a way that is not always apparent, reflecting comments by C.

H. Weiss (1977a) that, in the case of social science research, the impact of knowledge may be a "diffuse, undirected seepage" (p. 534). Literature suggests that research knowledge may not immediately, or always, impact on policy or practice, but in a multitude of other ways (Levin, 2011). In addition to informing policy and guiding practice (Cleaver & Franks, 2008; S. R. Smith, 2007), research generates knowledge (Rolfe, 1998) and shapes public opinion (Kuruvilla et al., 2007). As suggested by Morton (2015b), research impact includes "changes in awareness, knowledge and understanding, ideas, attitudes and perceptions, and policy and practice as a result of research" (p. 2), reinforcing both the tangible and intangible dimensions of impact.

Research participants acknowledged that the actual or potential benefits of research knowledge may not be immediately recognisable (University of Strathclyde Humanities and Social Sciences, 2014), suggesting that the usefulness of research knowledge may not be realised for years. There are numerous examples where the impact of research was not immediately apparent. Such examples include Waterston's molecular velocity research, that was rejected as nonsense (Merton, 1968), yet informed the development of kinetic theory (Whitaker, 1979), and Madame Curie's discovery of radium, that would ultimately benefit humanity in ways unforeseen at the time (Molas-Gallart, 2014). The impact of research may also be serendipitous (Cadogan, 2014; Meagher et al., 2008). Two senior researchers in this study noted the inadvertent discovery of research knowledge that is evidenced in the literature. Serendipity is one factor that contributed to the accidental discovery of penicillin by Fleming in 1946 (Kirk & Miller, 1986), and the development of Viagra's sildenafil citrate in 1989 (Li, 2006; Osterloh, 2004).

The real-world impact of research may be indirect, intangible, unexpected and endless. Given that research builds upon research, it may be difficult to identify the influence of some research (H. Davies & Nutley, 2008). Tracking how research influences people's

minds is a great challenge (Willinsky, 2002), particularly how research changes "people's knowledge, understanding and attitudes towards social issues" (H. Davies et al., 2005, p. 2). Researchers are often not aware of who is reading their work, and the use that is being made of it (Molas-Gallart & Tang, 2011). The notion of *research without impact* was troubling for one research participant who provided comments about the subjective nature of assessing impact, particularly from an individual perspective:

> I would say that apparent to whom… I can't imagine a situation in which somebody's dedicating years of their life to research that they themselves can't imagine having any apparent impact. (E6)

Research participants expressed concern that the current focus on applied research, by funding agencies and government, may adversely affect curiosity-driven blue-sky research, and leave little room for serendipity and the discovery of unexpected phenomena (Huber, 2012; Stipp, 2010). Such targeted research seeks answers to existing problems, and may discourage researchers from pursuing interesting tangential research and "following his/her insight to an exciting end" (Stipp, 2010, p. 140) to generate even more valuable research knowledge.

The data suggests that real-world impact is achieved in a diversity of ways. The perceptions and experiences shared by research participants reinforced that research impact is a nebulous concept (Bastow et al., 2014a), with the term used to describe both scholarly and real-world impact (Penfield et al., 2013). The incremental nature of research, and the nebulous nature of impact, presents challenges when seeking to attribute real-world impact to one specific research activity, reinforcing the complexity of efforts to understand and assess how research influences society.

Theme four: Research impact includes scholarly and real-world impact

Research participants perceived research as having real-world impact irrespective of whether the impact was achieved within or beyond academia. In discussing how research achieves real-world impact, DF-CRN Researchers supported a perspective presented by Brown et al. (2016) that "good scholarly work includes among its end results that the work in read, discussed, and built upon by other scholars to extend our knowledge and understanding of the world" (p. 646). Research knowledge needs to be made "accessible, reachable, and workable" (Porter, 2015) in seeking to influence non-academics. As noted by Lee during the first focus group, "even just publishing the research is an impact", highlighting the scholarly and real-world impact of disseminating research knowledge.

The requirement for research knowledge to be shared for real-world impact was emphasised by one of the senior researchers:

> Research is not just about acquiring new knowledge, and then communicating it in obscure peer-reviewed journals. It is, must, should be, about communicating what has been found more broadly, but not only because tax payers are often paying for the research. But also, because the more you spread the message about the research, the more I would argue that it has value. The value of research is as much about communicating that research as it is about doing it in the first place. It also, of course, helps prevent what has happened many times in history, which is, research is repeated because one group doesn't realise what the other group has been doing previously, or even what it is doing at present. So you could make the point that research, even underway rather than completed, needs to be communicated so that research teams and collaborators and even the competition can know what's happening and respond effectively to that. (S5)

Participants in this study acknowledged that scholarly impact was an academic necessity in the prevailing publish or perish environment. There was suggestion that scholarly impact is a precursor to achieving real-world impact, due to the fact that academics with scholarly

reputations are sought to provide advice outside the academic community. As explained by Tinkler (2012), it is contemporary practice for governments to seek academics with "experience and expertise" (para. 3) when requesting input to the policy development process. However, scholarly impact alone is insufficient in seeking to influence practitioners and broader society. As noted by one of the Research Leaders, practitioners do not read academic journals for reasons of cost, accessibility, and difficulty translating the academic content.

During the interviews and focus groups, participants shared concerns about sectoral and institutional publishing priorities that continued to favour peer-reviewed publications in high impact factor journals, frustrating efforts by researchers to disseminate research knowledge in more-accessible channels. Research participants recognised the opportunities provided by social media that enabled them to share research knowledge more easily to achieve real-world impact. Sharing research knowledge was perceived to be an obligation and a requirement, reflecting the responsibility of researchers to justify public expenditure on research by demonstrating public good.

The data suggests that scholarly impact manifests in two ways. First, formal scholarly impact occurs through the peer-review process, and the production of research outputs such as journal articles and conference papers. Second, informal scholarly impact occurs through dissemination activities undertaken by academics seeking to share research knowledge and academic perspectives, at networking events, community engagement opportunities and through social media channels. Such dissemination occurs irrespective of the production of research outputs, and may occur before, during and after the research activity. Although participants recognised the importance of achieving scholarly impact for reputational purposes, they also understood the importance of balancing peer-reviewed publishing activities with the need to make research knowledge more readily accessible.

Evidence suggests that research impact may be better understood as comprising both scholarly and real-world impact, and that scholarly impact may be perceived as a form of real-world impact. Although some research participants equated impact with dissemination as noted in the literature (Cameron, 2014), participants aspired to achieve both scholarly and real-world impact as two dimensions of research impact.

Theme five: Research impact is a shared responsibility

The collaborative nature of research impact was emphasised in the interviews and focus groups. Research participants emphasised that achieving real-world impact is a shared responsibility across researchers, research institutions, government and funding agencies. Real-world impact relies upon collaboration and knowledge-sharing between researchers and research users (Armstrong & Kendall, 2010; Hemsley-Brown & Sharp, 2003), reinforcing efforts by the Australian government to encourage collaborative research activities. However, as noted by the research participants, there is no guarantee that the research findings will be useful or adopted by intended recipients (Buykx et al., 2012). Real-world impact requires research users to adopt and apply research knowledge, whether that be in terms of capacity building (indirect benefit) or policy and practice (direct benefit) (Hazell & Slade, 2016).

Research activities have a direct influence on those individuals involved in the research activity. However, achieving broader real-world impact requires the involvement of multiple research stakeholders, reinforcing that research impact is a shared responsibility. Although the researcher may seek to achieve real-world impact from research knowledge, the knowledge beneficiary plays the ultimate role in making use of the research knowledge. The role of the knowledge beneficiary is explored in the final chapter of this thesis.

