

Introducing systemic design to support an Australian Government regulatory agency address complex problems

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Certificate of authorship

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as part of the collaborative doctoral degree and/or fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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the 1990s, the number of people with a mental health problem has increased in the UK (Mental Health Act 1983, 1990).

There is a growing awareness of the need to improve the lives of people with mental health problems. The UK Government has set out a strategy for mental health care in the 21st century (Department of Health 1999). The strategy is based on the following principles:

- People with mental health problems should be given the opportunity to live as fully as possible in their own homes and communities.
- People with mental health problems should be given the opportunity to participate in decisions about their care and treatment.
- People with mental health problems should be given the opportunity to live a life of choice.

The strategy also states that people with mental health problems should be given the opportunity to live a life of choice.

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My motivations to study design

Although it seems a long time ago, my earliest desires were to be an artist. This passion was sparked with my Grandmother patiently teaching me to draw facial expressions on the blank-headed stick figures I'd been scribbling as a pre-schooler. It evolved with enrolment into every high school art class available and sleepless nights joyfully creating imaginary scenes in oil paints. Naturally, I enrolled into a media arts degree after school that I assumed would provide the commercial reality for a creative career.

However, towards the end of that first year of study, I had some kind of empty feeling about what we were being led into. It seemed like there was a choice between either leading a life of rebellion creating something from your own individual vision (and being poor but happy), or creating something from someone else's vision in a commercial setting (and being rich but guilty)! I had a vision of a different life; one where I could work with a group of people in a position of leadership to improve the way we live. To apply creativity not to aesthetic ideals but to the design of things that are meaningful in our lives.

This idea led me to study communications, including content streams in creative communications and corporate social responsibility. Then onto work in private sector roles in stakeholder engagement and community relations, and later to provide communications and strategic projects advice within a government regulator. These roles all involved working with complex, multi-stakeholder problems. There always seemed to be some incremental progress made against these problems, although it was never clear how to best go about this. Although valiant efforts were being applied, businesses and governments were still failing to bring about meaningful solutions to entrenched problems.

The question of how organisations can embrace diverse stakeholder perspectives and find new solutions in complex scenarios brought me back to the idea of design. At the time, design thinking had entered the public lexicon as offering creative processes and methods to solve problems. However, as I have explored design more deeply through this research degree, I can understand design as a new way to see, think and act in order to bring about meaningful change within complex systems (Dorst 2015b). This is exactly the kind of design I was intuitively seeking in my post-high school studies, which has evolved from the traditional design practice that I was being trained in (Jones 2013). This type of design is also very different to the conventional problem-solving approaches within our current organisations that is no longer capable to address the increasingly complex problems we face (Dorst 2015b)

This thesis is a result of my explorations into conventional problem-solving practice within a government regulator, the nature of these complex problems and why we keep failing to address them, and systemic design practices that can help us to create positive change in the most complex systems and environments (Jones 2013). It is also a stamp on my newly formed professional identity – as an artist in meaningful social change; as a systemic designer.

Acknowledgements of support

Many times in writing this thesis, I felt like I was sitting in a room full of knowledge and drawing down on the pieces that I could integrate and weave together to make sense of my research. I'm grateful for all the wonderful thinkers who have populated this knowledge room, and their efforts to give form to these perceptions of reality that may have been very foreign to the world at their time of writing. This makes my job very easy and I'm delighted to be able to contribute something to that room of knowledge. My design heroes who have committed themselves to this effort can be easily identified in this thesis as Kees Dorst, Peter Jones and Harold Nelson.

Thank you to Mieke van der Bijl-Brouwer, who supervised me through this process. You have been trusting and flexible with my approach to learning and incredibly structured and thoughtful in providing the right prompts and theoretical frameworks that I needed. Your passion for these subjects is infectious and I love the way that our ideas have evolved together as new fields and theories have opened up within the scope of this research. We make a great team.

Thank you to the academics and practitioners at the University of Technology Sydney (UTS) Design Innovation research centre and Designing Out Crime research centre. You have been a continued source of inspiration and connection to world-leading design for some of Australia's most challenging issues.

To the academics on my confirmation of candidature panel – Melissa Edwards, Bligh Grant and Liisa Naar – although we only had a brief feedback session, your comments have often been with me as I've been completing this research and have helped to shape my work.

And thank you to the Australian Government regulatory agency who trusted me to observe and interview project staff, introduce some strange systemic design ideas and implement design experiments. Your most senior leaders through to project officers were all willing to have me examine your practice and to consider new ways to do things. Your participation has made this a very practical and real research project that I have benefitted greatly from.

The research environment

This research was conducted in two environments—within the UTS Design Innovation research centre (and alongside the sister Designing Out Crime research centre) as well as within the Australian Government regulatory agency that is the subject of this research. In line with research agreements, the regulatory agency is not named in this research and is referred to by an alias ‘Agency X’. This co-location enabled a rich learning position with information being gathered and made sense of within two very different organisational contexts.

The UTS Design Innovation research centre is a transdisciplinary centre focussed on innovative, design-oriented research with the potential to transform the companies we work for and the cities in which we live. The centre forms part of the UTS Creative Intelligence Strategy. The centre progresses two main design methodologies – design-led innovation, which is mainly focussed on business growth and competitiveness in the private sector; and frame creation, which is mainly focused on complex problem solving in the public sector (Thurgood et al. 2015).

Agency X is an Australian Government regulator responsible for ensuring quality of goods and services provided by a specific business sector. The business sector being regulated is large and very diverse, ranging from small family operated businesses to large multi-national enterprises. The customer base of the regulated sector is also extremely diverse. I was also employee of the Agency X from 2011 until late 2016, most recently as an officer working at a strategic level with executive managers in the agency. The research component was conducted part time and outside of my regular duties. Being embedded as an employee in Agency X enabled me to understand regulatory problem-solving practices and the genuine challenges in achieving innovation within a public-sector context.

the 1990s, the number of people in the UK who are employed in the public sector has increased from 10.5 million to 12.5 million (12.5% of the population).

There are a number of reasons for this increase. One is that the public sector has become a more important part of the economy. Another is that the public sector has become more efficient. A third is that the public sector has become more attractive to workers. A fourth is that the public sector has become more diverse.

The public sector has become a more important part of the economy. In the 1990s, the public sector accounted for 12.5% of the UK's GDP, up from 10.5% in 1980.

The public sector has become more efficient. In the 1990s, the public sector's productivity grew at an average rate of 2.5% per year, up from 1.5% in the 1980s.

The public sector has become more attractive to workers. In the 1990s, the public sector's share of the UK's workforce grew from 10.5% to 12.5%.

The public sector has become more diverse. In the 1990s, the public sector's workforce became more diverse in terms of age, gender, and ethnicity.

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Abstract

Government regulatory agencies are important stakeholders in addressing complex societal problems and are beginning to recognise that these kinds of problems cannot be managed using traditional regulatory tools. This master's thesis seeks to understand the current practice of a regulatory agency in addressing a complex problem and to determine whether this can be supported by methods from the field of systemic design. Existing regulatory problem-solving practices are examined and their limitations for addressing complex social problems are identified when viewed alongside concepts from systems thinking and complexity theory. A qualitative case study is then conducted within an Australian Government regulatory agency to understand their current practice in addressing complex problems and the various contextual influences. Systemic design practice is examined as alternative way to address complex problems. A comparison of the findings from the current regulatory practice with systemic design principles identifies numerous opportunities to introduce systemic design into regulatory practice. A specific systemic design intervention is developed to trial within the regulatory context. This is applied within a second case study in the regulatory agency to understand the design outcomes, benefits and limitations of the intervention. The thesis concludes that systemic design principles and methods have the potential to support regulatory agencies to navigate compartmentalised governance systems by establishing a shared frame of reference to problems and the co-design of new responses. It proposes that the incorporation of systems thinking and complexity theories within design methods increases the likelihood of them being taken seriously in the government sector and that methods need to be tested and adapted further to enable integration within existing regulatory practice.

1. INTRODUCTION

Regulation does not appear to be the most engaging of topics so let's begin with a story.

Government regulators chasing an ever-changing problem

In early 2016, reports began emerging of asbestos contaminated construction materials being found imported and found in building sites across Australia. The initial 60 identified sites were thought to be the tip of the iceberg. "It's an emerging problem and it seems to be growing exponentially, as more and more products are brought into Australia, because of the wind-down of manufacturing in this country" said Asbestos Safety and Eradication Agency CEO Peter Tighe in an ABC News article in February 2016 (Donnellan 2016b). Indeed, by mid-2016, asbestos had been discovered in two large construction projects—a children's hospital in Western Australia and a government headquarters in Queensland (Upton & Stallard 2017). This importation of asbestos contaminated material comes despite an Australia-wide ban on the use of asbestos since 2003.

Most of the contaminated materials were traced back to suppliers in China, including claims of fraudulent test certificates from third parties claiming the products were asbestos free. Blame for the importation was attributed to heavy-handed Russian manufacturers, criminal syndicates and dodgy Australian builders choosing cheap Chinese products (Patty 2017).

Like many complex problems, this issue of asbestos contaminated building supplies crosses the jurisdiction of many government authorities and regulators. This included four federal government agencies responsible for different policy development and implementation; state and territory building regulators and workplace health and safety regulators; and federal and state consumer

law regulators (KGH Border Services 2016; Australian Government Department of Immigration and Border Protection 2017; Senior Officers Group 2016). A Department of Immigration and Border Protection (DIBP) commissioned report into the department's management of the issue states that there is "confusion about policy and regulatory responsibilities across Government in Australia and some ambiguity in the overarching legal framework" (KGH Border Services 2016).

Within this compartmentalised governance system, authorities remain busy taking separate action with the regulatory tools available to them. This includes attempted control of importation at the border and legal responses to punish importers and suppliers through written warnings, infringement notices, fines and criminal convictions (Senior Officers Group 2016).

Meanwhile, two national political inquiries were conducted. A Senior Officers Group Report (2016) notes significant issues in the current governance system that limit the ability for any regulator to stop known contaminated products entering into Australia, including:

- barriers preventing the collection and reporting of data on contaminated products
- gaps in the investigative and enforcement processes
- no coordinating mechanism to encourage information-sharing and collaboration between authorities, and
- no central point of information for industry or consumers.

Independent Senator Nick Xenophon elaborates that:

"The left hand doesn't know what the right hand is doing and Border Force needs to explain to Australians why they haven't been communicating this information immediately to state authorities, to the companies involved so public safety is not at risk" (Donnellan 2016a).

The increasing complexity of problems

Unfortunately, this kind of story is becoming very familiar to us. On one hand, it illustrates the increasing complexity of today's problems. In investigating the problem outlined above, the Senior Officer's Group (2016) highlighted that globalisation, internet procurement, reduction in trade barriers, more innovative products and increased competition are all factors that challenge traditional supply chains and therefore effective regulation. Other authors attribute the increased complexity of today's problems to the growth of technology and communication capabilities,

urbanisation, rising populations and the reduction in natural resources (Commonwealth of Australia 2010; Viebeke Carstensen and Bason 2012; Eggers and Singh 2009; Dorst 2015b).

There are diverse descriptions of complex problems, although most have common elements. Dorst (2015b) describes today's problems as being "a radically new species of problem: problems that are so open, complex, dynamic and networked that they seem impervious to solution" (p. 1). Snowden and Boone (2007) discuss the unordered and dynamic nature of complex systems in which today's problems emerge, which involve unpredictable human responses to intervention. Government literature tends to adopt the description of 'wicked problems' from Rittel and Webber (1973) to describe policy problems that are difficult to define, have many interdependencies, are socially complex and where attempts to address them can lead to unforeseen consequences (Australian Public Service Commission 2007). Specifically in the field of regulation, Sparrow (2008) has drawn regulators' attention to what he refers to as systemic problems, or specific patterns of risk that are revealed repeatedly in the sector, which might manifest as crime problems, environmental issues, drug smuggling etc. He describes different properties of systemic problems and claims that practitioners are left to try and find responses to the complex problems that lie between national-level risks being addressed by high level policy decisions and low-level incident responses.

Compartmentalised and dynamic governance systems

The example above also highlights the challenges of regulators working in compartmentalised and dynamic governance systems. The governance system can be taken to mean the policies (strategies that guide action), regulations (rules endorsed by government where there is an expectation of compliance) and the different government bodies (central departments and independent agencies) established to develop and administer those policies and regulations. The Organisation for Economic Co-operation and Development refer to "complex and multi-layered regulatory systems" which can include regulations stemming from sub-national, national and international levels of government (2010).

One way to understand this complexity is to perceive that governance systems have been organised by separating activities and problems into component parts through the establishment of discrete policies and implementing agencies (Bentley 2014). This approach becomes even more fragmented in the Australian democratic federation which includes the Australian federal government as well as state governments from the six states and two territories, followed by smaller local governments (Organisation for Economic Co-operation and Development 2010). Bentley (2014) comments that while the separation of responsibilities for activities and problems within government enables

stable operations in a high pressure environment, it does not support collaboration and innovative action (Bentley 2014).

Governance systems are also continually undergoing change. This may include decision makers developing new policies, rules, organisational structures or technology simultaneously and often without informing other parties (Norman & Stappers 2016). Traditionally, governments have responded to emerging problems with the creation of new regulations in an attempt to control the harm caused to the public. The Organisation for Economic Co-operation and Development attribute the rapid increase in new regulations to an increased risk aversion of the public sector (2010). This approach has more recently come under criticism for not only imposing a huge compliance burden on businesses and individuals (Department of the Prime Minister and Cabinet 2014) but also limiting the effectiveness of regulators in addressing emerging problems (Organisation for Economic Co-operation and Development 2010; Dorst 2015b; Giudice 2016). Both Dorst (2015) and Giudice (2016) comment that the knee-jerk response of legislators to create new rules when problems emerge only limits the agility of regulators to respond; paradoxically making their actions more static while the problems themselves become more dynamic.

Limitations of existing public-sector practice

In addition, the example above highlights the challenges of regulators trying to control complex problems by applying existing regulatory tools (rewards and punishments) that have been predetermined in legislation. The intention is to influence individual and business behaviour; however complex problems prove not so easy to influence. Many authors have warned that the established practices in government will not be sufficient to manage today's unprecedented challenges (Eggers & Singh 2009; Bason 2014; Bourgon 2008; Mulgan & Albury 2003; Australian Public Service Commission 2007). Traditional government practices were established in the industrial era where the public sector was "expected to perform predictable tasks under prescribed rules" (Bourgon 2008 p. 391). However, as the challenges in society have become more complex, government practice has struggled to keep up (Bason 2014; Bourgon 2008; Mulgan & Albury 2003). While the public sector has undergone numerous reforms in the past 30 years in order to increase flexibility, including introducing networked governance through the privatisation of services, Bourgon (2008) argues that these reforms are shaped as if the government operates in a predictable environment where it can control outcomes. For governments to work effectively in an unpredictable and increasingly complex world, they need to learn to innovate (Bourgon 2008; Moore & Hartley 2008; Mulgan & Albury 2003; Bason 2014; Eggers & Goldsmith 2009).

Innovation is described by Mulgan and Albury (2003) simply as 'new ideas that work'. Moore and Hartley (2008) elaborate on this description, clarifying that innovations must be implemented (not simply inventions) and that they must be large and durable enough to affect the operations of the organisation. Hartley (2005) adds that while innovation in the private sector may be considered a competitive advantage in itself, innovation in the public sector "is justifiable only where it increases public value in the quality, efficiency or fitness for purpose of governance or services" (p. 30).

Although innovation literature has primarily been focussed in the private sector, there is now a limited but growing body of research aiming to understand how innovation can be adopted in the public sector. Several authors have stressed the current barriers that make innovation in the public sector difficult, including a culture of risk aversion, existing administrative burdens, short-term political cycles, limited innovation skills and poor incentives to innovate (Mulgan & Albury 2003; Commonwealth of Australia 2010; Vibeke Carstensen & Bason 2012). Other authors have developed innovation frameworks to guide activities (Eggers & Singh 2009; Mulgan & Albury 2003), although these largely draw from private sector practices and may be biased towards needs in a commercial setting (Yee & White 2016). Most authors agree that innovation and the ability to develop and adopt new practices must become a core activity for the public sector.

Design to support public sector innovation

Design practice has been increasingly explored as a way to enable innovation in the public sector (Bason 2014; Burns et al. 2006; Design Council 2013). Simon (1996) famously described design as "courses of action aimed at changing existing situations into preferred ones" (p. 111). Nelson and Stolterman (2012) provide a similar description of design as the core human activity of creation, where we come up with an idea that would be a positive addition to the world and then bring that idea into existence. While the design profession has traditionally focussed on the production of visual or physical objects, it is now viewed as a genuine alternative to conventional problem solving (Dorst 2015b; Nelson & Stolterman 2012; Buchanan 1992). Design generated a significant following from the private sector in the 1990s due to its potential to support business innovation, and public sector interest has followed (Brown & Wyatt 2010).

Opportunities for innovation in a regulatory context

This research provides a unique opportunity to explore the potential for innovation within a regulatory agency. Therefore, it is important to understand the role of a regulator within a general governance system and where innovation might be applied within this context. Bentley (2014) highlights that government bodies are structured within a hierarchy with national government

departments being responsible for the development of policy and separate agencies being responsible for implementation. This includes the design of regulation and related legislation occurring at a national government departments level with independent agencies being responsible for the administration and enforcement of those regulations. If the purpose of a regulatory agency is simply seen to be the enforcement predetermined rules, they would be the last kind of government organisation expected to innovate. Bourgon (2008) echoes this sentiment, arguing that while the public sector needs to learn to innovate, the traditional compliance model (focussing on the rule of law, due process and accountability) is still relevant for the regulatory functions of government.