Summary

This chapter has presented the results of a thematic analysis of the data collected during Stages 1, 2 and 3, when interviews and focus groups were conducted with Research Leaders, DF-CRN Researchers and DF-CRN Participants. The three-stage data collection process sought to answer the main research question: *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?* Six concepts that emerged from Stage 1 and 2 interviews were amended following Stage 3 focus groups to reveal five themes of research impact: *research is useful for society; research impact is about making a difference; research impact is a nebulous concept; research impact includes scholarly and real-world impact* and *research impact is a shared responsibility*.

The five themes reveal the human experience of research impact (Michael van Manen, 2012). Phenomenological research does not seek to generalise findings to a population, but to "reveal, open, and explore a possible human experience" (Michael van Manen, 2012, p. 2). The five themes of research impact reflect a common construction of reality (Guba & Lincoln, 1989). In this chapter, the themes were discussed with regard to the literature, to demonstrate the relevance of the findings.

The next chapter considers implications for theory and practice arising from this research, to demonstrate how the study makes an original contribution to knowledge.

CHAPTER 5 – DISCUSSION, CONCLUSIONS AND IMPLICATIONS

The real-world impact of research is not well understood, complicating efforts to assess how research knowledge influences society. This research has explored perceptions and experiences of research impact to answer the main research question: *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?* Over a period of five months, data was collected from research executives, institutional leaders, senior research officers and researchers using a phenomenological research approach. Phenomenology explores the lived experience of research impact from the perspective of those who experience the phenomenon (Titchen & Hobson, 2005).

The research used a bounded case study of the Digital Futures CRN to explore how Research Leaders, DF-CRN Researchers and DF-CRN Participants understood research impact. The research was informed by two research sub-questions. The first sub-question – *How do researchers and research leaders perceive research impact?* – sought to explore perceptions and experiences of research impact shared by research participants. The second sub-question – *How does a logic model approach support understanding of research impact?* – sought to explore the effectiveness of the logic model framework for understanding how research impact is realised.

The analysis of data collected during interviews and focus groups revealed five themes of research impact. First, that *research is useful for society*, regardless of whether the impact of research is good or bad. Second, that *research impact is about making a difference*, highlighting the subjective nature of assessing impact. Third, that *research impact is a nebulous concept,* suggesting that the impact of research may be difficult to discern and challenging to assess. Fourth, that *research impact includes scholarly and real-world impact*,

and efforts to distinguish between the two may be immaterial due to their entwined nature. And finally, that *research impact is a shared responsibility,* with a multitude of research stakeholders involved in the process of achieving impact from research.

This chapter discusses the links between the five themes of research impact, and implications for theory and practice (Figure 13).

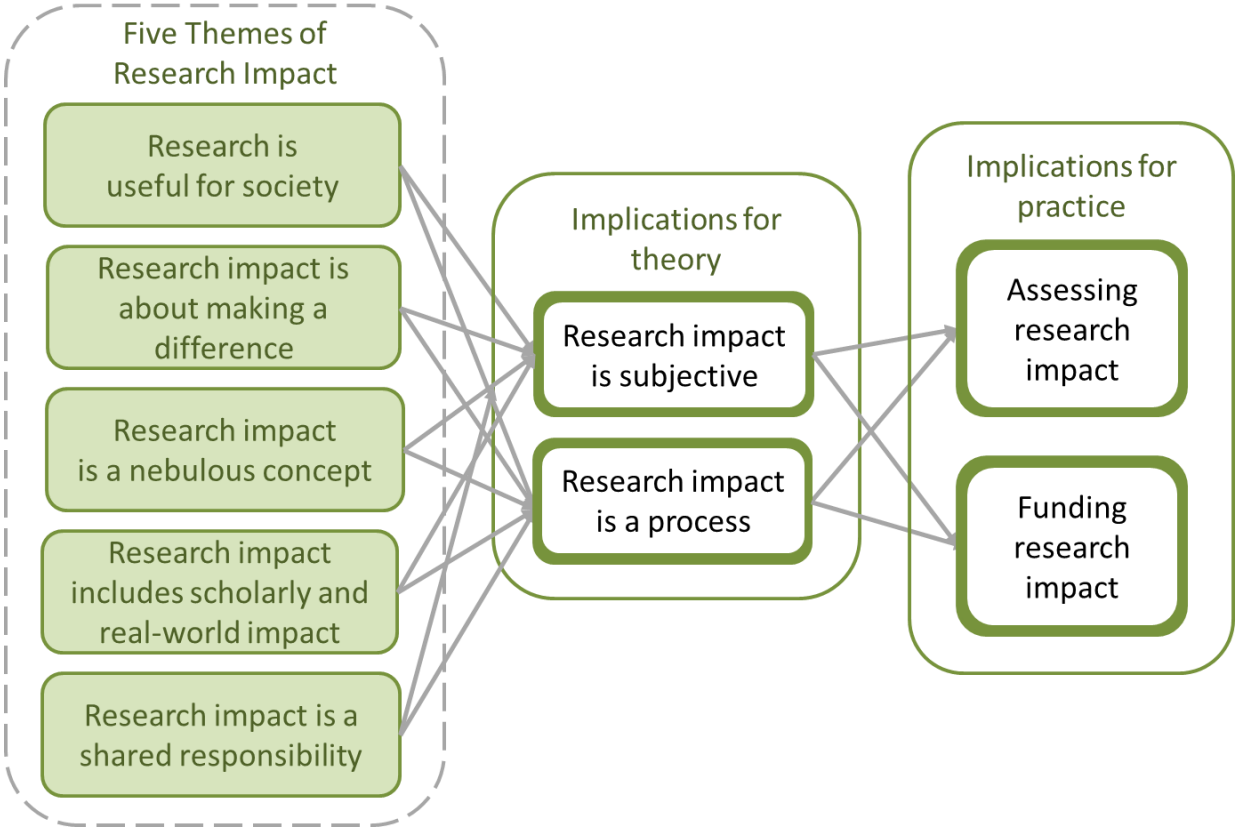

Figure 13. Synthesis of the five themes of research impact into implications for theory and practice.

Two key contributions to theory, identified through this research, are discussed in this chapter. First, that research impact is a subjective assessment that varies according to the usefulness of research. The requirement for research to be useful in order to achieve real-world impact suggests a key role for the knowledge beneficiary in determining the relevance of the research knowledge. Second, that research impact may be better conceptualised as a process, rather than a product, suggesting a new definition of research impact: *Research*

impact is the process whereby research knowledge makes a difference to the knowledge beneficiary. Such a re-conceptualisation of impact provides an alternative perspective to logic model approaches for assessing impact.

Two key implications for practice identified from the research findings are discussed. First, government efforts to assess research impact may be improved by ensuring those benefitting from the research are included in the process of assessing the impact of research. Second, in seeking to encourage research with real-world impact, there is value in funding both blue-sky and applied research activities, and encouraging collaborative research endeavours. Achieving impact from research is a shared responsibility. Researchers, research institutions, government, funding agencies and those benefitting from the research knowledge play a part in ensuring research achieves real-world impact. The chapter concludes with my own reflections on the research process, and suggestions for further research arising from this investigation.

Throughout this chapter, the term *knowledge beneficiary* is used to denote the individual, group or community benefitting from the research knowledge. As evidenced in this study, the end-user of research is difficult to identify. The term knowledge beneficiary, rather than end-user, avoids insinuating that research impact is finite. Whilst Pratt (2016) distinguishes between the research user and the research beneficiary, the term knowledge beneficiary encompasses both of these groups to reflect advantages in terms of how research knowledge makes a difference.

The following section discusses implications for theory arising from this research.

Implications for theory

The research findings suggest two implications for theory: research impact is subjective, and research impact is a process. The subjective nature of research impact suggests that research needs to be useful to make a difference.

Research impact is subjective

The subjective nature of research impact was evident in the way research participants described the lived experience of research impact. Impact may be unexpected, difficult to discern and challenging to assess, supporting comments by H. Davies and Nutley (2008) that "impacts are often indirect and long-term and can be difficult to track" (p. 3). Participants shared a diversity of ways that research makes a difference, providing examples of impact both within academia and outside academia. Scholarly impact and real-world impact were encompassed within the broader term of research impact, with scholarly impact perceived as a form of real-world impact. The lived experience of research impact, from the perspective of research participants, suggests that attempts to distinguish between scholarly impact and real-world impact may be immaterial. Although scholarly impact remains a contemporary imperative for academics, as evidenced by a focus on the production of research outputs, DF-CRN Researchers aspired to achieve real-world impact.

The literature suggests that a culture of publish or perish continues to dominate researcher activities (Reich, 2013). However, research participants acknowledged an informal dimension to scholarly communication that has been noted by Cronin (2010), whereby impact occurs irrespective of research outputs such as publications, conference papers, frameworks, data and presentations. Although one research participant suggested that researcher credibility facilitated the process of seeking to achieve real-world impact, there was little evidence of causality between research excellence and research impact, suggesting

that scholarly impact and real-world impact are not always related (Buxton, Hanney, Packwood, Roberts, & Youll, 2000). Literature reinforces this perspective. For example, in the United Kingdom, one government-commissioned report over-generalised research data, yet received extensive media coverage and political endorsement (Mendel, 2014). In contrast, research into lethal injection, that has only been cited eight times, achieved a change in public policy such that lethal injection was ruled unconstitutional in the state of Tennessee in the United States of America (Swannell, 2013). These examples suggest that research with high citation rates may not achieve significant societal impact (Buxton, 2011), and research with significant societal impact may not necessarily achieve high citation rates.

Research participants emphasised the subtle ways that research makes a difference, such as when researchers interact and engage with others to share research findings. Research knowledge achieves impact when it extends understanding, influences perspectives, satisfies curiosity and incites enthusiasm. Such nebulous impacts of research are not always apparent to the researcher or to the individual, group or community benefitting from the research knowledge. Literature reflects the embedded and invisible nature of impact (Cain & Allan, 2017), suggesting that the influence of research is "multiple, multi-layered and complex to track" (Sumner et al., 2009, p. 3). As noted by Barcan (2013), it is the "invisible work" (p. 3) of academics that is so difficult to assess. The subtle influences of research (Eynon, 2012), and the inherently subjective nature of impact assessment activities (U. Kelly & McNicoll, 2011), present challenges for those seeking to understand the real-world impact of research.

As evidenced in the data, research needs to be relevant to be useful, and it is through usefulness that research gains value. Although Boulton and Lucas (2011) suggest that usefulness may be a shallow perception of how research contributes to society's wellbeing, participants in this study were confident that all research knowledge is useful. The distinction made by Bastow et al. (2014a) between *knowledge currently in use* and *knowledge not in*

current use, and by Boulton and Lucas (2011) in noting two types of research knowledge as "applied and not yet applied" (p. 2510), suggest that all research knowledge is potentially useful. This perspective was highlighted by one research participant, who suggested that the act of doing research changes the mind of the researcher, thereby demonstrating the immediate impact of research on an individual.

Usefulness is a complex concept. Notions of value are underpinned by experiences (Payne et al., 2008), and mean different things to different people (Zeithaml, 1988). Assessments of impact tend to blur the distinction between *useful knowledge* and *used knowledge*. As Porter (2015) notes, "there is plenty of knowledge out there that is not particularly useful, in the socially productive sense of that term, but that is nonetheless used" (p. 294). Research participants recognised that the value of research knowledge may not become apparent until a later time, delaying utilisation of the research knowledge, and reinforcing literature that the impact of research may take time to become apparent. As stated in the Group of Eight Australia (2014) *Submission to the Inquiry into Australia's Innovation System*, often the research that has greatest impact is that which was undertaken without any direct intention of being useful.

The subjective nature of impact assessment extends to contemporary practices whereby governments, funding agencies and universities establish research priorities based on what they deem to be useful. Such steering of research activities was concerning to the participants in this study who conveyed dissatisfaction with the prioritisation of applied research, and the perceived pressure to achieve pre-determined outcomes. Although setting research priorities appears to be an efficient way of directing research, there is a risk in assuming that today's research priorities are related to tomorrow's problems. Attempts to direct research efforts to resolve society's grand challenges (such as famine and climate change) need to be balanced with encouraging blue-sky research where the application of

research knowledge may be less apparent, and deliver less immediate benefits for society. In this study, participants noted that each form of research was valuable, with data suggesting that the usefulness of knowledge is irrespective of whether the research is applied or blue-sky.

The Australian dialogue of impact focuses on the *demonstrable contribution* of research (ARC, 2016e). The notion of demonstrable contribution attempts to address the subjective nature of impact, by implying that research with impact has obvious benefits, and that evidence of those benefits is possible. Such tangible dimensions overlook the subtle influences of research and dismiss the nebulous nature of research impact. As noted by Sumner et al. (2009), impact may be "visible or invisible; progressive or regressive… intended or unintended and immediate or long term" (p. 7), reflecting the multiple dimensions of impact that create challenges for those seeking to assess impact. Marjanovic et al. (2009) note that the "unintended consequences" (p. 31) of research are often overlooked in impact assessment processes. Research participants emphasised the serendipitous nature of impact and the less apparent benefits of research, such as research that changes the minds and hearts of individuals.

Analysis of data from this study suggests that research is an incremental activity with each piece of research building upon another, and laying the foundation for future research efforts. The ongoing nature of research, in terms of its continual contribution to the body of knowledge, and acknowledgement that impact takes time to be realised, suggests there may be no end to the impact from research. As evidence of this, DF-CRN Researchers were challenged to identify specific beneficiaries of research, other than impacts on their own research participants or potential future impacts on broad categories of beneficiaries such as *individuals, groups, communities* or *society*. One research participant suggested the term *end-*

user was inappropriate as it was difficult to know who would be the ultimate, or final, user of research.

The research findings reinforce literature suggesting that achieving real-world impact from research is a slow, haphazard and complex process (Bastow, Dunleavy, & Tinkler, 2014b; I. D. Graham et al., 2006; Lavis, Ross, & Hurley, 2002) that is neither rational, linear nor direct (Adelle & Weiland, 2012; Juhlin, Tang, & Molas-Gallart, 2012; Molas-Gallart, Salter, Patel, Scott, & Duran, 2002; Sommer, 2001). Yet the logic model, which is commonly used to visualise the generation of research impact, suggests a planned pathway to impact, and fails to account for the unpredictable, and at times serendipitous, nature of impact that was emphasised in the interviews and focus groups. The next section will explore the processual nature of research impact, and limitations of a logic model approach to understanding how research impact is achieved.

Research impact is a process

Analysis of the data suggests an alternative perspective to understanding research impact, whereby research impact is conceptualised as a process rather than a product, in much the same way as research is a process rather than a product (Buckler, 2011; H. Davies & Nutley, 2008; Duffield, 1997; Simmons, 1999). This section reviews the logic model approach to understanding impact in light of the research data, and re-conceptualises impact as a process, to better reflect how contemporary research achieves real-world impact.