While the implementation of rules is likely to remain a strong and important function for regulators, they have not entirely escaped the call to innovate. The Organisation for Economic Co-operation and Development (2010) calls on the public sector to identify ways that innovation can be promoted in both regulatory design and delivery to increase efficiency and effectiveness. Australian public sector design agency, ThinkPlace, promotes design to develop effective regulatory enforcement regimes as well as strategic design of the regulatory organisations that deliver this experience (ThinkPlace 2014). The Australian Taxation Office is a notable example of developing internal design capabilities in order to redesign user experience of the tax system (Terrey 2009; Terrey 2013). Figure 1 demonstrates the role of a regulator in a governance hierarchy and the potential application of innovation and design within this context. This draws on classifications of innovation in the public sector by Moore and Hartley (2008b), Hartley (2010) and Windrum (2008), as well as descriptions of design in the public sector in Bason (2014).

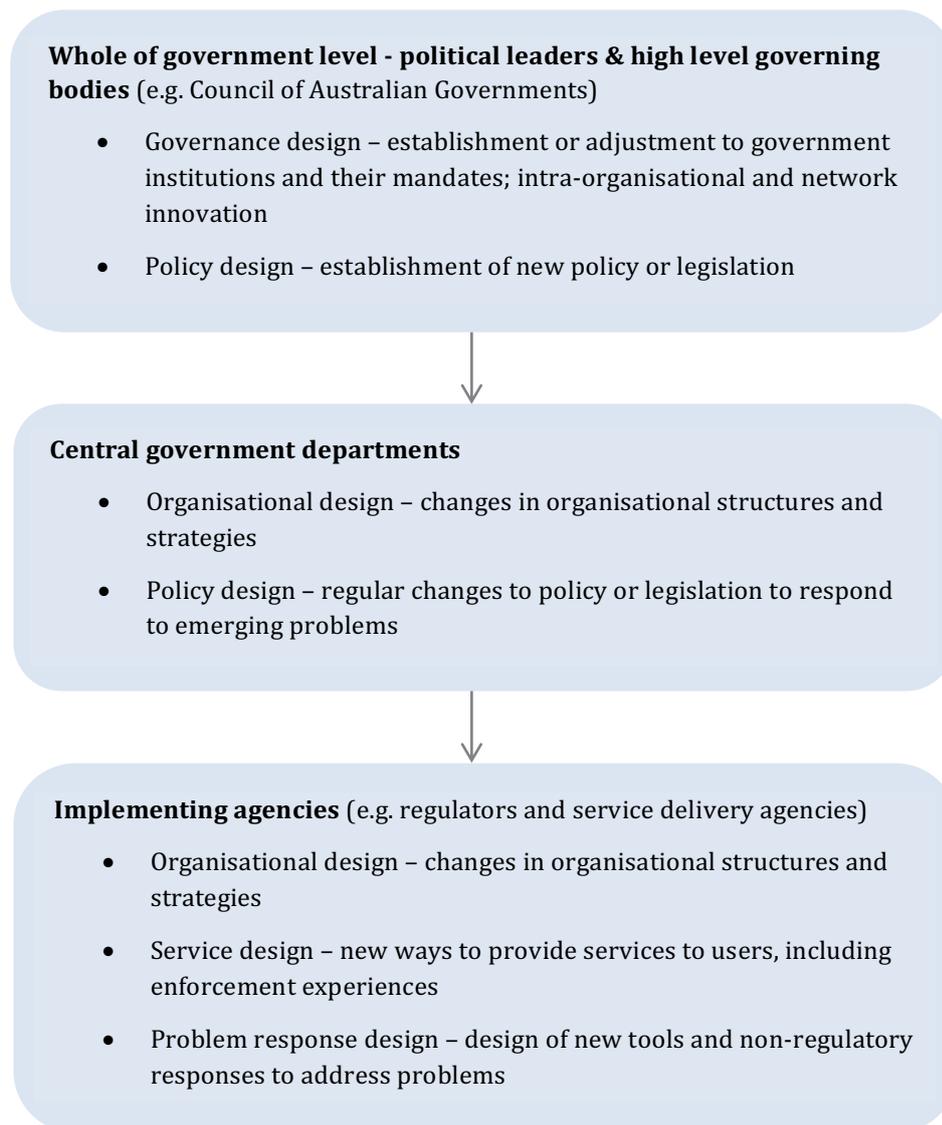


Figure 1: Opportunities for design within a governance hierarchy

The design of services appears to be the most thoroughly explored application of design in the public sector. Bason (2014) notes that service design approaches have transferred relatively easily from the private sector into the public-sector due to the flexibility of the government function that focuses on serving users in some similar ways to the private sector. These approaches include user-centred design, where the user moves from being seen as a ‘passive expert’ in a design process, to becoming a more active participant in the information and conception of new designs; and co-design, a similar participatory approach where the user is treated as a design partner in a collective creative process (Sanders and Stappers 2008). However, Bason (2014) notes that areas like policy design involve stronger contextual influences in the public sector for designers to navigate. Design for policy, although experimental, is now increasingly being explored (Design Council 2013; Bason 2014).

As stated by ThinkPlace (2014), regulators have the opportunity to innovate in areas of organisational design and service design. However, a more pressing area for regulatory innovation emerged in the early exploration of this research, which is innovation to address complex problems. Complexity is a term that become more common in our business in academic vocabularies in recent years and describes contexts and problems full of “unknown unknowns”, where cause and effect exists but can only be determined in retrospect, and where we need to rely more on information observed from patterns (Snowden and Boone 2007). The focus on complex problems emerged from both Agency X’s exposure to the work of Sparrow (Sparrow 2000; Sparrow 2008), who encourages regulators to identify systemic, or repeating, patterns of risk in the sector and to treat these risks differently through problem-based regulation, as well as Agency X’s genuine recognition that systemic problems were emerging that could not be easily dealt with by applying their standard regulatory responses. The OECD (2010) also reflects that innovation to address complex problems is an important focus for regulators, through developing the capacity to choose the most effective tool, or alternatively develop non-regulatory responses. This level of innovation moves regulators beyond simply being effective implementers of policy to becoming designers in their own right.

Understanding the relationship between regulatory practice and design practice

While an increasing number of government organisations worldwide have experimented with implementing design approaches, the results have been varied and sporadic (Luetjens 2016). Many authors comment on the lack of true integration of design practice into government being due to the fundamental differences of these two practices. Dorst (2015b) highlights that design offers a completely different approach to conventional problem solving applied in most organisations. Bason (2014) comments on a “clash of logic” (p. 5) between public sector organisations and designers, based on their different values and approaches to problems. Strong contextual factors in the public sector are also seen as a barrier to the adoption of design, and are said to become more challenging to navigate when the complexity of a problem increases (Bason & Schneider 2014).

Dorst (2015b) emphasises the importance of understanding and confronting these misalignments in a current organisational practice and design practice before design can be effectively embedded. This aligns with the accepted design research methodology of Blessing and Chakrabarti (2009) that it is important to understand the factors influencing current practice before designing any intervention to introduce into that practice. This is echoed by Bason (2014) who states that we need to gather evidence of specific applications of design in the public sector, and how this is impacted by the unique contextual factors of this context. Bason (2014) adds that literature that

explores the relationship of design and public sector practice is sparse. Steinberg (2014) states that academics need to be able to prepare designers to innovate from within government structures.

1.1. Research purpose, structure and questions

This research is conducted within the context of an Australian government regulatory agency for the purpose of understanding current regulatory practice to address a complex problem and the potential for systemic design (design practices that incorporate systems thinking or complexity theories in order to address high levels of complexity) to support this practice.

The structure of the research is based on the Design Research Methodology (DRM)(Blessing & Chakrabarti 2009) which was developed to provide a consistent approach and terminology for research specifically within the design field. Like action research, another research method undertaken in practice settings, DRM guides the researcher through iterative cycles of goal setting, understanding, design, implementation and reflection within a real-life context (Blessing & Chakrabarti 2009; Mackenzie et.al, 2012). However, the nuanced difference between DRM and action research is that DRM aims to establish general statements about the partial implementation of an intervention to inform the researcher on improving aspects of the design, which can then be generalised into other similar contexts. Conversely, action research aims to gradually improve the intervention in strong collaboration with the client, until an optimal implementation is achieved to improve a specific situation, where the intervention cannot necessarily be generalised. DRM is relevant due to the limited scope of this master's research, and the desire for the researcher to establish insights that can be generalised within other regulatory contexts (Blessing & Chakrabarti 2009). Within the DRM structure, case study research methods are utilised to guide the process of understanding what is 'real' within the practice setting (Yin 2013). The research approach is described in greater detail in Section 5.

The research structure is conveyed in Figure 2 in a representation adapted from Blessing and Chakrabarti (2009). In a more extensive study, each of the DRM stages could be explored in-depth, with numerous iterative cycles to improve upon the understanding and design of the intervention. Due to the limited scope of the master's program, this study focuses on an extensive descriptive study I to understand the context of current regulatory practice. It then includes a short prescriptive study including the analysis from an additional literature review, and a brief descriptive study I (implementation and evaluation), which can be considered a systemic design 'experiment'.

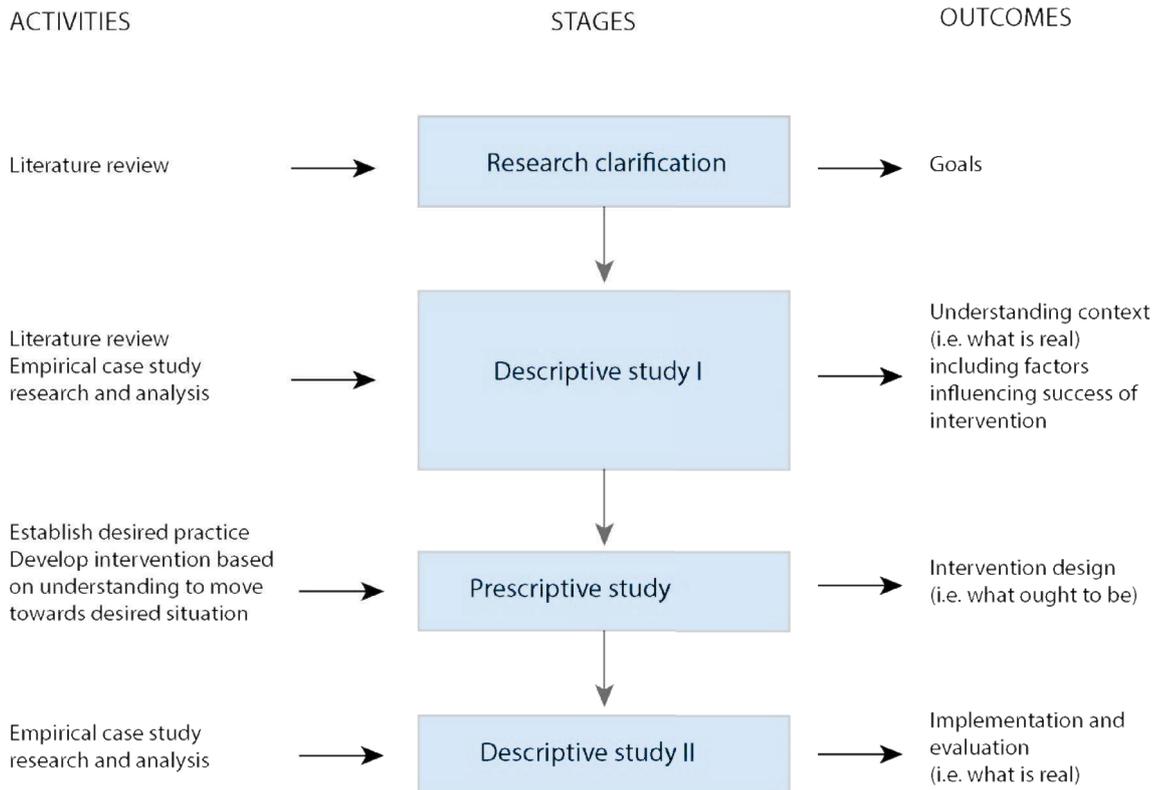


Figure 2: DRM research stages for the study, adapted from Blessing and Chakrabarti (2009)

As conveyed above, the research includes two main stages of literature review, and two empirical case studies conducted within a regulator in a particular business sector (referred to as Agency X) in order to respond to the research questions below. Many of the research questions include sub-questions that are covered in each relevant section.

Table 1: Research structure and questions

STAGES	ACTIVITIES & RESEARCH QUESTIONS
Research clarification	<p>Literature and practice observation</p> <p>Q1: What are the opportunities for innovation in a regulatory context?</p> <p>Q2: What is the relevance of design within a regulatory context?</p> <p>Resulting in goal: <i>to understand the current practice to address complex problems in a regulatory agency and whether this can be supported by systemic design</i></p>
PART ONE	
Descriptive study I	<p>Literature</p> <p>Q3: What can be understood about regulatory practice to address complex problems from current literature?</p> <p>Q4: What is systems thinking and complexity theory and can insights from these fields support regulatory practice to address complex problems?</p> <p>Empirical case study one</p> <p>Q5: What is the current regulatory practice to address a complex problem and how can this inform the development of a systemic design intervention?</p>
PART TWO	
Prescriptive study	<p>Literature</p> <p>Q6: What is systemic design and what would a more ideal practice include for a regulatory agency to address complex problems?</p> <p>Intervention design</p> <p>Q7: What opportunities exist for Agency X to move towards more ideal practice to address complex problems?</p> <p>Q8: What should a systemic design intervention include move Agency X towards more ideal practice?</p>
Descriptive study II	<p>Empirical case study two</p> <p>Q9: What are the results of introducing systemic design within regulatory practice to address a complex problem?</p>

1.2. Thesis outline

This thesis comprises fourteen sections, which outline the research approach and the findings. Each section is described briefly below.

Section one: this previous section provides an introduction to the research topic and context and an overview of the research questions and research structures.

Section two includes the conceptual framework that is used to understand practice, and introduces the indicators of complexity, Cynefin Framework and systemic design as key elements that will be considered within existing regulatory practice to address complex problems.

PART ONE focuses on the aspects of the research that aim to build an understanding of the current regulatory practice to address complex problems. Within part one:

- **Section three** outlines current literature of regulatory practice to address complex problems, considering the regulatory context, the practitioners, the type of problems being addressed, current methodologies and underlying paradigms.
- **Section four** focuses on systems thinking and complexity theory to gain an insight into how complexity is addressed within these fields, which enables a comparison to regulatory practice.
- **Section five** outlines the research approach for both case studies, including the research methodology and the data collection and analysis methods
- **Section six** describes the in-depth findings of case study one, including the context of the practice, the nature of the problem, the actions Agency X took to address the problem and how the response compared to the complexity of the problem. The influences of the context and practitioner are then considered, as well as additional challenges, and the influence of the underlying paradigm to the practice.

PART TWO then focuses on understanding systemic design practice and the development and trial of a systemic design intervention within a regulatory context. Within part two:

- **Section seven** examines design practice and identifies systemic design as a relevant aspect of the field to address complexity. Systemic design practice is considered against the conceptual framework to understand the relevant methodologies, principles and methods.

Seven systemic design principles are adopted to guide the development of an intervention to trial within regulatory practice.

- **Section eight** revisits the findings from case study one and compares these against the seven systemic design principles to identify possible limitations of the current regulatory practice and opportunities for this to be supported by systemic design.
- **Section nine** outlines the findings of the second case study when the systemic design intervention was applied to another complex problem in Agency X. The results include a discussion on the design outcomes, benefits and limitations of the intervention, the likelihood of adoption and further recommendations.

Section ten provides a discussion of additional research themes that arose through this research, including the relevance of combining systems thinking, complexity theories and design in a public-sector context, the possibility of changing paradigms, the role of a translator in bridging practice and paradoxes for regulators addressing complex problems.

Section eleven concludes the research, highlighting the findings against the main research questions that were established to understand the potential for systemic design to support current regulatory practice to address complex problems.

Section twelve comprises a brief reflection of the research approach, including the methodologies and methods applied within the research.

Section thirteen lists the appendices, including data collection instruments, additional findings summaries and the copy of a systemic design paper that the researcher published in the RSD5 symposium proceedings during this Master's program candidature.

Section fourteen lists the references used in this research.

2. CONCEPTUAL FRAMEWORK: Understanding practice

Dorst (2015b) and Bason (2014) have highlighted the importance of understanding current organisational practice (in this research the practice of regulatory agencies) and design practice, and critically examining this relationship before design can be effectively embedded into a new organisational context. However, the term practice is a contested concept and requires a conceptual framework for it to be consistently observed, described and compared. Hager, Lee and Reich (2012) explain “the term practice refers to many things and is used in many different ways, some deliberate and others less so”. They quote van Manen stating, “practice is one of the least theorised concepts in the discourses of professional fields” (Hager, Lee and Reich 2012 p. 1).

The Oxford Dictionary definition of practice is “the actual application of an idea, belief, or method, as opposed to theories relating to it” and “the carrying out or exercise of a profession” (Stevenson 2011). It also means Early theories of practice were based on the assumption of the intentional application of knowledge and theory by participants. However, more recent theories take into account a broad range of influences including the nature of the context the practice is conducted within and the perception or mindset of practitioners (Hager, Lee and Reich 2012). Dorst (2015b) provides a concise description of practice as the way someone sees, thinks and acts. This highlights that the observable actions are not the only aspects of practice that are relevant.