Re-visiting the logic model

The conceptual framework for this study used a logic model to explore the relationship between scholarly and real-world impact. Although logic model approaches are commonly used for assessing impact (Marjanovic et al., 2009), such approaches presume a causal relationship between inputs and outputs, outputs and outcomes, and outcomes and impact

(Kellogg Foundation, 2004), without considering the underlying mechanisms and context (Pawson, Greenhalgh, Harvey, & Walshe, 2005). This study presents an alternative perspective for understanding research impact that is less quantitative and objective, and emphasises the role of the knowledge beneficiary in the process of assessing research impact.

Research participants perceived that scholarly impact was a form of real-world impact, with the term research impact used synonymously with scholarly and real-world impact. When asked to provide examples of research impact, DF-CRN Researchers provided examples of scholarly impact such as publications, conferences and key-note addresses. This confirms literature suggesting there are variations in understanding of research impact across different stakeholders, with research outputs perceived as socio-economic impact (Penfield et al., 2013), and bibliometric data used as evidence of research impact (Qin, 2010). Research participants also used logic model terminology in an inconsistent manner, reinforcing evidence in the literature that research impact terminology is confusing (A. Weiss, 2007).

During the interviews and focus groups, participants noted that real-world impact was evident in the myriad ways that research delivers benefits for others, such as advancing knowledge, raising awareness, influencing perspectives, satisfying curiosity, inciting enthusiasm and changing behaviour. The DF-CRN Researchers provided examples of how they shared research findings via social media and community forums, to demonstrate how their research directly impacts others. Although these dissemination activities are valuable for sharing research knowledge, such efforts are generally unrecognised in terms of reward and recognition at an individual or institutional level.

The researcher plays a significant role in making research knowledge available for others, however the role of the researcher in achieving impact is not reflected in the logic model framework that suggests *research creates impact*. Whereas the logic model suggests a linear relationship between the activity of research and the generation of impact, the data

from this study suggests there is a relationship between the researcher and research knowledge, and between research knowledge and the knowledge beneficiary.

The research findings confirm the complexity of research impact as being non-linear and unpredictable (Milat et al., 2015). As noted by Boyer (1990), knowledge does not develop in a linear way, suggesting that linear approaches to understanding impact may be ineffective for assessing some kinds of impact (Roche, 2001). Linear models are often used to represent processes that are multi-dimensional (McCawley, 2001), and linear approaches have been criticised for their simplistic representation of how research impacts practice (McCormack, 2011). More recently, there has been a noted departure from linear models of knowledge transfer to models that recognise end-user participation and promote collaborative knowledge production approaches in seeking to close the research-practice gap (see, for example: Boyer, 1990; Cuthill, 2010; Gibbons et al., 1994; Heaton, Day, & Britten, 2016; Pain, Kesby, & Askins, 2011).

Re-conceptualising research impact

In the literature reviewed for this study, there is evidence that impact is understood to be a product of research. A range of terms are used to describe the real-world impact of research, including *consequences* (H. Davies & Nutley, 2008), *societal benefits* (M. R. Roberts, 2009), *useful interventions in the world* (Porter, 2015), *benefits or returns* (Donovan, 2008), *direct and demonstrable contribution* (Hammersley, 2014), *broader impacts* (The National Science Foundation, 2014) or *occasion of influence* (London School of Economics Public Policy Group, 2011). However, participants in this study highlighted the processual nature of research and impact using terms such as “research process”, “dissemination process”, “peer review process”, “process to take an idea to market”, “process of discovering new information”, and “knowledge transfer process”. The data reflects a perspective whereby research impact may be more a process than a product, in much the same way as Lomas

(2000) suggests that research is "more a process than a product" (p. 140). As evidenced from the data, impact is the process by which research makes a difference, rather than the product of having made a difference.

The findings suggest that the process of generating impact is more *organic* than *mechanistic* (Utterback & Abernathy, 1975). Yet linear models of impact promulgate impact as a ricochet effect of research. Such notions, that suggest collision or contact imagery, have been criticised in the literature, with Collini (2009) suggesting they perpetuate two-community approaches whereby universities collide with *not-universities* as representations of society. As noted by Hammersley (2014), the snooker ball analogy of impact implies that research (presumed to have force) comes into contact with policy-making and practice (presumed to be stationary) to change its direction. Although there is a need for research to come into contact with policy-making or practice in order for research to have an influence (Hammersley, 2014), the impact of research is "much subtler, more long-term, and more indirect than the clacking of one billiard ball against another" (Collini, 2009, p. 176). In addition, real-world impact may be facilitated by intermediaries. Spaapen et al. (2011) distinguish three types of interaction that occur between researchers and stakeholders: direct or personal interaction, indirect interaction through a medium, and financial or material exchanges. A productive interaction occurs when the results of research are applied to achieve behavioural change (Spaapen et al., 2011). However, it is only by considering the indirect effects of research that the *ultimate impact* of research on society will be revealed (Godin & Doré, 2004).

The organic process of impact is more aligned with ripple imagery suggested by W. Grant and Harris (2012), and noted by an early career researcher during the Stage 1 interviews. Bastow et al. (2014b) propose an alternative metaphor that likens research impact to a pile of sand where each grain contributes, and even though the last grain of sand may

trigger an avalanche, each grain has played a part, and is no more or less significant than another. This metaphor better reflects the incremental nature of research knowledge, and the perceptions of research impact evidenced in the data. However, contemporary definitions of research impact, and attempts to assess research impact, such as ERA, suggest that impact is the direct and tangible influence of research knowledge.

The less-linear nature of impact suggests a need to explore the relationships between elements, rather than focus on the elements themselves. This reflects a systems-level approach to understanding impact where impact is re-conceptualised as a process rather than a product. A similar approach was used by Gilbert (2005) in re-conceptualising knowledge as a process, rather than a product, and "as a verb, not a noun… something we do rather than something we have" (p. 76). As suggested by Buykx et al. (2012), there are two approaches to assessing the impact of research: either focusing on *outcomes or measures* of how the research knowledge is used; or focusing on *activities or processes* facilitating use of the research knowledge. Understanding how research influences the real-world requires a process of assessment, rather than an evaluation of the products or outputs of research. Assessment is process-oriented, whereas evaluation is product-oriented (Angelo & Cross, 1993). The aim of assessment is to achieve improvements in the level of quality; the aim of evaluation is to describe or judge the level of quality (Baehr, 2005). The findings from this research suggest that a focus on the process of assessing impact may be useful for identifying influences of research that are not otherwise apparent (Spaapen & van Drooge, 2011).

Arguably, the process of assessing impact may be improved by focusing on how research knowledge *makes a difference* for knowledge beneficiaries rather than focusing on research outputs which were perceived by participants in this study as a secondary, rather than a primary, outcome of research. The logic model approach focuses on outcomes or measures, whereas a process understanding of impact focuses on the activities or processes.

Applying a process understanding to research is more aligned with a knowledge mobilisation perspective that focuses on interactions and relationships in the process of connecting research with the real-world (Levin, 2011).

The processual nature of impact was evident in the way research participants used the terms "research" and "researching" when discussing research impact. Research Leaders used the term "research" whereas DF-CRN Researchers used the term "researching". Research as a noun emphasises the product dimensions of research, whereas researching as a verb hints at the processual nature of research. The data suggests that Research Leaders were focussed on research impact as an outcome. In contrast, the perceptions and experiences shared by DF-CRN Researchers focused on research impact as an activity.

The product-process differentiation is evident in marketing literature where goods are differentiated from services (Rushton & Carson, 1989). As explained by Vargo and Lusch (2004), the marketing of goods focuses on "tangible resources, embedded value and transactions" (p. 1) whereas the marketing of services focuses on "intangible resources, the co-creation of value and relationships" (p. 1). The characteristics of research impact are similar to those of services, in terms of being intangible, inseparable, heterogeneous and perishable (Wolak et al., 1998), reflecting the nebulous nature of research impact.

Given that neoliberal doctrine continues to influence the higher education sector, there is an additional reason to re-conceptualise impact as a process: the opportunity to re-dress neoliberal discourse that has infiltrated the higher education sector (B. Davies, 2005) and manifested in a "verbless pomposity" (Watson, 2015, p. 5). An over-reliance on abstract terms such as *deceased instead of dying* and *rain event instead of raining* (Watson, 2016) encourages public language that is "evasive and dishonest in its essence; abstract, devoid of useful information and concrete example, remote from human reality, filled not with detail but with hogwash" (Watson, 2015, p. 1). As suggested by B. Davies (2005), the adoption of

superficial neoliberal language renders academics vulnerable to "those who would govern us through the manipulation of funds and the tying of dollar values to each aspect of our work" (p. 1).

A contemporary focus on research outputs as drivers of individual and institutional reward systems reinforces how neoliberal doctrine continues to influence the higher education sector. Given that research impact remains a misunderstood term as evidenced in the literature, there may be value in re-defining research impact as a process where verbs are embraced, and *making a difference* captures the essence of impact.

Re-defining research impact

The findings from this research suggest re-conceptualising research impact as a process, and re-defining research impact as follows:

> *Research impact is the process whereby research knowledge makes a difference to the knowledge beneficiary*.

Re-defining research impact as a process, rather than a product, supports research participant perspectives that research is an incremental activity. Each piece of research builds upon a previous piece of research, and if research has no end, then the opportunity for research knowledge to achieve research impact is endless. Furthermore, the definition acknowledges the role of the knowledge beneficiary, and the lived experience of impact from the perspective of the knowledge beneficiary, reflecting the phenomenological approach to this research study. There is no attempt to specify how research knowledge makes a difference, in terms of form or function (Buckland, 1991), as this would require a comparison of two states (before and after) to establish similarities and differences (Macfarlane, 2004). Given the subjective nature of impact assessment, and the indirect, intangible, unexpected and endless influences of research, it may not be possible to specify how research knowledge makes a difference to the knowledge beneficiary.

Three key features of the definition are outlined below.

1. **Impact as making a difference.** The real-world impact of research was noted by research participants as *making a difference,* and this is evidenced in the literature. The notion of making a difference avoids value-laden terms that may attempt to specify the difference in terms of magnitude, quality, benefit, worth, or value. Determinations of *making a difference* must be made by the knowledge beneficiary, reflecting the individual and subjective nature of impact assessment that presents problems when seeking to provide attributes for the difference made by research. Furthermore, as noted by research participants, the act of making a difference can be either positive or negative. The definition does not presume that impact delivers public good outcomes, given that some research has had a negative impact on humanity, such as research that enabled the atomic bomb to be developed. The new definition avoids logic model terminology which is not well understood, and does not include terms such as translation, mobilisation, transfer, uptake, activation, exchange, utilisation or use, that attempt to specify how research knowledge achieves impact. Rather, the definition reflects the nebulous nature of research impact, whereby it may not be possible to fully describe how research knowledge achieves real-world impact.
2. **Impact on the knowledge beneficiary.** The new definition recognises that impact occurs at the interface between research knowledge and the knowledge beneficiary. Whilst the researcher contributes research knowledge, the researcher does not have sole responsibility for achieving real-world impact which is a shared responsibility. The real-world impact of research knowledge depends on the knowledge beneficiary, and may occur without the

involvement of the researcher or other research stakeholders. The new definition uses the term knowledge beneficiary to avoid specifying particular groups that may benefit from the research knowledge. As evidenced from the data, it is challenging to denote individuals, groups or communities that may benefit from the research knowledge given that the influence of research may be indirect, intangible, unexpected and endless.

3. **Impact of research knowledge**. The new definition makes no reference to scholarly or real-world impact to reflect the research findings that research impact occurs irrespective of whether the impact is scholarly or real-world. There was a noted interdependency across the two types of impact, with data suggesting that real-world impact is facilitated by scholarly impact, and that scholarly impact is a form of real-world impact. In the opinion of research participants, impact was making a difference whether that difference was achieved *within academia* or *outside academia,* with each perceived as a type of real-world impact.

Re-visualising research impact

Research impact conceptualised as a process challenges logic model approaches to understanding impact, and suggests a non-linear model for describing research impact (Figure 14).

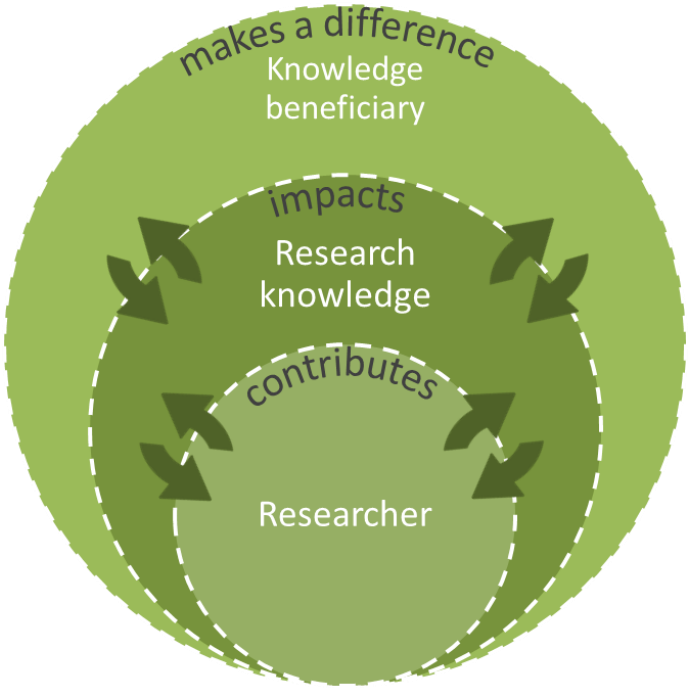

Figure 14. Conceptual model describing the process of research impact.

The re-conceptualised model of research impact reflects five key considerations that were revealed through the data.

First, the diagram is circular rather than linear. This contrasts with current conceptions of research impact and impact assessment frameworks which are heavily reliant upon linear models. Research data and literature support a ripple understanding of impact (W. Grant & Harris, 2012) as being more relevant for depicting the incremental nature of research impact. The stacked Venn format, rather than concentric circles, reflects the way research radiates from the researcher to research knowledge to the knowledge beneficiary. The outer circle contains the generic term *knowledge beneficiary* to avoid specific terminology, such as society, people, individuals, groups or communities, yet encompass the multiple and varied beneficiaries of research knowledge. The ripple imagery captures the complexity of real-world impact, in that knowledge evolves and influences in a gradual and incremental manner.

Second, the diagram centres upon researchers rather than research itself. Terms such as *research, research question* and *research objective* were considered, however *researcher*

was chosen to reflect comments by research participants that researchers contribute research knowledge, and that research knowledge is not always derived from the activity of research, the research question or the research objective. As recognised by Collini (2009), in discussing the public discourse of research impact, "none of us [are] wholly 'inside' or 'outside' any of the institutions or identities which partly constitute who we are" (para. 21). The placement of the researcher within the smallest circle reflects how the researcher is instrumental in contributing research knowledge for the benefit of the knowledge beneficiary.