Dorst also recommends possible elements to be incorporated into a conceptual framework to understand an “area of complex human endeavour like design” (Dorst 2008, p. 5). The conceptual

framework to understand practice within this research builds on these recommendations to include the following elements:

- **The context** in which the practice takes place. This may include the broader systems if they influential on the practice, and the organisational context
- **The practitioners** that are doing the practice. This could involve an individual, team or support from an external designer. The practitioner brings a range of skills, knowledge, attitudes and mindset. In this research, the focus remains mainly on problem-solving actions that can be observed through the application of:
 - **Tacit or implicit knowledge**, meaning unique skills that a practitioner develops but which they may not be able to specifically explain (Polanyi 1966; Schön 1996).
- **The actions and activities** being observed, which may be based on:
 - **Observable methods**, meaning an established procedure for accomplishing something (Stevenson 2011)
 - **Principles**, meaning a fundamental truth or proposition that serves as the foundation for a system of belief or behaviour, and may provide more flexible guidance within a methodology (Stevenson 2011; Dorst 2015a)
 - **Methodology**, meaning a system of methods used in a particular area of study (Stevenson 2011)
 - **Paradigm**, meaning an established worldview underlying methodologies within established disciplines (Stevenson 2011).
- The object of the practice – in this case, a **complex problem** and the **problem response**.

These elements work together to form a more complete understanding of practice, as highlighted in Figure 3. The conceptual framework helped to inform the research design, and is used to compare the findings of different problem-solving practices throughout this thesis.

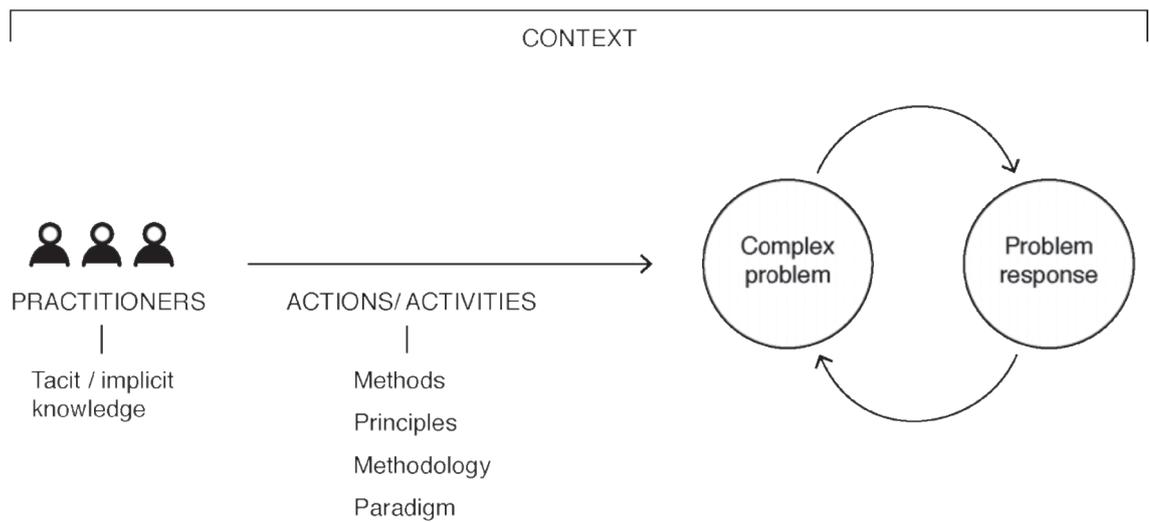


Figure 3: Conceptual framework of practice

Two particular methodologies are adopted in the conceptual framework to compare to current regulatory practice. These are:

- Snowden and Boone's (2007) **indicators of complexity** to understand whether the problem being addressed is complex, and the **Cynefin Framework** (Snowden & Boone 2007) to determine the appropriateness of responses. This is further outlined in section 4.
- **Systemic design methodologies** are adopted for the development of an intervention within the regulatory context. These comprise principles and methods, which are further outlined in Section 7.

PART ONE

Understanding current regulatory practice to address complex problems

Part one of this thesis focuses on understanding current regulatory practice to address complex problems. This is firstly informed by literature on regulatory practice and a brief exploration of systems thinking and complexity theory to better understand the realm of complex problems. Part one then includes the first empirical case study, to understand the current practice of a regulatory agency in addressing a complex problem in a real-life setting. Part one forms the descriptive study to understand current practice before prescribing and trialling a design-based intervention.

3. LITERATURE:

Understanding regulatory practice to address complex problems

This section considers the research question: *What can be understood about regulatory practice to address complex problems from current literature?* Aspects of the theoretical framework are considered, including the regulatory context, type of practitioners, type of problems regulators face, regulatory methodologies and the paradigm underlying regulatory practice. The elements of this practice are outlined in Figure 4.

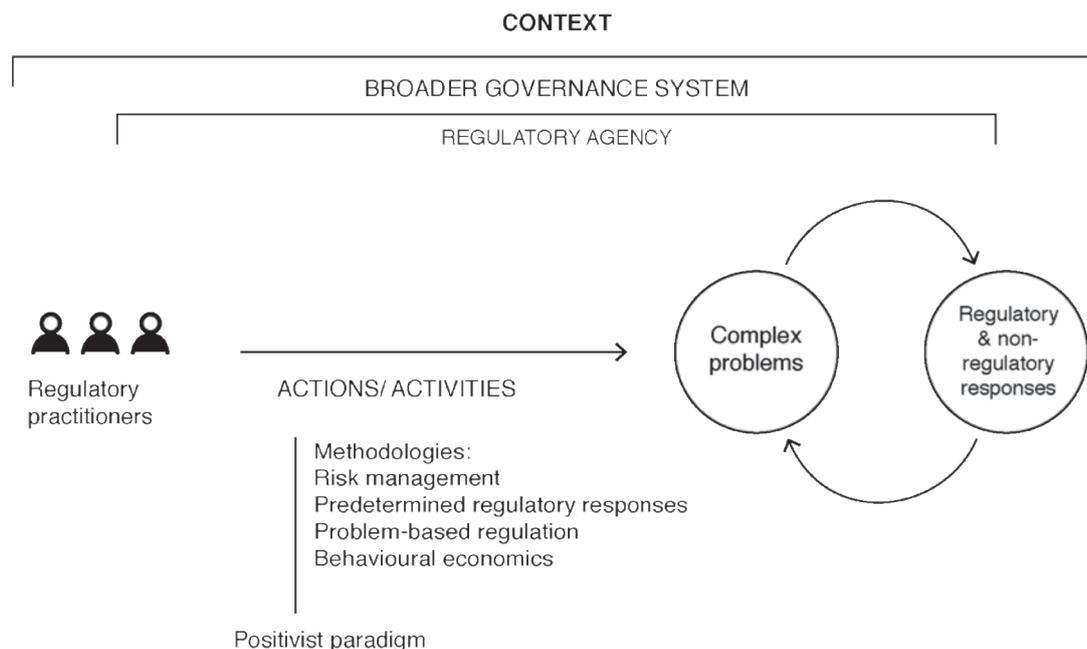


Figure 4: conceptual framework of literature on regulatory practice to address complex problems

Firstly, a brief history on regulation informs us that it is an old practice, having existed in several ancient civilisations through enforcement of contracts or the maintenance of norms, customs and privileges (Braithwaite 1951). Regulatory agencies were established in the United States from the late 19th and 20th century to formally administer regulation and produce administrative law (Braithwaite 1951). Sparrow (2000) notes that regulators draw knowledge from a huge range of disciplines. However, as an independent practice, regulation does not appear well established compared to other professional disciplines (such as law, business etc. that can be commonly studied in higher education). The range of explicit regulatory methodologies is not expansive and its literature is limited to a few respected authors (notably John Braithwaite and Malcolm Sparrow).

3.1. What is the regulatory context?

The context of practice in a regulatory agency can be considered on two levels – there is both the context of the broader governance system within the public-sector environment that Agency X is part of and the context of the regulatory organisation from which regulatory practice takes place.

Context: nature of the governance system

Governance systems were described in the introduction to mean the policies and regulations as well as the different government bodies that develop and administer those policies and regulations. Governing bodies exist in a hierarchy with national government departments being responsible for the development of policy and regulations and regulatory agencies being responsible for administering regulations.

Policy frameworks within the governance systems drive the direction of a regulator's operations. Regulatory agencies are prescribed specific objectives and given powers to perform certain regulatory activities under legislation developed by central government departments. In Australia, agencies are held accountable to their performance under the Commonwealth Resource Management Framework that was strengthened in 2014 to drive an increased emphasis on performance, planning and risk management. Agencies are allocated a budget to deliver on their prescribed objectives and functions, report on their performance in annual performance statements, and respond to questioning about their performance at a government hearing three times a year.

Context: nature of the regulatory agency's governance and structure

In Australia, the appointed leaders of a regulatory agency are generally considered statutory authorities of the Commonwealth and are delegated responsibilities for decision making and spending public money (Organisation for Economic Co-operation and Development 2010). These statutory authorities oversee the operations of a regulator, which is structured to perform regulatory functions. Sparrow (2008) comments that most regulators are structured around functional expertise (e.g. grouping lawyers together in a legal function and auditors in an audit department) which helps preserve and develop disciplinary expertise but also creates a silo mentality where each function acts in isolation with the specific disciplinary tools seen to be most suited to each task. Regulatory agencies may also be organised around processes that they are required to perform to carry out their regulatory functions, such as processing tax returns (Sparrow 2008).

Public sector barriers to innovation

It is well known that contextual factors in the public sector can limit innovation. Vibeke Carstensen and Bason (2012) describe the 'anti-innovation DNA' present in public sector organisations due to

their typically hierarchical, bureaucratic and sectorialised nature. The Commonwealth of Australia released a report in 2010 into the state of innovation in the Australian Public Service (APS) which found 23 specific barriers that are present at different stages of the innovation process (Commonwealth of Australia 2010). While this report was based on information across various government entities and not just regulation, most of the barriers are relevant to practice within a regulatory agency context. These include risk aversion based on the political and media scrutiny of government, the short-term focus within political cycles and the lack of mobility between the public and private sector with a prioritisation of administrative and regulatory skillsets.

While the current context may limit innovation, there are numerous external forces requiring the public sector and regulatory agencies to adjust their practices. In addition to the need to more adequately address complex problems, regulators in Australia are being challenged to develop reforms that reduce regulatory burden, boost productivity, increase competitiveness and lift regulatory performance (Australian National Audit Office 2014).

3.2. What type of practitioners perform regulatory practice?

While the type of practitioners at each regulatory agency will be different, there are some indications of the general skill sets expected within regulatory agencies. The Australian Government 2015-16 State of the Service Report (Australian Public Service Commission 2016) notes that across the public sector generally, the most common job types are in service delivery, administration, compliance and regulation. The report also tracks the levels of organisational capability and highlights that within regulatory agencies, the highest skill levels are in project management and change management, whereas the lowest skill levels are in innovation and talent management.

3.3. What type of problems are regulators responsible for addressing?

Regulatory agencies are specifically established to manage social and economic problems within the sectors that they regulate (Organisation for Economic Co-operation and Development 2010). As highlighted in the introduction to this thesis, problems that regulators are facing are growing increasingly complex. Sparrow (2008) highlights that regulators need to begin identifying systemic problems, or repeating patterns of risk occurring in the sector that need to be treated differently instead of using standard approaches. He categorises the type of systemic problems that regulators face as being invisible (with low reporting rates making the scope difficult to determine), involving

conscious opponents (adaptive human opposition), catastrophic (involving enormous consequence), in equilibrium (where the harm rests in balance with the regulatory forces unless greater action is taken) and performance-enhancing (where unlawful acts are seen to enhance an organisation's performance).

Sparrow (2008) provides an indication of the diversity of problems that regulators may face which vary in scope and complexity, including:

- piracy of copyright material
- a pattern of injuries or fatalities from improperly operated fairground rides
- injuries to infants falling downstairs while using baby walkers
- illegal passing of red signals by trains
- underinsurance of homes, resulting in inflated rebuilding costs following a disaster
- a pattern of injuries or fatalities to electricians when installing specific lighting systems.

The research in this thesis focuses specifically on complex problems, akin to systemic risks that Sparrow (2008) identifies which require new approaches to be adequately addressed.

3.4. What regulatory methodologies exist to address problems?

Several methodologies can be identified in the literature that guide regulatory practice to respond to problems—these are risk management, the application of predetermined regulatory responses, problem-based regulation and behavioural economics. Before problems can be responded to, they first need to be detected so detection methodologies are briefly described.

Problem detection

Regulators oversee complex sectors of our society and need to utilise various detection methods to identify when there are serious risks or emerging problems occurring. These methods generally include (Braithwaite 2011; Girgenti & Hedley 2016; Power 2007; Sparrow 2000; Sparrow 2008):

- engagement with the community—either through a complaints function enabling voluntary reporting of risks, or through proactive engagement by the regulator to undertake stakeholder consultations
- information sharing with other public entities—including business registration details and complaints data
- audits, or official inspections of business or community activities—to ascertain whether the businesses or individuals are complying with established regulations
- investigations, an activity with similar intent to an audit but with stronger legal powers—to search premises and seize evidence.
- data analytics—to identify problems through trends in business data trends or compliance records.

Risk management

Policy makers and regulatory agencies have also begun to adopt risk management practices as a basis to manage risks with regulatory systems (United Nations Economic Commission for Europe [UN] 2012). These practices, established within management disciplines, are focussed on providing structured tools to support businesses to deal with uncertain events in the future. ISO 31000 was established to harmonise the range of guidance on risk management, and defines a risk in the business context as “an effect of uncertainty on objectives” (UN 2012). Risk management “gives decision makers tools that enable rational choices” (UN 2012), and covers the process of:

- risk identification
- analysis and evaluation (including how to prioritise risks based on the potential consequences of a risk occurring and the likelihood of it occurring)
- choosing and implementing risk treatment strategies (focussed on the strategies of tolerance, transference, mitigation and avoidance), and
- contingency planning and crisis management.

Application of predetermined regulatory responses

Once evidence has been collected of businesses or individuals not complying with regulations, a common action is to apply a regulatory response that has been prescribed in legislation. Regulatory responses tend to be based on punishment and reward (or ‘carrots and sticks’) to influence

behaviour (Andreoni et al. 2014; Braithwaite 2011). This design of problem responses is based on rational choice theory (Braithwaite, 2011), a positivist economic theory that assumes humans make efficient, self-interested decisions to efficiently achieve their desires and that their behaviour and choices can be modelled to determine outcomes (De Jonge, 2012; Lakoff, 1999). Punishments rely on fear-based responses to deter undesirable behaviour and include regulatory responses such as prosecution which threaten prison time, fines, cancelling business registration and public shaming (Feaver & Sheehy 2015; Braithwaite 2011). Rewards include giving publicly recognised awards, financial grants and reduced regulatory oversight or cost (Girgenti & Hedley 2016; Braithwaite 2011).

Braithwaite’s (2011) popular theory of responsive regulation guides regulators in applying regulatory responses based on the nature of the offence. This methodology includes considering the problem within its context, not imposing a preconceived theory, actively listening to stakeholders and responding to problems in a probing way with a series of escalating sanctions. However, in use the theory tends to be distilled down to a central concept of the responsive regulatory pyramid (often referred to as a cooperative compliance model), see Figure 5. This supports regulators to categorise the nature of the problem and select an appropriate response based on the seriousness of the problem or a business or individual attitude to compliance attitude.

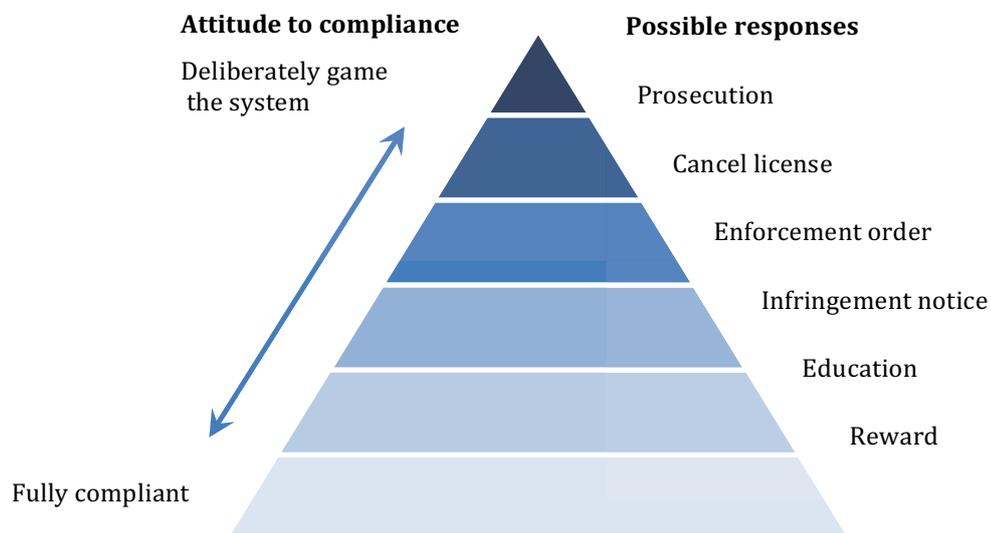


Figure 5: Example responsive regulatory pyramid

Problem-based regulation

In the last ten years, a focus on problem-based regulation has permeated regulatory practice following the popular work of Sparrow (2008). Sparrow emphasises that the fundamental purpose of regulation is to solve societies more intractable problems. He proposes that regulators become more flexible in making choices in how to respond to issues by developing tailor made interventions outside of the legislation as well as relying on existing tools. Sparrow recommends that regulators use risk assessment approaches to identify systemic problems, or specific patterns of risk that are revealed repeatedly in the sector. Once identified, Sparrow recommends that regulators act like saboteurs to find new ways to disrupt the problem that may be outside of the actions defined in legislation. He recommends that this work be conducted outside of regular program implementation, through cross-functional project teams established to address the problem.