Third, the diagram conceptualises research impact as a process, rather than a product. The circles in the diagram reflect processes that are described using verbs – contributes, impacts and makes a difference – with the spaces between the circles representing elements, as nouns, related to these processes – researcher, research knowledge and knowledge beneficiary. The diagram uses the term *contributes* in recognition of how research participants explained the process of making research knowledge available for broader benefit. As noted by the research participants, the contribution of research knowledge may occur irrespective of the researcher's role in discovering or creating the knowledge. For example, researchers may contribute research knowledge that was discovered or created by other researchers, or they may extend the body of knowledge such that the usefulness of research knowledge becomes apparent. In the diagram, research knowledge *impacts* knowledge beneficiaries, rather than creating *an impact* as the end result of the research activity. This reflects the ongoing processual nature of research articulated by the DF-CRN Researchers, and the perspective that if research has no end then research impact has no end. The phrase *makes a difference* is included in the diagram as it was prominent in the interview and focus group data, and encapsulates the essence of research impact as shared by the research participants.

Fourth, the diagram uses dotted circular lines to depict the multiple and porous interdependencies between the researcher, research knowledge and knowledge beneficiary. Impact is the process of moving research knowledge to the knowledge beneficiary, yet there is also a reverse impact whereby the knowledge beneficiary influences research knowledge. As an example, knowledge beneficiaries such as the government and funding agencies influence the generation of research knowledge by establishing research funding priorities to direct research activities towards solving society's grand challenges. In a similar way, although researchers influence the generation of research knowledge, extant research knowledge also influences researchers. Rather than including feedback loops, the two-way interactive flow process is visualised on the diagram using bi-directional arrows over the dashed circles to depict fluidity across the interfaces. The interfaces reflect that research knowledge impacts the knowledge beneficiary, and the knowledge beneficiary impacts research knowledge, which was evident from the data. The interfaces also reflect that researchers contribute research knowledge, and that research knowledge influences the research undertaken by researchers.

Finally, the diagram makes no distinction between scholarly and real-world impact to avoid a *two communities* approach to understanding impact (Harris, 2015b) that was evident in the literature. The participants in this study emphasised that research impact is a shared responsibility, rather than the traditional research-practice paradigm. A range of research stakeholders participate in the process of impact by connecting research knowledge with the knowledge beneficiary. The diagram makes no attempt to specify the research stakeholders involved in the impact process, as evidence suggests they are myriad and not always discernible.

Implications for practice

This research suggests two implications for practice arising from the research findings. First, that government efforts to assess the impact of research may benefit from including knowledge beneficiaries in assessment activities. Second, that the funding of research for real-world impact needs to be carefully managed to ensure that a focus on delivering short-term objectives does not adversely affect the achievement of longer term public good.

Assessing research impact

Since the beginning of the 21st century, the Australian government has attempted to encourage research with real-world impact, by prioritising research that makes a demonstrable contribution to society. Although impact has been part of the Australian government's vernacular in recent years, as outlined in Chapter 2, the assessment of research has relied primarily upon the ERA process of expert review, informed by activity data that is reported by research institutions. Reportable data includes research outputs, research income, applied measures and esteem measures (ARC, 2014). Although the Australian government prioritises impact *beyond contributions to academia,* and has engaged in ongoing efforts to understand the real-world impact of research, there was no specific impact category in the *ERA 2015 Submission Guidelines* released by the ARC (2014).

In 2016 and 2017, impact continues to feature in government documentation. Impact was noted as one of the government's key priorities in the *ARC Budget Statements* released on 3 May 2016, with the ARC designated as responsible for assessing the impact of research (Australian Government, 2016a). As evidence of the government's commitment to research impact, an amount of $8.3 million was dedicated to measuring research impact for the period 2015 to 2018 (Commonwealth of Australia, 2015a). The allocation of such funding emphasises the importance of understanding research impact to the Australian government. In

2017, the ARC will manage a pilot exercise to assess engagement and impact using a combination of quantitative and qualitative measures (ARC, 2016d).

The next round of ERA, scheduled for 2018, is expected to include elements of impact and engagement (ARC, 2015d), and be guided by work undertaken in the United Kingdom where research institutions, informed by contributions from researchers, report evidence of research impact using case study submissions. However, despite a focus on real-world impact, there is concern that the United Kingdom process may preference case studies centred on science, technology, engineering and mathematics (Bastow et al., 2014a) by requiring submissions to include "key outputs from the research" (HEFCE, 2012, p. 53) such as publications and research grants. Even though the case study submissions request details of up to ten external sources able to corroborate claims of impact, including beneficiaries of the research, HEFCE (2012) states that this information is "for audit purposes only" (p. 54). As such, traditional measures of scholarly impact continue to be reinforced as evidence of real-world impact.

The findings from this research suggest that impact is the process whereby research knowledge makes a difference to the knowledge beneficiary. Yet contemporary efforts to assess the impact of research do not generally include knowledge beneficiaries, except for audit purposes as noted in the previous section. Given that impact may not always be apparent, and therefore may be difficult to discern, it is unwise for researchers and research institutions to be given responsibility for identifying the real-world impact of research, without involving knowledge beneficiaries in the process. Assessing whether research has made a difference requires the involvement of those who benefit from the research knowledge, suggesting the need to include knowledge beneficiaries in the processing of assessing research impact.

Attempts to assess impact without including knowledge beneficiaries reinforces traditional frameworks for understanding impact where impact is conceptualised as an extrapolation of research outputs, suggesting that *extra effort will generate impact*. The dilemma facing researchers and research institutions is that impact assessment processes hold researchers accountable for generating impact, however real-world impact occurs at the interface between research knowledge and the knowledge beneficiary, which is beyond the control of researchers and research institutions (Figure 15).

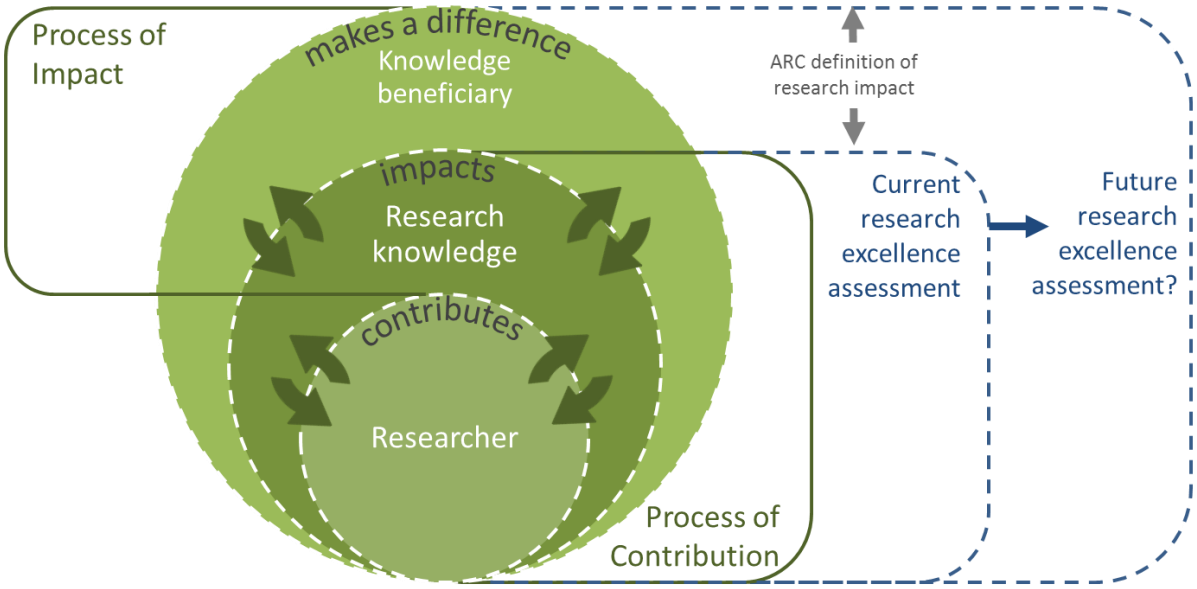

Figure 15. Re-conceptualised framework overlaid with Australian research excellence assessment frameworks.

As argued by Redman et al. (2015), future attempts to assess research impact will need to be "sophisticated and contextualised" (p. 2). Re-conceptualising impact as a process, occurring at the interface between research knowledge and the knowledge beneficiary, recognises the key role of knowledge beneficiaries in identifying the usefulness of research knowledge.

Across the Australian higher education sector, research performance continues to be assessed using quantitative indicators of research outputs including publications, grant

successes and HDR student completions. Researchers are encouraged to list numerous research publications on CVs, and research institutions reward and recognise researchers who publish in high impact factor journals and achieve research grants. Yet, as evidenced in this study, the ability for research knowledge to achieve real-world impact requires research knowledge to be made available, irrespective of the production of research outputs. As suggested by Jansen and Ruwaard (2012), courage is needed to re-dress the dominance of scientific impact in favour of a more balanced approach to assessing impact, where societal impact is considered equal to scholarly impact.

It is possible that current research excellence exercises may be undermining efforts to encourage research with real-world impact. The ERA process prioritises scholarly impact by capturing data on research outputs, research income, applied measures and esteem measures. Such objective assessment of impact fails to acknowledge the multiple ways in which research achieves real-world impact. Furthermore, the ERA process relies upon university submissions of research output data, and overlooks the role of the knowledge beneficiary in assessing the usefulness of research knowledge.

Impact as a process suggests the need to involve knowledge beneficiaries in activities to assess the difference made by research knowledge. Impact is the process by which research knowledge makes a difference, and it is the knowledge beneficiaries who are best situated to verify whether research does in fact make a difference. Impact assessment activities may be improved by exploring the relationships between the elements, rather than the elements themselves, thereby seeking to understand research impact as a process, rather than research impact as a product. Although the researcher plays an essential role in discovering, creating and contributing research knowledge, the knowledge beneficiary plays an equally important role in assessing the usefulness of research knowledge, and assimilating that knowledge for real-world impact.

Funding research impact

In Australia, efforts have been made by funding agencies to encourage research with real-world impact. Schemes such as those managed by the National Health and Medical Research Council (NHMRC), the ARC and the Australian government's Office for Learning and Teaching (OLT) request applicants to anticipate and address the wider influences of research to demonstrate how funding will deliver benefits for society.

- The NHMRC, Australia's leading expert body for health and medical research, funds a range of programs that aim to accelerate research impact by improving the process of research translation (NHMRC, 2014). In seeking to encourage research with real-world impact, the organisation recommends assessing applications by considering "a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice" (W. Anderson, 2014). The NHMRC acknowledges that identifying the real-world impact of research on policies, products and processes is a difficult process, however does not consider scholarly metrics to be an adequate substitute for assessing the contribution of research (W. Anderson, 2014).
- The ARC, since 2014, has required all funding submissions to include 75-word impact statements. The aim of the statements is to encourage researchers to consider the real-world impact of research when developing funding submissions. There is suggestion that such statements may be more effective, than impact assessment mechanisms, for focusing research activity on real-world impact (Trounson, 2014).
- The OLT introduced impact as an assessment criterion in funding guidelines released for the *2015 Innovation and Development Grants*, noting that impact

> is an explicit requirement of all funding applications and project reports (Office for Learning and Teaching, 2014). The OLT funding guidelines require projects to achieve impact for students, staff, institutions and the higher education sector that is "positive and substantial" (p. 12). An Impact Management Planning and Evaluation Ladder (Hinton, 2014) supports applicants to describe anticipated impact, by outlining a spectrum of change arising from educational development projects, progressing from impact on team members, through narrow opportunistic adoption, to broad systemic adoption.

The efforts of these Australian funding agencies to promote real-world impact in funding documentation suggest that impact is tangible and predictable. Yet, as evidenced in this study, capturing how research achieves real-world impact is a challenging process. The DF-CRN Researchers shared multiple soft impacts of research, such as extending understanding, influencing perspectives, satisfying curiosity and inciting enthusiasm, reinforcing comments by Eynon (2012) that the impact of research may be difficult to discern. It may not be possible for researchers to identify or anticipate changes in knowledge, understanding or perspective arising from research activities. Requiring researchers to do so may encourage statements that are embellished (Chubb & Watermeyer, 2016), or aspirational, rather than achievable. Whilst DF-CRN Researchers were enthusiastic to understand impact, they noted a lack of time and funding to do so, reinforcing perspectives by the London School of Economics and Political Science (2013) that researchers tend to claim impact from research in a haphazard manner. The requirement that publicly-funded projects be reviewed by an independent external assessor is mandatory for a number of Australian grants, encouraging researchers to remain committed to achieving real-world impact for the duration of these projects.

Researchers are not only being challenged to anticipate, articulate and demonstrate the real-world impact of research for funding purposes. They are also under pressure from their own research institutions to commercialise research knowledge. Protecting and exploiting research knowledge, in the form of intellectual property, has become a key priority for universities operating in a globally competitive marketplace where public sector funding of research is comparatively reduced. Increasingly, universities are seeking to commercialise research knowledge as a way of recovering institutional overheads, maximising returns on investment, and compensating for reduced public sector funding. As evidenced in the data, researchers were actively engaged in activities to marketise research knowledge (across social media, research reporting exercises and funding applications), and appreciated the need to commercialise research knowledge (in the form of patents) to achieve real-world impact.

The DF-CRN Researchers noted the pressure to meet key performance indicators, and deliver both scholarly and real-world impact. Although literature suggests that governments, funding agencies and research institutions prioritise real-world impact, researchers and research institutions continue to be rewarded on the basis of scholarly impact, perpetuating the *publish or perish* culture. Universities aspire to achieve public good, yet encourage academic productivity in terms of research publications, grant successes and HDR student completions, highlighting a disparity between institutional visions and management practices that Shore (2010) suggests is rendering academics increasingly schizophrenic.

There is little doubt that the funding of research will continue to drive research endeavours. However, government-determined research priorities, and a focus on real-world impact, will require careful management to ensure that funding supports both blue-sky and applied research endeavours. Research participants emphasised a distinction between blue-sky and applied research when discussing real-world impact, suggesting that blue-sky research may not have immediate impact, despite being responsible for some of the greatest

contemporary advancements such as the mobile phone and cancer treatment. The Research Leaders and DF-CRN Researchers emphasised that a balanced approach to funding research was needed to ensure that funding of applied research did not proceed at the detriment of funding for blue-sky research.

There is evidence that the Australian government is encouraging university-industry collaboration to ensure research achieves real-world impact (Commonwealth of Australia, 2015b). Programs within the government's National Competitive Grants Program (NCGP) such as the ARC Linkage Programme, Industrial Transformation Research Programme and Centres of Excellence Programme, aim to strengthen university-industry links and encourage national and international innovation systems (ARC, 2015e). Funding guidelines that promote collaborative research endeavours recognise the value of collaborative interdisciplinary efforts in solving the complex problems that plague society (Head, 2008).