To address systemic risks, Sparrow proposes a problem-solving protocol, which he refers to as being based on the policing SARA model (scan, analyse, respond and assess) (Sparrow, 2008).

Problem-solving protocol

Stage 1: Nominate & select potential problem for attention

Stage 2: Define the problem precisely

Stage3: Determine how to measure impact

Stage 4: Develop solutions/interventions

Stage 5(a): Implement the plan

Stage 5 (b): Periodic monitoring/review/adjustment

Stage 6: Project closure, and long-term monitoring/maintenance

Figure 6: Problem-solving protocol, Sparrow 2008, p. 158

Behavioural economics

The concept of behavioural economics (Kahneman and Tversky 2000) has been recently adopted within the public sector as a promising methodology to influence citizens to make positive choices (Berg 2015). Behavioural economics is based on empirical studies demonstrating that humans don't make the rational choices that economic modelling predicts, but make choices influenced by less rational factors such as framing, bias and loss aversion (Kahneman and Tversky 2000).

Alemanno and Spina (2014) discuss the potential application within regulation, based on the

opportunities to utilise persuasion over the traditional command-and-control coercion strategies for behaviour change. However, they comment that the legal frameworks are not yet available to turn these insights into usable regulatory tools. They also note critiques of behavioural economics including the limitations of lab-based research to indicate real-world human decisions, and concerns about the ethics of influencing citizen behaviour. The Australian Tax Office (ATO) has utilised behavioural economics in a well-known example of communicating the high percentage of citizens that comply with tax payments to influence other citizens to act with the compliant majority (Berg 2015).

3.5. What is the underlying paradigm of regulatory practice?

Many elements of the regulatory context and methodologies indicate an underlying positivist paradigm which is characterised by the assumed predictability, objectivity and control of reality (Dunne 1999; Rutgers 1999). This is demonstrated through assumptions in the design of regulations that problems can be predicted in advance and then controlled with predetermined regulatory responses, as well as the assumed predictability and control of human behaviour through punishment and reward. Behavioural economics, although it includes a greater emphasis on understanding emotional reasoning, still assumes the predictability and control of human behaviour. Objectivity is demonstrated through the assumption that problems can be identified and 'precisely defined', as in Sparrow's problem-based regulation protocol, which is based on the belief that the world can be known from an objective perspective, rather than constructed through many different perceptions of reality. Control is observed by the assumption that regulatory agencies can set a specific goal to address a certain problem and take action in a linear step by step approach to achieve this defined goal. While linearity naturally exists in any process by undertaking inquiry and action that leads to new knowledge and action over time (described as the 'arrow of time' by Nelson and Stolterman, 2012), the challenge of a positivist approach is that goals and process are set, without the accompanying flexibility to adjust to influential forces and the emerging reality (Checkland 1994a; Kurtz & Snowden 2003). The positivist paradigm is also evident in the nature of inquiry present within regulatory methodologies, where understanding a risk before taking action is based on utilising rule-based methods (such as auditing and risk rating) to understand what is true. This contrasts to inquiry focussed on exploration and trial and error to explore more subtle relationships and patterns within complex phenomena.

While the positivist paradigm is criticised for its simplification of reality (reductionism) and limitation to support action in complex systems (Checkland 1994a; Kurtz & Snowden 2003; Morin 2006), it is the most common paradigm underlying our conventional organisational methodologies due to its deep connection with traditional management science (Rutgers 1999). The positivist

paradigm emerged from the philosophical base of the science and technology disciplines in nineteenth century which succeeded in understanding the natural world through the application of logic and mathematics (Schön 1984; Bernstein 1976). The strengths of positivism were further demonstrated during operations research in the Second World War where humans were able to control mechanical and technology problems through goal orientated, linear problem-solving approaches including predicting outcomes through computer modelling of large numbers of variables. Positivist thinking was then adopted in the development of management science, particularly using Taylor's (1911) work to support decision making and problem solving in human organisations (Checkland 1994a; Snowden 2005).

Management science then made its way into the public sector through reforms in the 1980s to "make government work better and cost less" (Denhardt and Denhardt 2000 p. 550), i.e. to run government like a business. Many of the current government practices can be linked to management science, including the current focus on demonstrating quantifiable performance improvements and the separation of policy planning and implementation.

Conclusion: literature on regulatory practice to address complex problems

Section three provided an overview of literature to try and understand current regulatory practice to address complex problems. It revealed that the regulatory context exists on two levels—the broader governing system and the regulatory organisation. The broader governing system has a strong influence on the practice of regulators since central government agencies determine many of the problem responses that a regulator can apply, and the public-sector environment includes many barriers to innovation that influence the way a regulator acts. Regulatory practitioners are known to have capabilities in project management and change management with limitations in innovation and talent management. Regulatory problems are growing increasingly complex with a new focus on systemic problems, or repeating patterns of risk in the sector. Regulatory methodologies to develop responses to problems are reasonably limited and include risk management, the application of predetermined responses, Sparrow's proposed problem-based regulation and newer experiments with behavioural economics. The regulatory context and methodologies are underpinned by a positivist paradigm. This has an undeniable effect on the way that practitioners see, think and act, which is further demonstrated in the next section through contrasting the nature of inquiry and action in the fields of systems thinking and complexity.

4. LITERATURE:

Insights into systems thinking and complexity theory

Public sector practices have been criticised for not keeping up with the increased complexity of today's problems (Bason 2014; Bourgon 2008; Mulgan & Albury 2003). Therefore, it is relevant to consider alternative practices that have been specifically developed to deal with complexity. These are the fields of systems thinking and complexity theory. Both will be considered below in terms of the history and key concepts of the field, underlying paradigms, primary methodologies and strengths and limitations for this study.

4.1. Systems thinking

History and key concepts

Systems thinking is an umbrella term for a diverse range of fields evolving from the 1950s to consider the way things exist as interconnected systems. This includes hard systems thinking, cybernetics and soft systems methodologies (Luoma 2007). System thinking is primarily focussed on the concept of an adaptive whole, which adjusts to its environment (Checkland and Poulter 2006) and the connections and relations between the parts and the whole (Ryan 2016b). The illustration below from Checkland and Poulter (2006) provides a useful visual representation of the core systems concept.

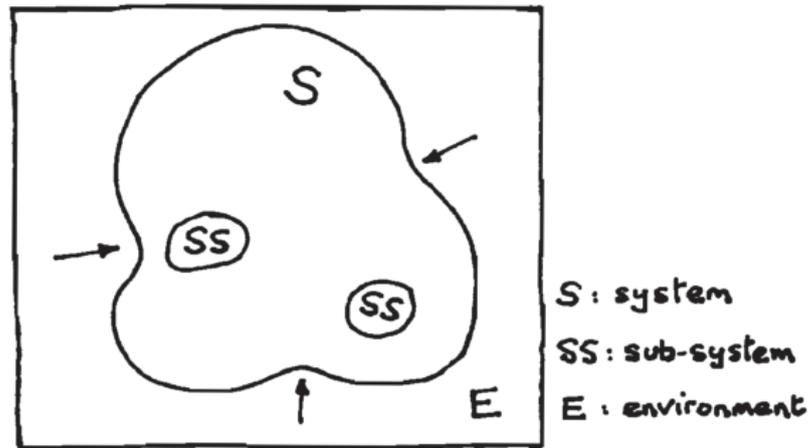


Figure 7: The core systems concept: an adaptive whole (Checkland and Poulter 2006, p. 7).

Hard systems thinking was established during research into decision-making to support defence capability (operations research) in the Second World War (Checkland 1994). This field began considering how inputs, conditions and feedback loops (where the outputs of a system cycle back to become an input to the system, increasing the complexity of cause-and-effect relationships) affected systems (Jondes 2013). Hard systems thinking largely focussed on decisions relating to manufacturing and technology problems, which could be controlled and manipulated to achieve pre-determined outcomes (Checkland 1994). This also evolved into computer modelling and simulation of systems (Jones 2013). Although hard systems thinking was established for industry, the concept of modelling and controlling inputs and outputs was adopted to understand human behaviour within management science. This led to the notion of an organisation as a rational, goal seeking entity able to control problems by compartmentalising them, selecting an appropriate tool to apply and evaluating the results (Checkland, 1994). Cybernetics, a related stream to hard systems thinking, was concerned with how living organisms communicate and exhibit control. This knowledge was then used to improve computer modelling (Sawyer 2005). Hard systems thinking reflects characteristics of an underlying positivist paradigm, identified earlier as being present in regulatory practices.

Soft systems methodologies were developed following the earlier systems thinking approaches in the 1970s and 1980s to bring greater recognition to human values within systems (Checkland 1994). Hard systems thinking was relegated by some authors as being only adequate to address well-framed problems. However, soft systems thinking, with its greater focus on human behaviour, was seen to be an organised and flexible process to tackle ill-defined and wicked problems (Checkland 1994; Checkland & Poulter 2006), including our most pressing global concerns (Jones 2014). Soft-systems approaches focus on extensive inquiry to understand the broader environment

that a problem or project fits within, the key elements involved and the larger systemic contexts. This enables patterns and relationships to be discerned and synthesised, leading to a level of understanding of real-world contexts that is not available in reductionist approaches (Nelson and Stolterman 2012).

Paradigm

It is relevant to comment on the soft systems thinking paradigm early in this section, due to the importance of the underlying assumptions of reality on soft systems methodologies. Soft systems thinking (as well as complexity theories) are transdisciplinary in that they consider all individual perspectives and disciplines as part of the same greater reality (Morin & Kern 1999), as opposed assuming there is one objective reality, and that this can be known through studying isolated factors, as in positivism. This approach is described by numerous theories, including holism and integral thinking, as a way to appreciate and incorporate all perspectives of a situation (Morin & Kern 1999; Nelson 1994).

Checkland and Poulter (2006) state that appreciating the diversity of perspectives “is the most important concept in understanding the complexity of human situations, and indeed, the nature and form of [soft systems methodologies]” (p. 6). Morin and Kern (1999) add that seeing the world through a transdisciplinary paradigm is our greatest hope for navigating complexity and creating large-scale positive change:

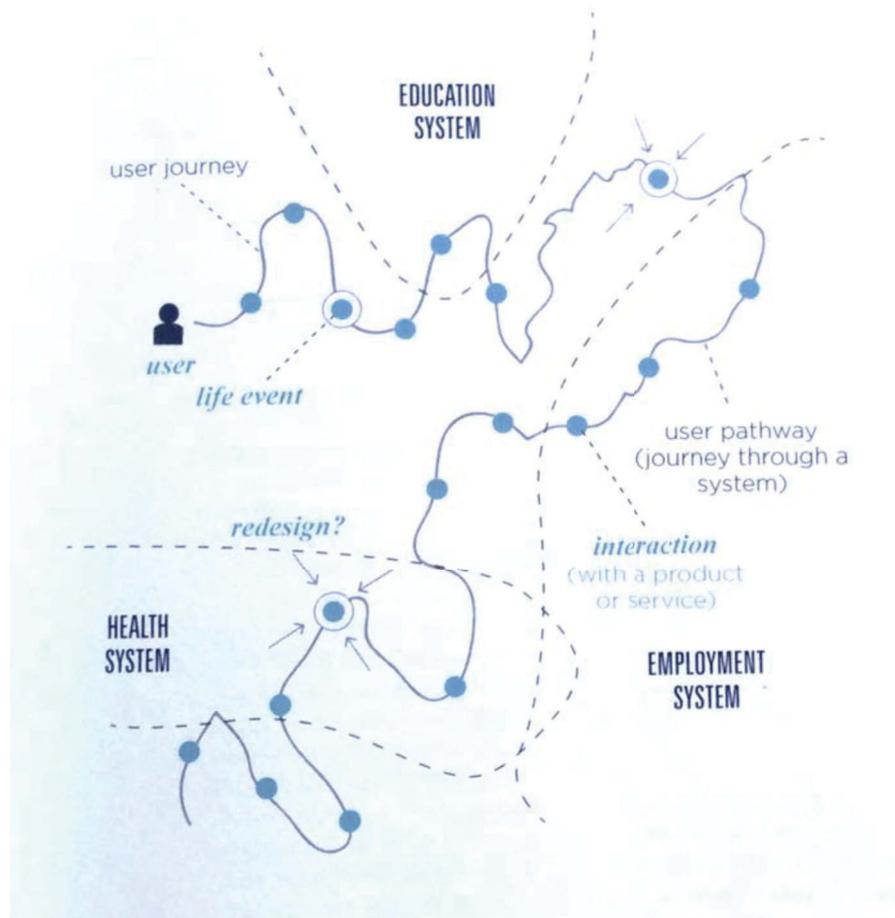
“We need a kind of thinking that relinks that which is disjointed and compartmentalized, that respects diversity as it recognizes unity, and that tries to discern interdependencies. We need a radical thinking (which gets to the root of problems), a multidimensional thinking, and an organizational or systemic thinking” (Morin & Kern, 1999, p. 130).

Methodologies

Checkland and Poulter (2006) outline soft systems methodologies as including four main activities—finding out about the initial ‘problematical situation’, making activity models or diagrams to consider the way a system operates, using models to question the situation and defining and then taking action to improve the situation.

System diagrams to consider and represent the way a system operates are the most commonly observed soft systems thinking outputs in literature. Visualisation enables the non-linear relationships within systems to be conveyed in a richer and simpler way than through using text.

This can include the system components, inputs, outputs, relationships, influences, gaps and feedback loops (Checkland and Poulter 2006). Specific diagrammatic methods include giga-mapping (Sevaldson 2015) or ecosystem mapping (ThinkPlace 2016) which aims to demonstrate the complexity of a system to help understand the user's experience and identify places to intervene. Rich picture mapping (Checkland & Poulter 2006; CoLab 2016) involves similar complexity mapping with a greater emphasis on visual images to show important actors, elements and relationships, and casual loop diagrams identify the underlying systemic structures of the patterns and events we can observe (CoLab 2016). An example of the combination of an ecosystem



map and a user journey is included below from ThinkPlace.

Figure 8: Combination of an ecosystem map and a user journey (ThinkPlace 2016, p. 65)

Once elements of a system have been identified, systems thinking methodologies then prompt decision makers to question the right point of intervention. Meadow's well-known article from 1997 identified nine different leverage points within a system, each with a different level of power

to influence behaviour and change within a system. These range from the less powerful leverage points of changing taxes and subsidies to the most powerful leverage points of changing the goals of a system or the paradigm from which the goals and rules arise.

The main strength of soft systems methodologies lies in its holistic understanding and synthesised representation of a problem situation. While Checkland and Poulter (2006) indicate that soft system methodologies include defining action and execution, this has been considered the weakest area within soft systems thinking (Ryan 2016b).

Insights and limitations for this research

Systems thinking has established an important acceptance of whole adaptive systems and using multiple perspectives to understand complex human situations. It includes numerous methods to represent a current system and some methods to identify leverage points within a system. However, it has been criticised for its lack of action, as well as its vague language and lack of integration with public policy and decision makers (Ackoff 2004).

The critique of the systems thinking movement has led the development of a new practice to integrate the deep knowledge of systems with action-orientated methods from design practice (Jones 2014; Nelson & Stolterman 2012; Ryan 2016b). This emerging field termed 'systemic design' shows strong promise to increase the levels of complexity that design is able to deal with, so it can more effectively impact complex societal issues (Systemic Design Research Network 2017). Systemic design is explored further in section 7.

The literature review has revealed insights and limitations for the use of systems thinking in complex regulatory problem solving. These are summarised in the table below and compared against regulatory practice in section 4.3.

Table 2: Insights and limitations of systems thinking for complex regulatory problem solving

Systems thinking insights are that it:	Systems thinking limitations are that it:
<ul style="list-style-type: none"> • provides methods to understand and represent broad environments, contexts and interrelationships for complex problems • supports the identification of different leverage points to affect change within a complex system • has been incorporated with design to form a 'systemic design' practice with the potential to be applied to complex regulatory problems. 	<ul style="list-style-type: none"> • contains limited guidance to develop interventions and take action.

4.2. Complexity theory

History and key concepts

Complexity theory was derived from numerous disciplines including natural science, mathematics, philosophy and social sciences (Lancaster in Hager, Lee & Reich 2012) in the last 100 years to consider the dynamic process of change (Ramalingam et al 2008). The field was originally developed with authors Poincaré and others and has found a resurgence in recent decades (Kurtz & Snowden 2003). Although a different field to systems thinking, there are numerous links with similar concepts and authors. In particular, complexity always occurs within interconnected systems, mainly with human participants. Some authors state that complexity theory is simply a revived systems thinking which emphasises complex adaptive processes (Poutanen, Soliman & Stähle 2016).

A popular analogy of complexity from natural science is the unexpected effects of a bird flapping its wings in Florida to create a hurricane in New York, referred to as the butterfly effect (Curlee & Gordon 2013; Sawyer 2005). These unexpected effects relate to that of chaos, an aspect of complexity theory. Kurtz and Snowden (2003) highlight that complexity theories familiarise us with the concept of chaos, which in ancient mythology always existed alongside order and was never completely vanquished. Rather than assuming that order exists or can be imposed (as per our conventional positivist paradigms), complexity theory identifies a new kind of order; one that emerges through the interactions of many different entities without a predefined design (Kurtz & Snowden 2003).