As evidenced in the data, DF-CRN Researchers valued engagement and collaboration opportunities in seeking to make a difference and achieve real-world impact. However, Australia's rate of researcher-industry collaboration is less than other OECD countries (ARC, 2015a). It may be possible that efforts to encourage researcher collaboration and engagement are being undermined by neoliberal doctrine that continues to influence academic and institutional activities. A focus on productivity and accountability is evident in the way research priorities are imposed, research activities are controlled and research impact is assessed. Yet, as proposed by Olssen (2016), the contemporary focus on assessing the real-world impact of research, in order to justify public expenditure on research activities, does not have to detract from public good outcomes.

The findings from this research reinforce that research impact is a shared responsibility across researchers, research institutions, government, funding agencies and knowledge beneficiaries. Although generating research knowledge may be a core activity of

the university, the process of achieving impact from research knowledge requires the involvement of multiple research stakeholders. Impact, occurring at the interface between research knowledge and the knowledge beneficiary, encourages the production of knowledge using collaborative processes whereby researchers work closely with knowledge beneficiaries (Cuthill et al., 2014). Alternative models for assessing research impact that include knowledge beneficiaries, may illuminate the real-world impact of research by providing an opportunity for beneficiaries to share stories of impact that may be less apparent.

Researcher reflections

The process of collecting and analysing data provided multiple opportunities for me to ponder the impact of my own research. Reflexivity, as explained earlier in this thesis, is as an important process for qualitative researchers seeking to recognise their own impact on the research process (Kleiman, 2004). As suggested by Ely et al. (1997), the researcher manages multiple roles being "a participant and an observer, a professional and a stranger, sympathetic yet detached….both knowledgeable and capable of being surprised" (p. 239). These roles reflect my experience as a doctoral researcher engaged in the phenomenological "tango" (Finlay, 2008, p. 3) of seeking to understand research impact. As much as I sought to explore the lived experience of my research participants, I was also immersed in a lived experience of my own (Kafle, 2013).

During the first focus group, I was presented with an opportunity to reflect on my lived experience as a doctoral researcher. One of the participants asked me whether my research had achieved what I had hoped it would achieve. This question was confronting for me as I had earlier realised that the findings emerging from the data were not aligned with the expectations I had held at the start of my research journey. My response to the participant is provided here in full as a way of sharing my lived experience of the research process:

> No, I haven't got out of it what I thought I would get out of it. No. I had a huge crisis about three months ago where I ended up in my supervisor's office saying 'this hasn't gone how I thought it would go'. And he said 'how did you think it would go?'. And I told him [how I had expected it to go]. And he said 'so if you thought it would go like that, why would you have had to do any research?' …So it was actually a really good lesson for me, in that I had my own pre-conceptions, even though I had tried to bracket them, set them aside, do all the right things. I still thought I would find something, and I haven't found what I thought I would find.

The same participant then queried me as to whether I was disappointed or excited about where I thought the research was headed. My reply reveals the "emotional rollercoaster of doctoral research" (Morrison-Saunders, Moore, Hughes, & Newsome, 2010, p. 206):

> I went through a phase of being quite disappointed and then I thought… this is exciting too… this is very interesting.

As my research progressed, I became more aware of the need to make a difference. Impact was *the elephant in the room*. I had embarked on a journey that was equally public and private, with two distinct purposes. First, to identify and articulate the impact of higher education research as a contribution to the body of knowledge; and second, to achieve real-world impact by contributing my own research knowledge for the benefit of knowledge beneficiaries.

As my doctoral research comes to completion, I have an increased appreciation of the myriad ways that research knowledge impacts knowledge beneficiaries, and I have an improved understanding of the complexity of research impact in terms of scholarly and real-world impact. The philosophical question – *If a tree falls in a forest and no-one is around to hear it, does it make a sound?* – captures the essence of research impact. Impact is about making a difference, even if that difference may not be apparent. The answer to the main research question – *How do researchers involved in a collaborative multidisciplinary*

research program perceive the real-world impact of their research? – is revealed in the five themes of research impact.

The perceptions and experiences of research impact shared by the participants in this study demonstrate the usefulness of research knowledge. In recognition that research never ends, the following section suggests two avenues for further investigation.

Opportunities for further research

Opportunities for further research are suggested here as activities for extending the findings from this study.

First, there would be value in seeking knowledge beneficiary perspectives of research impact, to supplement researcher perspectives of research impact, and identify any alignment or misalignment in perceptions and experiences. Further research in this area would help improve understanding of the "context where knowledge is generated and applied" (Molas-Gallart, 2014, p. 12) and elucidate community priorities and knowledge beneficiary concepts of research impact (G. King et al., 2009; S. A. McKenna & Main, 2013). The findings from such research may reveal why academics and practitioners are perceived as *two communities* (Harris, 2015b), as explained in Chapter 2.

Second, the research provides a good basis for developing a process-based research impact indicator framework. Such a framework would provide a tool for policymakers and practitioners to assess the real-world impact of collaborative multidisciplinary research undertaken in higher education institutions. Literature suggests that process-based measures may be preferential to outcomes-based measures when assessing impact (Burton, 2013) as they are more actionable and informative (Rubin, Pronovost, & Diette, 2001). Such an understanding could be applied to broader notions of research impact, suggesting a process mapping approach to capture "the formal and informal structures and processes within an

agency or organisation involved in the delivery of a particular function" (Poole, 2006, p. 3). Developing a process-based research impact indicator framework would be a logical next step in articulating the broader impacts of research. Such a framework would enable the economic, social, cultural and environmental advantages of research to be revealed from the perspectives of researchers and knowledge beneficiaries.

Summary

This research has explored the lived experience of research impact to answer the main research question *How do researchers involved in a collaborative multidisciplinary research program perceive the real-world impact of their research?* The research was guided by two research sub-questions: *How do researchers and research leaders perceive research impact? How does a logic model approach support understanding of research impact?*

The single case study approach enabled perceptions and experiences of research impact to be explored within the bounds of a confined research program. The research findings from the Digital Futures CRN case study revealed five themes of research impact: *research is useful for society; research impact is about making a difference; research impact is a nebulous concept; research impact includes scholarly and real-world impact* and *research impact is a shared responsibility*. The five themes highlight the complexity of research impact, and suggest a new definition of research impact: *Research impact is the process whereby research knowledge makes a difference to the knowledge beneficiary*.

The findings from this study suggest that research impact encompasses both scholarly impact and real-world impact, and that scholarly impact is a form of real-world impact. The supposed separation between scholarly and real-world impact, evident in contemporary definitions of research impact, is not supported by the data collected in this study.

This research makes two original contributions to theory. First, to a broader definition of research impact that reflects the subjective nature of impact assessment, where usefulness is an essential criterion for research to make a difference. Second, to an improved understanding of impact as a process, rather than a product, thereby addressing limitations of the logic model approach to understanding research impact. The re-conceptualisation of impact as a process reflects the nebulous nature of research impact, and challenges the contemporary understanding of impact as an effect of research, with implications for the way research is assessed and funded.

There remains an expectation that university research will achieve public good. However, demonstrating the real-world impact of research is a challenging process due to the nebulous nature of research impact, and the indirect, intangible, unexpected and endless influences of research. Although further work is required to improve understanding of research impact in the 21st century, achieving real-world impact from research remains a contemporary imperative for researchers and research institutions, as a way of demonstrating the public good outcomes of research.

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