Paradigm

Similar to systems thinking, complexity theory appreciates multiple perspectives and disciplines available within a transdisciplinary paradigm. This is emphasised by Morin (1998) who states that complex thought must be transdisciplinary since this offers the advantage of not breaking the relationship from the parts to the whole. Snowden (2005), a popular modern author in the complexity field encourages practitioners to understand the nature of different realities in a system, such as whether the system is ordered or unordered, and to select an appropriate tool which may have come from a traditional positivist paradigm, or may rely on a transdisciplinary and experimental approach, depending on what is most appropriate to the situation.

Methodologies

The main methodologies within complexity theory appear to be based on understanding the dynamic nature of change and thus developing appropriate responses that account for this reality. Concepts regarding the nature of reality have been developed to include (Lancaster in Hager, Lee & Reich 2012; Johnson 2015 and Kurtz & Snowden 2003):

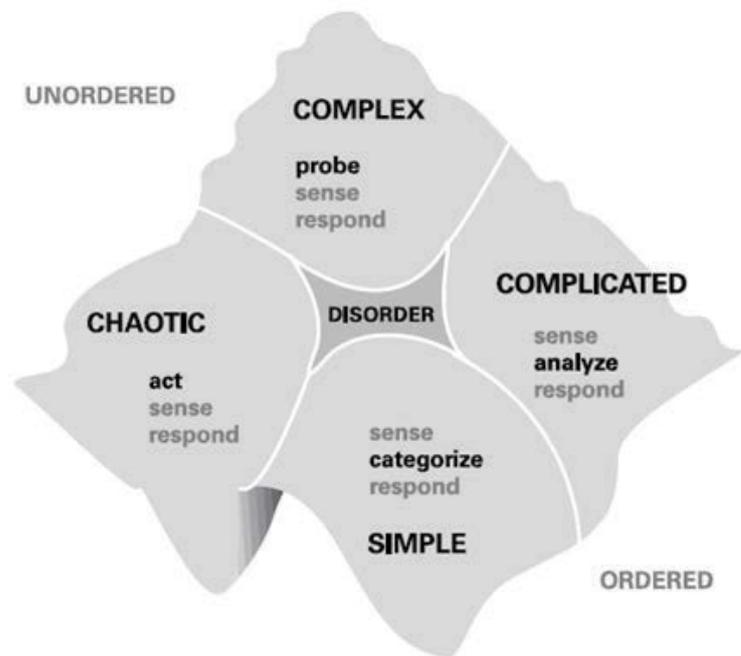
- **Non-linearity**—cause and effect cannot be determined and small differences in initial conditions can lead to unpredictable outcomes
- **Attractors**—systems move towards patterns of ideal values but never reach exact goals or outcomes
- **Self-organisation**—complex systems adjust and adapt to the external environment to establish or re-establish order
- **Emergence**—the interaction of smaller or simpler entities, which cause novel outcomes that affect the whole system.

Cynefin Framework

However, complexity theory has also been criticised as lacking methodological coherence (Poutanen, Soliman & Ståhle 2016) and including numerous misunderstandings and misplaced enthusiasm when being applied within organisational contexts (Kurtz & Snowden 2003). Snowden and collaborators (Kurtz & Snowden 2003; Snowden 2005; Snowden & Boone 2007) have made significant advancements in helping organisations make sense of the application of complexity theory through the creation of the Cynefin Framework. This enables organisations to identify the

nature of the issues and the context or systems that these operate within and to select appropriate tools for response.

The Cynefin Framework identifies four main contexts: simple, complicated, complex and chaotic, each with an appropriate response option. The order and nature of responses are identified in Figure 9. Snowden and Boone (2007) state that decision-makers frequently diagnose problems based on their preferred way of acting, such as government leaders always seeing problems as



chaotic since they are used to taking decisive action to calm a situation.

Figure 9 Cynefin Framework (Snowden & Boone 2007)

This research focuses on complex problems, the area that our conventional practices are struggling to deal with. Snowden and Boone (2007) include a comprehensive description the indicators of complex systems within their work. These comprise:

- large numbers of interacting elements
- non-linear interactions where minor changes can produce disproportionate effects
- a dynamic nature, where the whole is greater than the sum of parts and solutions emerge through circumstance rather than being imposed
- that the system has a history where evolution is irreversible (unlike man made systems such as IT infrastructure where changes can be reversed)
- lack of order in the system (when it is not constrained through boundaries) and the agents within the system enable and constrain each other in unpredictable ways.

In addition, Snowden and Boone (2007) explain that the involvement of humans in complex systems makes them even more unpredictable because humans have multiple identities which they can switch between, they make decisions based on past knowledge of success or failure (not on current logic) and can sometimes intentionally cause change within a system.

To address complex problems, Snowden and Boone (2007) stress the importance of experimentation, through taking probing actions, sensing the response from the system and then adjusting the action to enhance or reduce the nature of changes that are occurring.

The Cynefin Framework is adopted in this research to assess the types of problems arising and the appropriateness of responses. This means that if a regulatory agency is addressing a complex problem, responses should be based on a probe-sense-response model.

Complexity theory methodologies in regulation

There is a limited section of literature on the application of complexity theory within regulation. These publications mostly focus on the use of complexity theories to enable complex system modelling, including of financial markets potential crisis triggers, and on system and data analysis for policy (Battiston, Farmer & Flache et.al 2016; Organisation for Economic Co-operation and Development 2009). This limited application indicates that complexity theories are being interpreted within positivist, hard systems frameworks still aimed at predicting and controlling issues through top-down actions.

Guidice (2016) provides a much broader understanding of complexity theory within regulation, criticising the public sector's attempts to control complex systems (such as the tax system) with complicated legal rules (the tax code). As he highlights below:

"In the pursuit of perfect justice, regulators are trying to account for every possible situation. In so doing, they create ever more complicated rules in an attempt to exert control over a non-linear complex system, resulting in costly, un-intended consequences" (Guidice 2016).

Insights and limitations for this research

There has been a growing interest in complexity theory from the management field since the 1990s (Straub 2013) which has the potential to change our view on how change occurs and how we can embrace the complexity of reality in the way we respond. However, Straub (2013) notes that this interest has not led to major changes in management practices. He attributes this partly to complexity theory not aligning with managers' desire for control, and the reluctance to move away from models that simplify decisions by assuming simple relationships of cause and effect. While cause and effect still have an undeniable effect on systems, the large number of variables means that we often cannot predict what the nature of the effects will be. Straub (2013) provides an example of the reality of unintended consequences of policy decisions in the fact that following the creation of the Cap-and-Trade Carbon Emission scheme, more coal is being burned in Europe than ever before. He explains that accepting complexity requires adopting a humble and open worldview where organisations, including regulators, need to keep the competing values, priorities and effects of decisions in sight.

This literature review has revealed insights and limitations for the use of complexity science in complex regulatory problem solving. These are summarised in the table below.

Table 3: Insights and limitations of complexity theory for complex regulatory problem solving

Complexity theory insights are that it:	Complexity theory limitations are that it:
<ul style="list-style-type: none"> reminds us of that nature of reality in that change occurs dynamically in complex systems and cannot be predicted in advance confirms insights that complex problems cannot be completely managed by goal-orientated, linear and deductive processes (the dominant approaches in management science) makes available the Cynefin Framework as a diagnostic tool to determine the type of problem and select an appropriate response. 	<ul style="list-style-type: none"> lacks methodological coherence and has been adopted minimally in organisations.

4.3. Applying insights from systems thinking and complexity theory to regulatory problem-solving practice

The investigation into systems thinking and complexity theory was undertaken due to criticisms that regulatory and public-sector practice has not kept pace with the increasingly complexity of today’s problems. Insights from these fields enable current regulatory practice to be considered in a new light. This includes application of the Cynefin Framework to consider the appropriateness of current regulatory methodologies to address complex problems. A brief reflection against regulatory methodologies is provided below.

Reflection on regulatory methodologies

Problem detection

The acceptance of broad worldviews when defining problem situations in soft systems thinking and complexity fields highlights the importance for regulators to consult widely and consider new perspectives when assessing possible risks and problems in the sector. Regulators may also benefit from systems thinking methodologies in trying to visually diagram the problem situation, understand contributing factors and identifying possible leverage points.

Responding according to legislative mandates

The core practice of regulatory problem solving—to influence individual or business behaviour by enforcing pre-determined rules, is identified in the systems and complexity literature as the least appropriate strategy to deal with complex problems. Firstly, this approach is based on an assumption that problems that regulators are tasked to deal with can be predicted. This is an assumption that does not hold true with theories of the dynamic and emergent nature of change, particularly when they involve human actors whose nature is unpredictable (Kurtz & Snowden, 2003). As Guidice (2016) points out, creating rules to counteract every possible market problem also reduces the agility to which regulators can respond to problems, while increasing the compliance efforts from those with positive intentions and creating opportunities for loopholes to be exploited. Dorst (2015b) from the design field, also comments on this knee-jerk response from legislators to create new rules when new problems arise, noting that this paradoxically limits a regulator's response to be even more static while the world around us becomes more dynamic. Seen through the Cynefin Framework, using predetermined responses in legislation equates to a sense-categorise-response action which is appropriate for simple problems when the relationship between cause and effect is known. This is not the case with complex problems.

Problem-based regulation

Sparrow's (2008) main arguments to identify systemic problems and treat them differently through developing tailored solutions provides very helpful direction for regulators to be able to conceptualise complex problems as being different from rules-based compliance issues. Sparrow's case studies of regulators finding unique ways to address complex problems also promotes appropriate complex problem-solving strategies within the Cynefin Framework of probe-sense-response. For example, Sparrow (2008) describes a US customs agency trying to address drug smuggling on the Mexico/US border. A probing strategy was enacted, where the agency trialled different interventions such as sniffer dogs and tyre spikes in several sites. They adapted their response based on the reaction of the various entities until they came up with a solution that worked in most cases.

However, when it comes to guidance to deal with complex problems, Sparrow's problem-solving protocol falls short. This goals-based, linear problem-solving model very typical within management science, has been much criticised within both soft systems thinking and complexity fields for leading practitioners to converge on a solution, often relying on past practice rather than developing new responses (Veale 2014). In particular, Sparrow does not provide sufficient guidance on how to develop solutions or interventions. This design expertise is an area which

regulators are least equipped to deal with in their traditional role as implementers of established regulation.

Reflection on regulatory paradigms

The increased complexity of problems and the limitation of current regulatory tools provides a relevant case for regulators to consider broader perspectives, disciplines and methodologies beyond the command and control positivist approach. This may include being constantly open to different ways to understand a problem situation and find new pathways for action through experimentation (Nelson and Stolterman 2012; Morin & Kern 1998). Experimentation is emerging in the dialogue on policy and regulatory design, to consider how to create flexibility in regulations so that they can be considered “working hypothesis’, not programs to be rigidly adhered to” (John Dewey, 1991 in van der Heijden 2014). This requires policy and regulatory processes to allow for adaptation based on feedback of what works in practice.

Conclusion

Regulatory agencies could be supported in addressing complex problems by being open to new perspectives and methodologies from the field of systems thinking and complexity theory identified above. However, both of these fields have been criticised for having limited methodological coherence and not establishing strong methods towards action that can be adopted by organisations. The new field of systemic design is emerging to build on the strengths of systems thinking and complexity with a new action-orientated practice (Systemic Design Research Network 2017). This is explored further in section 7.

The Cynefin Framework will be adopted throughout this research to provide guidance on identifying a complex context or problem and identifying appropriate response options aligned with the nature of the problem.

The following section describes the research approach to undertake empirical research to understand the nature of regulatory practice to address complex problems in a real-life setting.

the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million (19.5% of the population).

There is a growing awareness of the need to address the needs of older people, and the Government has set out a strategy for the 21st century in the White Paper on *Ageing Better: The Government's Strategy for Older People* (Department of Health 2000). This strategy is based on the following principles:

- Older people should be able to live independently and actively in their own homes.
- Older people should be able to live in their own communities.
- Older people should be able to live in their own homes and communities for as long as possible.

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5. RESEARCH DESIGN

As highlighted in Section 1.1, the Design Research Methodology (DRM) was selected to guide the structure for the research. DRM also provides guidance on how to design an intervention within a practice setting. Within the DRM structure, a case study methodology was also used to inform the data collection and analysis methods. The selected methodologies come from a particular research paradigm which influences assumptions around the nature of the research approach and findings.

Research methodology

The criteria for selection of the research methodology was:

- that it would be applicable within a ‘real life’ practice setting (as opposed to studying phenomena in a controlled lab environment),
- that it would facilitate an explorative research approach, since it could not be predicted in advance what aspects of regulatory practice would be relevant to the study,
- that it included guidance for how to design an intervention, and
- that the research could lead to generalised results so that the findings could be used to support other regulatory agencies to address complex problems.

Case study research

A well-known methodology within qualitative studies is case study research. Case study research is employed to gain a deep understanding of a specific unit of analysis within a complex social system

and has been used extensively to understand group, organisational and political phenomena (Denzin and Lincoln, 2013; Yin, 2013). The unit of analysis, or case, is selected by the researcher based on access to data that is likely to provide insights to the established research questions. A range of evidence can be collected, including from documents, physical artefacts, interviews, surveys and direct observation. Analysis techniques can vary and include comparing findings to existing theoretical propositions, considering new emergent findings, analysis through pattern matching and time series analysis (Yin, 2013).

The case study research methodology was selected to guide the descriptive studies I and II to understand the current context and the impact of the intervention. Case study methodology is relevant due to its ability to help researchers understand what is 'real' within a practice context, using an explorative approach that does not require to be fully planned in advance. While this thesis project aims to create insights that can be generalised, it is limited to studying two cases within one regulatory agency. It is recognised that further case study comparisons would be required within other regulatory agency contexts for theoretical insights to be generalised more broadly.

Design Research Methodology – guiding the design of the intervention

The DRM has already been described for the purpose of providing a structure for this research. DRM also provides additional guidance of how to go about the design of the intervention for the prescriptive study, which is not readily provided by case study research methodologies. This includes:

- firstly establishing in descriptive study I that there is evidence of a need to improve the current practice
- using information from descriptive study I to understand the factors that are most likely to influence the success of the intervention
- establishing an understanding of a more ideal situation of practice
- developing an intervention that addresses the key success factors in a systematic way, to move the practice towards the ideal situation.

The DRM includes some recommendations for the development of interventions that have not been adopted in this research, primarily the development of impact models that visually represent how specific factors operate and influence each other and the changes that are expected to occur when the intervention is introduced. This level of prediction is a strongly positivist approach which assumes the objectivity of individual factors and their known influence on direct cause and effect.

This is not relevant for the complex problems and organisational contexts for which this research takes place.

Research paradigm

By moving away from the positivist approaches within DRM, and adopting broader case study methods, this research can be said to utilise a constructivist paradigm. This means that throughout the research, information is gathered from interviewing and observing a range of stakeholders and 'reality' is constructed by using their various explanations of experience, which may be diverse and conflicting. This is opposed to assuming a singular objective reality that might be perceived by only interviewing, for example, senior managers, or only reviewing final project reports. Research questions used in the interviews were also kept broad and semi-structured, to allow for emergence in information that the interviewees felt was important to convey. This further differentiates the research from a positivist approach that would include structured questions to validate an existing hypothesis. The research findings were also interpreted as being dynamic (always changing) and the researcher has attempted to convey the evolution of findings that occurred over time in each case in this thesis (Gomm, 2004).

5.1. Research design for case study one

The aim of the first case study was to understand what is the current practice of a regulatory agency to address a complex problem and how this can inform the development of a systemic design intervention.

Selection of the case

This case study was undertaken within Agency X, an Australian Government regulator responsible for ensuring quality of goods and services provided by a specific business sector. The business sector being regulated is large and very diverse, ranging from small family operated businesses to large multi-national enterprises. The customer base of the regulated sector is also extremely diverse. As described in the preface, the researcher was employed with Agency X between 2011–2016 and so had the unique opportunity to observe the case while being embedded in the agency.

The research focus had been narrowed to consider systemic risks, or complex problems, that Agency X was attempting to address. Several systemic risks had been identified within a recent

environmental scan that would have been possible to include in the study. The criteria for the selection of the problem was:

- the risk or problem appeared to be complex
- Agency X planned to take action to address the problem which could be observed for the case study
- The researcher would have access to observe the practice and conduct interviews with project staff.

Through discussions with a senior leader in Agency X, the problem was selected due to it meeting the criteria above. The risk was also expected to attract the most significant problem-solving efforts by the agency to date. A project team had already been allocated to address the risk and the decision had been made to trial Sparrow's (2008) problem-based regulation methodologies, which also enabled access to observe the agency trialling the introduction of a new practice.

The risk selected for the case study appeared to be linked to businesses accessing a government assistance program and poor business practices, which negatively impacted a high number of consumers. The project established to address the risk commenced in mid-2015. This research commenced in late 2015 and observed the practice through until early 2016, including retrospective interviews conducted throughout this period.

While the researcher had reasonably unlimited access to the project and participants, Agency X agreed to keep the details of the agency and the case anonymous due to the political sensitivity of this work. This does not impact the effectiveness of the study since the purpose is to understand practice and the potential for design in this context, which can be explored adequately without publishing the details of the case.

Research questions

The research questions this study aimed to address were developed to understand the practice broadly, as well to provide input for the development of an intervention. The questions are outlined below, alongside the type of input they provided for the intervention design.

Table 4: case study one research questions leading to design input

Research questions	Input for the design of an intervention (guided by DRM)
What is the context of the practice?	What factors are likely to influence the success of the intervention?
What is the nature of the problem being addressed?	Is there evidence of a need to improve the current practice?
What actions did Agency X take to address the problem?	
What was the response to the problem and how adequate was this for the level of complexity?	
What was the influence of the context on the practice?	What factors are likely to influence the success of the intervention?
What was the influence of the practitioner on the practice?	
What other challenges were faced in addressing the problem?	
What is the underlying paradigm of the practice?	

Note that this study did not include an explicit analysis of the effectiveness of the current problem-solving practice, or the effect of the intervention, as this would have required a longer and more in-depth study to observe longer-term results of the regulator's actions. However, as per Snowden's analysis of complex systems (2005), the outcomes incurred by specific actions may be impossible to measure. Outcomes may be driven by cumulative actions or may have occurred as unintended consequence to an unrelated action in the broader system. Instead, this study uses a constructivist lens to consider practice and effectiveness through the interpretations of participants involved in the project and their reflections on the experience.

Research methods

Case study one utilised the following methods to collect evidence of the current regulatory practice to inform the research questions:

1. Observation of the fortnightly project steering committee between approximately December 2015–April 2016
2. Review of project and policy documentation, including:
 - a. risk-assessment policies
 - b. project plans
 - c. risk analysis working documents
 - d. project reports
3. Three semi-structured interviews (interviews structured by a set of open questions that prompt discussion and allow for the exploration of themes, Yin 2013) with five project participants:
 - a. 1.5-hour interview with the risk manager responsible for developing the original project plan and providing ongoing advice and guidance in the project steering committee
 - b. 1.5-hour interview with a senior officer with responsibilities for implementing the project
 - c. 1.5-hour interview with the manager and two officers responsible for ongoing implementation and development of the later stages of the project

The range of different data points enabled triangulation of evidence for some findings, where the data could be validated from across two or more sources (Yin 2013).

Interviewees were selected based on their involvement in the project and their availability. Logistics such as interviewee location and availability also affected the selection and grouping of the interviews. The interview questions were developed with the intention to elicit information to inform the overall research questions. Many of these questions were kept general to allow the interviewees to provide richer responses in their own words. Some interview questions were developed to understand the difference between the regulatory practice to address a complex problem and design practice. This was informed by insights from the earlier literature review. The interview questions for the descriptive study I are provided in Appendix A. However, as semi-

structured interviews, some questions were adjusted based on the project phases that different interviewees were involved in. A range of active listening techniques were also employed to clarify the information that interviewees had provided and to question some information deeper where it seemed to relate to the research questions. This aligns with Yin's advice (2013, p. 73) for case study researchers to employ good listening skills and stay adaptive to perceive new information and opportunities.

Data analysis

Evidence for case study one was collected over time and analysed using an emergent case study research approach where broad insights were initially considered and these insights informed more specific data collection and analysis.

Insights obtained through direct observation of the steering committees were recorded in NVivo. Case study documents were reviewed throughout the project and insights were also recorded in NVivo.

The three interviews were digitally recorded and transcribed by the researcher. These were entered into NVivo where the interview data, along with insights from observations and document analysis were coded against the research questions. As this was being completed, additional themes emerged and new NVivo codes were generated to capture these themes.

The initial coding was reviewed and synthesised to create a refined set of themes. These were analysed with a particular focus on understanding evidence of a need to improve the current practice, and the factors that are likely to influence the success of an intervention.

The case study findings were validated through discussion with the case study project managers, their review of the researcher's RSD5 conference paper (available in Appendix I) and the final thesis results. Some adjustments were required based on their feedback.

Note that interviewees are only identified by an interview number and not their specific role. This is in line with confidentiality agreements to ensure that participants could not be identified in the research.

Research ethics

All research has the potential to expose participants to harm, discomfort or inconvenience. In line with the National Statement on Ethical Conduct in Human Research 2007, all risks relating to this master's project were identified, the level of probability and severity assessed and mitigation strategies developed. While the participants in the research were not a vulnerable group at high risk of negative impact, several relevant risks were identified. These included employees of Agency X being concerned that participation in the research would expose them to judgement and impact their professional reputation (devaluation of personal worth and social harm); that they would be negatively impacted by time requirements to be involved in the research (inconvenience) and that the agency could be exposed to increased public and political scrutiny (social and economic harm). These risks were mitigated by the research focus on practice rather than effectiveness, the de-identification of research data, pre-approved timeframes for research involvement and maintaining confidentiality for the agency and case studies in all publications. This included informed consent being gained from all research participants and the researcher establishing a confidentiality agreement with the agency.

UTS Human Research Ethics Committee approval was provided for the commencement of the descriptive study I on 3 November 2015, reference number. 2015000176.

Research limitations

Case study research includes some possible limitations that are important to consider. Since case study research is primarily a qualitative research method; collection, analysis and the interpretation of data are at risk of researcher bias where data may be skewed to reflect preconceived ideologies (Denzin & Lincoln 2013; Yin 2013). There was also a risk of this study being influenced to bias due to the researcher being an employee of the organisation and subject to greater influence of rationale behind the organisation's existing approach. The issue of bias was addressed by the researcher seeking to determine clear findings while remaining open to new information throughout all stages of the study (Riege, 2003). This was supported by being physically based within two worlds—one within Agency X, and one within the UTS Design Innovation research centre. These two different contexts provided exposure to various new ideas simultaneously including through conferences and training opportunities. This made it easier to question new and contradictory information and to reflect on various interpretations of evidence. The iterative process of data analysis of the descriptive study I also allowed for initial assumptions to be surpassed through the exposure and deeper understanding of different theories. A specific

effort was also made to consider possible rival explanations to the researcher's primary data interpretation.

Yin (2013) describes a range of strategies used to address risks to the validity and reliability of case study research. This study incorporated a number of those strategies to address validity; including using multiple sources of evidence, having key case study participants review the draft findings, using theory to support the interpretation of single-case studies, building explanations through an accumulation of evidence and addressing rival explanations. Reliability was addressed through having a case study protocol to guide the researcher through the data collection phase; including preparation instructions, the aim of each data collection stage, specific research questions and a data storage and analysis plan. The case study protocol was an important component of seeking approval to conduct the study with the case study regulatory agency and was documented and provided to the senior management group in advance of the case study commencing.

It is also difficult to generalise findings or establish theory based on specific case studies. As a limited master's thesis project, findings are provided as insights at this stage, which could be built on through further repetition of case study research within other regulatory contexts.

5.2. Research design for the intervention

Within the Design Research Methodology (Blessing & Chakrabarti 2009), an intervention is prescribed and then trialled in the practice context. The research approach for the prescriptive study (design of the intervention) commenced with a literature review to understand '*what is systemic design and what would a more ideal practice include for a regulatory agency to address complex problems?*'. The systemic design field was considered from a broad practice perspective, and principles were identified as capturing the essence of systemic design in a way that can be flexibly adapted to new contexts. Seven principles were synthesised from four systemic design methodologies. Because systemic design has been specifically developed to provide approaches to deal with complex problems, the systemic design principles can be considered to capture an 'ideal practice' that a regulatory agency can aim to move towards.

The findings from case study one were then revisited to assess the current practice against this 'ideal practice'. Opportunities for improvement were identified to inform the development of the intervention.

In line with the DRM, the systemic design intervention was then developed by referring to the identified factors likely to influence success of an intervention from case study one, and the

opportunities for improvement to move the current practice towards a more ideal practice identified in the prescriptive study.

5.3. Research design for case study two

The development of the intervention occurred quickly and without much time for revision due to the opportunity that was presented to trial it for an emerging risk that Agency X decided to take action against.

Selection of the case

The risk presented to the researcher by Agency X was deemed to be relevant for the focus of case study two because the problem appeared to be complex, with similar characteristics to the problem that was addressed in case study one. These characteristics included that the problem was multifaceted, crossed the jurisdiction of multiple government entities, involved numerous policies and regulations and high numbers of different businesses and consumers. The problem also had an additional level of complexity from case study one in that it involved international jurisdictions.

Research questions

Case study two aimed to address the research question ‘what are the results of introducing systemic design within regulatory practice to address a complex problem?’

Sub-questions were developed to understand both the practical effects of the intervention and how it could be further developed:

- What were the design outcomes of the application of each systemic design method?
- What were the benefits and limitations of each systemic design method?
- What is the likelihood of adoption of the systemic design intervention by Agency X?

Research methods

The researcher led the implementation of the intervention, alongside an Agency X Project Manager. The results were captured using the following research methods:

- observation of project scoping meetings and both co-design workshops
- document analysis of the project outcomes including project plans, workshop outcomes and the final project report
- analysis of workshop artefacts
- a brief online survey of participants following the completion of workshop one (survey questions are provided in Appendix E)
- a brief feedback session with participants in workshop two (feedback session questions are provided in Appendix F)
- one semi-structured interview with two managers involved in the project following the completion of workshop two (interview questions are provided in Appendix G).

The survey and interview questions were designed to gain insights into the research questions, but also to remain relevant to the practice of Agency X since they were also interested in feedback on the systemic design intervention for possible future use in their practice.

Data analysis

Observations and notes taken throughout the intervention were recorded in NVivo, as were responses to the survey and brief workshop feedback session. The interview following workshop two was digitally recorded and transcribed by the researcher and analysed using iterative NVivo coding.

Research ethics

This component of the research involved a broader range of participants, including staff from three additional government agencies. Identified risks were the same as case study one, relating to potential devaluation of personal worth, social harm, economic harm and inconvenience. Risk mitigation strategies included focussing on the practice rather than the effectiveness in addressing the problem, ensuring participants were informed of the observation of activities as research data (including in invitations to the systemic design workshops), keeping research data collection instruments short and voluntary and ensuring the research data remained anonymous.

An amendment was made to the UTS Human Research Ethics Committee to provide approval for the adjusted research scope. Approval was provided on 23 August 2016, reference number ETH16-0779.

Research limitations

While observations could be recorded throughout the intervention, the collection of formal research data was kept to a minimum to reduce the additional work burden on the cross-agency staff involved in the project. This comprised the voluntary survey following workshop one, a brief feedback session at the end of workshop two and one interview with officers from Agency X. The workshop survey did not receive a high response (less than 30 per cent of attendees) and the in-workshop feedback session was intentionally brief. Observations throughout the intervention and the in-depth interview with regulatory agency staff resulted in more substantial information to gain an insight into the relevance and effectiveness of these methods. However, this would need to be explored further in a research project with broader scope to gain more conclusive information about the proposed practice.

Case study two required the researcher to balance the roles of design facilitator, researcher and employee. The researcher was seconded for two weeks from her normal role to develop and implement workshop one. The second workshop was designed and implemented in the capacity of a consultant as the researcher was no longer working as an employee of Agency X. The performance of multiple roles within a research context has the potential to limit the capturing and objective analysis of findings. This was reduced by gaining support from project staff in Agency X to fully document the dialogue and outcomes of both workshops which could be analysed following the research.

the 1990s, the number of people with a mental health problem has increased in the UK (Mental Health Act 1983, 1990).

There is a growing awareness of the need to improve the lives of people with mental health problems. The Department of Health (1999) has set out a vision of a new mental health system, which will be based on the following principles:

- (i) People with mental health problems should be treated as individuals, with their own needs and wishes.
- (ii) People with mental health problems should be given the opportunity to participate in decisions about their care.
- (iii) People with mental health problems should be given the opportunity to live in their own homes and communities.

There is a growing awareness of the need to improve the lives of people with mental health problems.

The Department of Health (1999) has set out a vision of a new mental health system, which will be based on the following principles:

- (iv) People with mental health problems should be given the opportunity to live in their own homes and communities.
- (v) People with mental health problems should be given the opportunity to participate in decisions about their care.
- (vi) People with mental health problems should be treated as individuals, with their own needs and wishes.

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The Department of Health (1999) has set out a vision of a new mental health system, which will be based on the following principles:

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- (viii) People with mental health problems should be given the opportunity to participate in decisions about their care.
- (ix) People with mental health problems should be treated as individuals, with their own needs and wishes.

There is a growing awareness of the need to improve the lives of people with mental health problems.

The Department of Health (1999) has set out a vision of a new mental health system, which will be based on the following principles:

- (x) People with mental health problems should be given the opportunity to live in their own homes and communities.
- (xi) People with mental health problems should be given the opportunity to participate in decisions about their care.
- (xii) People with mental health problems should be treated as individuals, with their own needs and wishes.

6. FINDINGS:

Case study one

The first case study in this research focussed on understanding the current practice of a regulatory agency in addressing a complex problem. This was considered against the theoretical framework of practice and informed by insights from systems thinking and complexity theory. These findings also provided input to the design of an intervention, which is highlighted in the question responses. The research questions covered in this section are listed below.

- What is the current regulatory practice to address a complex problem?
 - What is the context of the practice?
 - What is the nature of the problem being addressed?
 - What actions did Agency X take to address the problem?
 - What was the response to the problem and how adequate was this for the level of complexity?
 - What was the influence of the context on the practice?
 - What was the influence of the practitioner on the practice?
 - What other challenges were faced in addressing the problem?
 - What is the underlying paradigm of the practice?

The elements of practice described within this section are outlined in Figure 10.

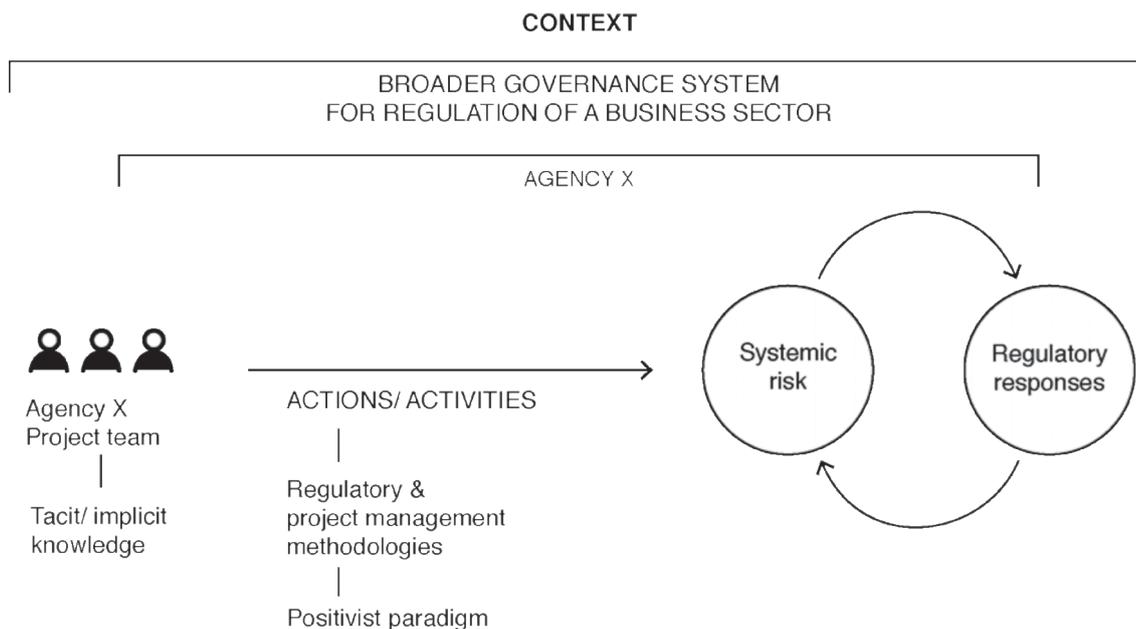


Figure 10: conceptual framework of current regulatory practice to address complex problems – case study one

6.1. What is the context of the regulatory practice?

As highlighted in Section 3, the regulatory context exists on two levels. The first is the broader governance system within the public-sector environment that Agency X is situated in and the second is the context of Agency X as an organisation.

As typical for regulatory agencies, the legislation that provides operational powers to the regulator and the regulatory standards that the regulated businesses must comply with are developed and maintained by a central government department. Agency X is responsible for enforcing the regulations, reducing risks and managing business registration for the sector. There are formal communication arrangements established to support the flow of information between Agency X and the central government department. Other government agencies within the broader governance system provide funding to businesses and there are several related regulators that oversee aspects of regulation in the sector, including consumer rights and taxation.

Agency X is reasonably small with less than 200 staff across the country. The agency is headed by Commissioners who are considered accountable authorities for decision-making and public spending. Under the Commissioners, the agency is structured based on the major functions (e.g.

auditing, risk management, investigations, communications and law) with some teams structured based on processes (e.g. application processing and customer service). The majority of the agency's staff have an extensive history of regulation within the sector, as well as some newer staff from other industries and sectors.

The business sector being regulated is large and very diverse, ranging from small family operated businesses to large multi-national enterprises. The customer base of the regulated sector is also extremely diverse.

6.2. What was the nature of the problem being addressed?

The problem that was selected for the case study was relevant because it appeared to be complex due to the difficulty understanding the full scope of the problem and the lack of clear direction of how it might be addressed. Now that more information is known about the problem following the case study, it can be generally described (while maintaining confidentiality), visualised as a system diagram and compared against Snowden and Boone's (2007) indicators of complexity below.

Description of the problem

The problem was described by Agency X as being a systemic risk. This is considered to be a recurring pattern of risk across the whole business sector that has the potential to harm individual consumers, the wider community and the reputation of the whole business sector (Sparrow 2008; case study documentation). The risk was identified through an environmental scan that draws on inputs from stakeholder consultations, print and social media, government and industry reviews and regulatory data including business registration information and compliance history. The term risk is used to imply a problem or harm that has not yet occurred. However, it became clear throughout the case study that the risk had already eventuated and was causing harm to stakeholders in the sector. Therefore, what Agency X refer to as the 'systemic risk' will be referred to as a problem within this thesis.

The problem related to the potential misuse of a government assistance program benefitting businesses and some consumers in the sector. This initially appeared to be linked to poor business practices in one specific business service area, but was later revealed to be widespread amongst many business services. It negatively impacted a high number of consumers, particularly those who were socially disadvantaged due to low literacy, disability or English language skills. There were also concerns that the problem was significant enough to negatively impact the reputation of the entire business sector.

Representation of the problem within a system

Authors in the systems thinking and complexity fields (Snowden & Boone 2007; Checkland & Poulter 2006; Nelson & Stolterman 2012) highlight the importance of not just considering the individual components or symptoms of a problem, but the nature of those broader systems that the problem arises within. By considering the broader system perspective, it can be understood that the various problem descriptions by Agency X were individual components of the problem. For example, problem descriptions included:

- ...harm being caused to vulnerable consumers (Public report by Agency X)
- ...“government fraud [by businesses]” and “patterns of bad behaviour” (Interviewee 1)
- ...“harm to the [consumer], “harm for the reputation of [Agency X], “lack of confidence in [the sector]” (Interviewee 2)
- ...“how the regulation can keep pace with the introduction of new incentives through funding models and what kind of risk that poses for the regulatory agencies. And I suppose the broader risk has been that uncoordinated policy and funding and regulatory arms have not been working appropriately together to manage those risks in an integrated way up front” (Interviewee 3).

All of these accounts of the problem are correct and could be evidenced, however considering each description in isolation risks narrowly defining the problem to one of its component parts. Nelson and Stolterman (2012) explain that it is impossible to see complex phenomena from one standpoint. Different perspectives of the same phenomena may reveal a contradiction, or paradox, where both perspectives cannot be resolved unless one perspective dominates through compromise or trade-off (Dorst 2015b; Nelson & Stolterman 2012; Schön & Rein 1996). Systems diagrams provide one way to try to understand and represent the whole systems in which problems emerge, including the consideration of problem boundaries. This also makes it easier for the problem to be compared against Snowden and Boone’s (2007) indicators of complexity.

The researcher's system diagram of the problem is provided below.

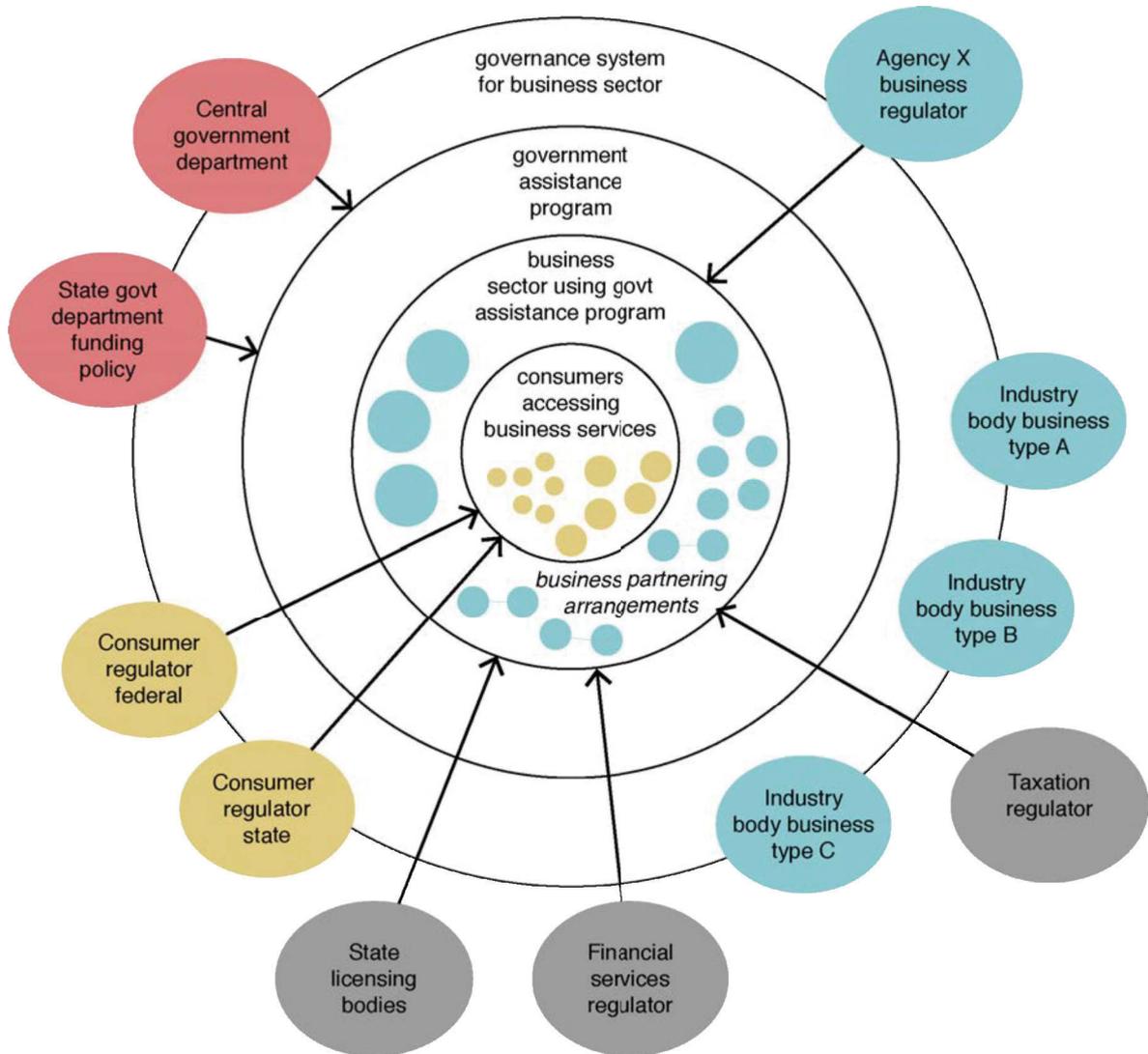


Figure 11: System diagram of the problem being addressed in case study one

The systems diagram enables a more complete analysis of the problem as an adaptive whole, and confirms components of the problem to be:

- a compartmentalised governance system
- poor businesses behaviour within the specific market that were accessing the government assistance program, including problems with business partnering arrangements
- lack of regulation over specific types of business partners

- human values and motivations driving business behaviour such as greed, and
- consumers accessing the business services who were being harmed by the poor service but also at times contributed to the problem by benefitting from the service arrangements and not reporting them.

Comparison of the problem context against complexity indicators

The systems diagram of the problem enables it to be compared against Snowden and Boone's indicators of complexity as outlined below.

1. Large numbers of interacting elements

There were a large number of interacting elements within the system that the problem arose from, including various government bodies in the broader governance system. This was described by interviewee 1:

"Well just the bureaucracy you know, it takes forever to move everything that far, because of the size of bureaucracy, there are many departments, many agents, many pieces of legislation, this one says you can do this, this one says you can't do that".

The system also included a large number of businesses, of varying types and sizes, and a large and diverse customer base.

2. Non-linear interactions where minor changes can produce disproportionate effects

Non-linear interactions within the system could be observed in two ways. Firstly, through diverse policy and governance changes where the effects could not be predicted in advance. Secondly in changes to the ownership or partnering arrangements of the regulated businesses that could not always be identified by the regulator and were sometimes observed to create significant and unexpected changes in the behaviour and level of compliance with legislation.

3. Dynamic – changing over time

It was clear that the problem changed over time, through changes any of the interacting parts, such as the effects of adjustment to policy, businesses making different decisions around business partnering arrangement and consumers changing behaviour about their selection of services. This

included hidden changes that occurred through collusion with different actors in the system, where businesses and consumers benefitted from behaving in ways that didn't comply with existing regulations.

4. The whole is greater than the sum of parts

As discussed earlier, the problem was often viewed from the perspective of its component parts, including effects on the individual consumers involved in the problem. However, it is also clear that a whole emerged from these components, resulting in concerns that the problem may negatively impact the reputation and economic value of the entire business sector.

5. The system is unordered (not constrained through boundaries) and the agents within the system constrain each other in unpredictable ways

This is a very interesting point to consider for a problem being viewed by a regulatory agency. In many ways, the system is ordered (constrained) by policy. For example, businesses have to operate according to an established set of business rules. The regulator enforces these rules and through applying the most serious sanctions, can stop the operations of a particular business or company director by cancelling their business license or sending the director to jail. Aligning with the assumptions of cause and effect within an ordered system, this would stop the problem. However, depending on what level you view the problem (within which problem boundary or frame), this did not stop the problem. At a consumer level the problem was often ongoing since consumers were still impacted by losses from the poor service, at an individual business level sometimes the directors went on to establish other poorly performing businesses in the same sector or a different sector, or passed the poorly run business operations onto family members. At a business sector level the reputation had been tarnished and well performing businesses may have been affected in various ways. At a policy level, without making changes to the government assistance program the problem would continue to manifest. And at a sector governance level, the diversity and lack of cohesiveness may enable other problems to arise which are just as difficult to address. This indicator highlights that the way Agency X views the problem boundary (i.e. whether it is constrained or unconstrained by policy or organisational mandate), impacts their actions to address it.

6. The system involves human actors and decision-makers which make changes unpredictable

As indicated above, the unpredictable behaviour of business owners and staff made it difficult for the regulator to monitor behaviour and track whether their interventions had adequately addressed the problem.

In addition, the unpredictable behaviour of consumers made it difficult for Agency X to trust consumer information to use their information as a primary detection of the problem. Challenges included the fact that some consumers were benefiting from the service arrangements and not reporting poor business behaviour to the regulator, and some consumers were particularly vulnerable which made it difficult to engage them in formal legal processes required to establish evidence and prosecute a business.

This comparison of the problem indicators against Snowden and Boone's (2007) summary of complex contexts provides evidence of the complexity of the problem. This provides a base level of understanding to then consider the relevance of actions taken to address the problem in the case study.

6.3. What actions did Agency X take to address the problem?

Prior to this case study, Agency X had established a practice to uncover and address what were referred to as 'strategic risks' in the sector. This was done with a dedicated team using a range of existing regulatory approaches including data analysis and audits. Identified risks were then addressed through taking specific regulatory action towards the individual businesses involved and publishing broader policy recommendations for various other governance agencies to consider. Prior to the commencement of this case study, several senior leaders and managers had been exposed to the work of Sparrow's problem-based regulation methodologies (2008) through government leadership training programs. Agency X decided to trial Sparrow's recommended approach for the problem being addressed in this particular case study. The main differences of Sparrow's approach to the previous 'strategic' risk approach was the use of more sophisticated risk assessments to identify problems, the establishment of a cross functional team to carry out the work, and the aim to utilise existing tools to respond to the problem as well as designing new ones.

It was clearly recognised that this was going to be an experimental project, with Interviewee 1 stating "So there was an attempt to do something different here", and Interviewee 2 stating..." this [problem] is a first cab off the rank [i.e. it is first in line]. You can see it forming and you can see that

we need to do something. We should probably try and do something on a sector level with certain [businesses]”.

Throughout the case study, approximately 25 discreet activities were identified that demonstrated how the regulator acted to address the problem. These activities mostly occurred in a chronological order as presented, although some activities occurred concurrently and some (such as audits) occurred multiple times. The activities were compared to the aim of the activity, the outcome of the activity and whether they were guided by a defined or implicit methodology. The full comparison table is provided in Appendix B. For brevity, only the activities are listed below:

1. Environmental scan with broad stakeholder input
2. Initial analysis of case study agency complaints data
3. Meetings with related regulatory agencies in the broader sector
4. Broader analysis of case study agency complaints data
5. Cross-government roundtable
6. Legal mapping of regulatory agency responsibility to components of the problem
7. Further engagement with related regulatory agencies
8. Decision from senior leaders to take action from within their own jurisdiction
9. Small internal reference group develop project plan
10. Plan reviewed by senior leaders
11. Project plan given to different team to implement
12. Cross-functional team established by basing the project in one team and drawing on support from staff in other teams
13. Additional data on the problem obtained from policy department
14. Interviews with consumers conducted
15. Tailored audits of individual businesses conducted
16. Internal Steering Committee established to meet weekly
17. Audit reports on individual businesses produced
18. Senior leaders make regulatory decisions on individual businesses
19. Regulator publishes project findings and actions against individual businesses
20. Broader policy recommendations made to policy department
21. Joint audits and investigations conducted with other regulatory agencies
22. Case study agency reflection leads to general audit model restructure
23. New kinds of data analysis trialled

24. Specific staff selected to do more audits who are able to adapt their process to each situation
25. Increased use of investigative staff

Analysis of actions taken to address the problem

An analysis of the activities and methodologies applied in the case study reveal a number of key findings, including the reliance on methodologies from certain disciplines, the use of a linear process, reliance on implicit expertise to develop the project plan, limited engagement with stakeholders in the development of responses and separation of planning and implementation. These findings are described briefly below.

Reliance of methodologies from the regulatory, public sector and management disciplines

As could be expected within a regulatory agency, the main methodologies applied within the case study come from the regulatory, public sector and management disciplines. These include:

- data analytics as the dominant methodology to understand the problem space
- formal government engagement methodologies driving the form of consultations and meetings
- management/project management methodologies influencing the separation of planning and implementation and the development of project plans
- audit methodologies influencing the way that audits were planned and implemented
- investigations methodologies driving new ways to uncover evidence of the problem.

Linear process to address the problem

The majority of the activities in the case study, up until activity 20, occurred in a relatively linear fashion focussed on first understanding the nature of the problem (including consulting with other government agencies), developing a plan to address the problem and then implementing the plan. The development and implementation of the plan was conducted with limited exploration of new approaches or experimentation. This practice is in line with conventional goal-orientated problem-solving approaches from management science, which is reflected in Sparrow's linear problem-solving protocol. However, the impact of relying on a linear process for Agency X, meant that problems in the planned approach were not revealed until much later in the project when they began to seriously affect progress of the project. These problems included staff not conducting

audits as planned or recording data in a way that could provide evidence about the specific problem.

Reliance on implicit expertise to develop the project plan

Sparrow's (2008) problem-based regulation methodologies provide the main guidance on identifying the problem, consulting broadly with other agencies in the sector, using a cross-functional team to organise around the problem and the aim to develop or adjust tools to address the problem. However, one of the limitations of the problem-based methodology is revealed through this case study at activity 9, where a small internal reference group developed a project plan outlining how the problem would be addressed. This was done simply by relying on the implicit expertise of the staff, and the use of project management planning templates. The resulting activities defined in the project plan only varied slightly from the agency's standard regulatory approach, limiting the opportunities for more radical innovation to address the problem.

Stakeholder engagement in problem identification but limited engagement in the development of responses

Agency X engaged quite broadly with external stakeholders in the identification of the problem (through the e-scan) and in understanding of the problem (using consumer complaints data and meeting with other government agencies). However, this engagement became very limited in the development of responses, until much later in the project when other regulatory agencies recognised the importance of the problem and were able to prioritise it to undertake joint audits. Interviewee 2 reflected on this approach when asked about the involvement of stakeholders in the response, noting that:

"I call it going back to your cave and trying to work out how you deal with a problem that is significant...the [senior leader] had foreseen that we would try and engage them [external stakeholders] in our solution, but the way we think about it differently now to back then was that we wanted to decide our response and then ask them"

Project staff in the case study noted a number of contextual influences that make it difficult to involve stakeholders in the design of solutions, which are discussed later in this section.

Separation of planning and implementation

The teams involved in the project adopted a common practice from early management science (Merkle 1980; Schön 1995) of having managers plan the project and a separate team implement it. While this was partly done to navigate resource constraints, it was clear that many of the staff involved in the implementation phase did not properly understand the problem or the rationale for the adopted strategy and did not feel empowered to make adjustments. This was evident from some staff ignoring instructions to vary their audit approach and reverting to standard practice.

[Interviewee 2]: "...as part of the handover of the project...I'm not blaming, I'm just saying something happened...the staff weren't briefed properly. In fact, I still don't believe we understood the [government assistance program] very well...it was a complex program to understand".

Other staff were aware of issues in the original project plan including unrealistic timeframes but did not feel empowered to make adjustments:

[Interviewee 1]: "There was not enough fat built into the timeframes to allow for correction and redirection and that's why so many things went scawif".

The original ideology behind the separation of planning and implementation aims to most efficiently utilise the skills of staff at different levels, meaning that a manager's time should be directed towards strategic planning and the workers towards implementation (Merkle 1980). However, this approach does not recognise the unique knowledge of different levels of staff, including those who understand a problem from the experience of front line stakeholder interactions. Project briefing between teams involved in planning and implementation can also be improved through an understanding of design practices, which is explored in section 7.

Greater levels of reflection and adaptability much later in the project

While the first stages of the project were undertaken in a linear, step-by-step fashion, once senior leaders realised the challenges in the project, they began implementing a much more reflective, iterative and experimental approach. This included trialling new activities such as joint audits with other regulatory agencies, and coming together in the steering committee to discuss the results and adapt the plans as necessary.

Reflection of the project challenges also led to the agency implementing more structural changes to their practice through the redesign of their standard audit model and seeking ways to use regulations more flexibly in relation to the nature of emerging problems.

These examples of the organisation adapting its practice indicates that the case may have been the necessary crisis experienced to trigger a change in the way the organisation solves problems. Prahalad and Bettis (1986) cite a number of authors, including Hedberg (1981), who suggest that in the overwhelming number of examples, a crisis is needed to lead to substantial change. Nystrom, Hedberg and Starbuck (1976) have also illustrated that it is usually when an organisation responds to a crisis using current practice, and this has the effect of deepening the crisis, before new solutions are sought.

6.4. What was the response to the problem and how adequate was this for the level of complexity?

This case study involved a project to address a complex problem. The project led to three specific responses that were aimed at reducing the impact of the problem and the likelihood of it reoccurring. Each response was targeted at a different component of the problem. The Cynefin Framework (Kurtz & Snowden 2003) is adopted within this research to help make sense of complexity theories and identify appropriate responses in different contexts. This includes four different contexts—simple, complicated, complex and chaotic and appropriate responses for each (Snowden & Boone 2007).

The responses applied in the case study are described and compared to response actions in the Cynefin Framework below:

- **Activity 18: regulatory actions taken against individual businesses to reduce the harm being caused to consumers**
 - **Simple context: Sense-categorise-response.** This response involved data analysis and audits (sense), considering the findings and determining an appropriate regulatory response from within the legislation, often referencing a responsive regulatory pyramid (categorise) and applying a predetermined regulatory response (respond).
 - **Complex contexts: Probe-sense-respond.** Note that one of the regulatory responses in the legislation had not been tried before and so this could have been considered a probe since the agency needed to apply the response (probe), monitor the effects of the response (sense) and consider whether to apply it in more cases (respond). To

remain a relevant response in a complex context, the regulator would need to actively monitor the impact of the response.

- **Activity 19: publishing the findings of the project, including the names of businesses that were investigated and sanctioned.** This response was aimed at the general business sector—to persuade the named businesses to improve their behaviour and dissuade others or acting in a similar way.
 - **Complex contexts: Probe-sense-respond.** Publishing the findings of the project, including the names of businesses that were sanctioned was something that the regulator had not done before and was not specifically defined in the legislation. The action involved implementing the response to publish findings (probe), observing whether this impacted the problem (sense) and continuing to publish findings or adjusting the response (respond). To remain a relevant response in a complex context, the regulator would need to actively monitor the impact of the response.
- **Activity 20 involved the case study agency developing and publishing policy recommendations to the relevant government department.** This was aimed at influencing changes to the government assistance program, which was seen to be allowing or motivating the problematic business behaviour to occur.
 - **Complicated context: sense, analyse, respond.** This action involved considering the nature of the emerging problem (**sense**), analysing this information against current policy settings (**analyse**) and publishing those recommendations (**response**).

This analysis demonstrates that the regulator’s responses to the problem were applied at a number of levels—those appropriate for complex, complicated and simple problems contexts. Considering whether the simple and complicated responses are likely to affect the problem raises the issue of how the regulator perceived the problem boundaries. In Figure 11 the problem can be seen to operate within the boundary of the business regulation that Agency X implements. If this was the way that the problem was defined by the regulator, making responses appropriate in an ordered domain would be sufficient. It is important to note that the agency’s legislative mandate encourages problems to be defined within the boundary of the regulated business sector since this is the context that the regulator is responsible for. However, when the problem is viewed to exist within the broader governance system, this confirms the complexity of the problem and will require more probing and experimental strategies in collaboration with other agencies in the sector. The issue of addressing problems from within a single organisation, or collaborating with broader organisations in the sector has become a critical consideration as the complexity of problems increases. This is highlighted by Dorst (2015b):

“The passing of structures and systems of the industrial age and the rise of the networked society have resulted in open, complex, dynamic and networked challenges that can only be successfully met by organisations that are ready to become open, complex and networked themselves” (p. 7).

The findings of the case study so far have indicated that the problem is complex, and that many of the actions to address the problem are not adequate for a complex context and are positivist in approach (e.g. linear processes, limited stakeholder engagement and reflection). This provides evidence, as required within the Design Research Methodology, that the current practice could be supported by a systemic design intervention.

The influence of the context and the practitioner are described below, which provides further input to factors likely to influence the success of an intervention.

6.5. What was the influence of the context on the practice?

Challenges collaborating within the broader governance system

One of the most interesting findings from a systems perspective were the challenges Agency X had in acting against a problem which exists in a much broader context than its own organisational focus. Agency X undertook a number of activities in an attempt to engage other government stakeholders with the problem, to come to a shared agreement on the nature of the problem and possible responses, and to take coordinated action. Interviewee 2 illustrates these intentions for collaborative action in a comment:

“[Senior leader] leads the work and he says he wants government to work, not for [the one regulatory agency] to work, not for [the one government department] to work. He says that people don't see that governments are different departments. You just want governments to fix it”.

However, the efforts to collaborate were hampered by a range of reasons that are briefly outlined below.

No shared view of risks across the system

Interviewee 2, who was the main project member involved in the early phase of the project, described how they had trouble gaining 'buy-in' to help address the problem from the central government department and other regulators in the sector. This was due to the other government

bodies believing that Agency X held full regulatory responsibility for the sector, when in fact several aspects of the problem were not specifically regulated by the agency. This was also due to each agency having their own list of priority risks that they planned to address. Interviewee 2 noted the irony in this:

“So here we were all trying to Sparrow each other, you know like trying to use each other’s resources but all deciding our own priorities independently”.

Different understanding of the problem impacting collaboration

The problem was very complex and was being defined on many different levels (relating to the business behaviour, the consumer behaviour, the behaviour of sales agents, and the design and administration of the government assistance program) by not only Agency X but also the central government department and other agencies in the system. Several instances were observed throughout the case study where the different problem framing (how the problem was perceived) impacted on the willingness of the government bodies to collaborate on responses and impacted the effectiveness of responses that were implemented. At one point the central government department made changes to the regulatory legislation that the regulator is required to enforce, which the regulator believed did not accurately target the problem and only increased their operational workload. Interviewee 3 stated:

“they [the central department] are changing our act without telling us...a piecemeal adding to our act that we can [enforce certain infringement notices]. So they dreamed that up which from our point of view has no utility whatsoever”

Hierarchy limiting open collaboration

Three of the five interviewees also commented on the challenges resolving sector-level problems when they need to rely on formal mechanisms to engage with other government bodies, particularly the central government department which is considered the ‘parent agency’. These communication mechanisms involve formal information sharing agreements, documentation in formal briefings, and ensuring that a senior officer manages the delivery of information to other senior officers. Although frustrating, Interviewee 3 noted that these are aspects of working in the public sector that need to be navigated:

“It seems silly we can’t just talk to each other but they’ve [the central department] obviously got layers of protocols that they have to go through and while we may have a certain amount of

flexibility at our level to do certain things [being a smaller regulatory agency], they may not. And it's understanding those complexities as well".

Concern that engagement would divert the agency's focus on its mandate

On the flip side of Agency X having trouble engaging others in their project, they were also concerned that too much open engagement would divert their focus from delivering on their own agency mandate. This led to reduced consultation when deciding on a response and asking for specific input from other agencies, rather than commencing a more open form of dialogue. Interviewee 2 described how the historical experience of engaging with other agencies has led to this approach:

"...they [other regulators] have like 20 businesses and we have [thousands]...so our history is that working with other regulators to do our transactional approach has been really complex and difficult. In fact, you go out and audit together, you end up losing focus of your audit at the expense of theirs".

Accountability requirements limit opportunities for collaboration

These findings in the case study confirm that the siloed approach in the public sector, where each agency is given a discreet responsibility, act as a barrier to innovation (Sorensen and Torfing 2011). This siloed structure is further embedded by the emphasis on accountability through budgeting processes. Although guiding policy documents usually always encourage a 'whole-of-government' or 'joined up government' approach (Australian Public Service Commission 2007), when an agency's budget assurance (i.e. job security) and public reputation (i.e. pride and personal wellbeing) are tied to demonstrating effectiveness against stated objectives, it is easy to see how collaborative efforts may slide. Stacey (Stacey & Griffin 2007) writes extensively about this issue and the "cult of performance that replaces purpose" (p.15-42) within public sector organisations when private sector accountability models are imposed.

Francesco and Alford (2015) from the Australian and New Zealand School of Government also agree that budgeting processes and structures decrease the level of trust that is required for government agencies to establish partnerships that are able to deal with complex problems. They note a tension for government agencies between expectations that they will deal with any problem in their area of responsibility, including those that are unexpected or complex, and that they will also spend money in accordance with legislation.

Pressure to act limiting innovation

An additional influence of the public-sector context on the regulatory practice was the pressure to act to quickly limit the harm the problem was causing to the public and to demonstrate effectiveness. While the intention in implementing Sparrow's problem-based regulation methodology was to develop unique ways to address the systemic problem, several staff mentioned that this pressure to act limited their ability to develop new approaches. Interviewee 4 clearly stated this:

"We are such a small organisation but there is a lot of interest about what we work in and so we have to keep getting in and doing things. And if we know there's a risk that if we don't act now, well we are costing not just millions of dollars, but we are costing the consumers. And there is a burden there and an obligation that we have to do something. So, we have a lot of obligation on us to act. That also does have a negative though, from a toolbox and a project perspective because we need to just get in and get it done. You don't really have that time to reflect and to think of new ways of doing it".

Interviewee 2 also noted that the pressure to report progress against the problem at an upcoming government hearing, which was fuelled by recent media reports about the problem, rushed the first stage of the project so that audits were not well planned and the staff were not fully briefed about the project plan.

It is helpful to apply the Cynefin framework to try and make sense of a preference for governments to act quickly. According to Snowden and Boone (2007), taking decisive action and then observing and adjusting the response is appropriate in a chaotic domain, occasions which they describe as being highly turbulent, as well as mercifully rare. This is a context in which governments have been celebrated as being highly effective and rely on our authoritarian notions of leaders making the right decisions. However, the problem being addressed was complex, which requires careful experimentation to find a response that can influence the problem, ideally in collaboration with other actors in the broader sector. If every agency in the governance system takes decisive, yet uncoordinated actions to address a problem, this is only likely to compound the problematic situation. The pressure to act may lead to a situation that Ackoff (2004) describes of government not properly considering the problem being addressed and spending their energy "doing the wrong things and...trying to do them righter" (p. 2).

The findings of this research question indicate that an intervention in this context is more likely to be successful if:

- it supports the agency to collaborate with other government bodies and stakeholders involved in the problem and supports them to develop a shared understanding of the risks
- it supports collaboration in more informal information-sharing environments that are not constrained by existing organisational and inter-agency hierarchies
- collaboration is undertaken with the understanding that each agency needs to remain focussed on delivering on their own mandate and accountability requirements, and
- the pressure for the agency to act with limited resources is respected.

6.6. What was the influence of the practitioner on the practice?

Practitioners have an important influence on the practice, being the people that perceive, think and act upon the problem. A number of findings emerged through the case study relating to the practitioner's willingness to experiment, a requirement for staff to adapt their practice in complex contexts, and an increase in innovation that was observed with the increased diversity of disciplinary skills in the project. These themes also connect strongly to organisational change literature, indicating potential pre-cursors to the adoption of a new practice. The findings and literature are discussed below.

Willingness to experiment positively influenced outcomes

Although noting the contextual influences of public accountability and pressure to act, all of the project staff who were interviewed expressed positive statements about the agency's willingness to experiment and try something new within the project. Interviewee 3 commented on the "fairly high risk-tolerance in our [senior leadership group] of the getting out and trying it strategy".

Interviewee 3 also commented that due to the small size of the organisation, particularly innovative staff can be quite influential on the attitude of the whole agency.

Willingness to experiment is a key precursor to being able to deal with complex systems with substantial uncertainty (Alliance for Useful Evidence 2015; Christiansen & Bunt 2014). Innovative individuals are also important in the transformation of practice, identified by Yee and White (2016) as 'champions' who can advocate the adoption of new approaches within all levels of an organisation.

Levels of staff adaptability affected outcomes

Bentley and Wilsdon (2003) define that “something is said to be adaptive when it responds to changes in its environment without central direction or control, while retaining the same core structure and values” (p. 26). All of the five interviewees brought up the capability of staff and their levels of adaptability when discussing the successes and challenges of the project. A general theme emerged about staff they believed were most comfortable either making unique judgements (i.e. being adaptive) or following rules-based approaches. Some of the early challenges of the project were attributed to auditing staff not being comfortable moving outside their normal way of operating to collect unique evidence and being able to make judgements about elements of the complex problem being addressed.

Interviewees also discussed the influence of business rules on adaptability, since business rules had been created for the regulator to establish a nationally consistent regulatory approach, and had become a defining feature of the organisational culture. As Interviewee 2 stated: “we have organised our organisation around rules...there are rules galore”. Within the Cynefin Framework, an auditor’s standard process follows the sense-categorise-respond model appropriate only for simple contexts.

For a regulator moving beyond simply being an implementer of policy to one that designs new approaches to complex problems, supporting their staff to become adaptive is an important focus. This requires staff being given permission to experiment, take risks and learn new ways to do things outside of their normal practice (Bentley & Wilsdon 2003). This enables innovation to develop from the ‘bottom-up’, and important factor of developing an innovative practice within the public sector (Bason 2010).

Towards the end of the case study, after Agency X had experienced significant challenges with the current practice, they began making proactive shifts in their thinking about the audit model. This included redesigning processes to encourage unique judgement and direction from individual auditors rather than enforcing a rules-based approach. Interviewee 2 noted the importance of supporting their staff to make this adjustment:

“Our [new] approach to regulation [occurring late in case study one] requires a judgement model. Therefore, it's going to be hard work moving to that different way unless it's well supported and that support needs to include capability development.

Innovation increased with skill diversity

Since professional training influencing the way people see, think and act; professional disciplines provide an insight to the way problems and responses are perceived. Nelson (1994) notes that individuals often establish an identity through their trained discipline and are hesitant to let this go due to traditional workplace recognition of a depth of expertise. The main professional disciplines represented in the case study are public sector management, auditing, law and policing.

Interviewee 3 commented on the impact of disciplines on innovation in the case study:

"I think the Sparrow stuff is good because it makes people think outside the box and talk to other people, but we are still, our responses are still constrained by our type of people that work here. Mainly, for a couple of reasons...one is you know you are constrained by your discipline so the answer that you find is often a result of the discipline that you come from".

However, towards the end of the case study, the agency had established an investigations team and broadened the expertise in the risk intelligence team. Some of these staff were able to contribute to the project and interviewees noted the increased experimentation of new approaches that emerged through the contribution of different skills and perspectives. This included new ways to search and identify evidence of non-compliance and different techniques to identify problems within regulatory data.

The findings of this research question indicate that an intervention in this context is more likely to be successful if:

- it engages with staff who have already shown a willingness to experiment and who have demonstrated adaptability; or actively builds the capacity of staff experimentation and adaptability (although this was outside of the scope of this research project)
- it includes a diversity of staff skill and level to be involved in the intervention.

6.7. What other challenges were faced in addressing the problem?

Case study one was a particularly challenging project for the agency, since the problem being addressed was highly complex and the agency was trialling Sparrow's (2008) problem-based regulation for the first time. Many challenges have been raised in the sections above, including challenges relating to the activities, the context and the practitioners. Additional challenges are

noted below that deal with the limitations of data, systems and resources. These are also common challenges documented in innovation literature where existing structures and systems do not provide the flexibility for new practices (Ryan 2016a).

Difficulty obtaining and integrating data about the problem

The case study agency initially did not seek to access existing data (electronically recorded facts and statistics) about the problem from other government agencies or stakeholders. Once they realised the limitations in their own data (primarily public complaints about businesses involved in the problem), they sought to access data from other government agencies but this took a significant period of time to negotiate approval to gain access, including the establishment of formal data-sharing arrangements. Once data was obtained, it became clear that different formats and assumptions made it very difficult to merge and compare, requiring significant manual review.

Lack of flexibility in established IT systems

The case study project staff also had difficulty effectively utilising existing data due to the lack of flexibility in the established IT systems. This made it difficult to query emerging indicators about the problem if they were not already part of established data reports.

[Interviewee 4]: "So it was about the business as usual [IT] systems and how flexible they can be to actually accommodate sophisticated thinking and processing of high risk [businesses]. So we've still got a bit of a break there. A disconnect between how that sort of fits together".

High resourcing requirements to deal with complexity

Many of the interview participants noted practical challenges in developing the new practice based on Sparrow's (2008) problem-based regulation. Since the project was taken on quickly and without a lot of timing or scope for resource planning, staff often didn't feel that they had the people resources they needed to adequately address the complexity of the issues.

[Interviewee 2]: "The downside [of being a small agency] is you can't move your staff around so if there is a particular problem, you want to take 5 people offline, you just don't have the capacity. A big organisation goes – here's a problem, take your best 5 people, put them in a room for 6 months to solve that problem then bring them back".

While all challenges are not able to be addressed by the experimental intervention in this context, the findings of this research question indicate that an intervention is more likely to be successful if:

- seeks to obtain data about the problem as early as possible utilising proactive collaboration approaches
- the high resourcing needs to innovate are considered and addressed by efficient design of the intervention.

6.8. What was the underlying paradigm of the practice?

Underlying paradigms are also relevant to an organisation's practice. The dominant regulatory paradigms in regulation were demonstrated through the literature in section 3 to be positivist, characterised by assumed predictability, objectivity and control of reality (Dunne 1999; Rutgers 1999). While it is difficult to demonstrate the presence of a paradigm through one case study, the findings indicate existing positivist practices but also a move towards a more experimental or transdisciplinary approach. Positivist practices include the examples of rules-based regulation that aim to predict problems and address them through predetermined regulatory responses as well as the conventional management practices that compartmentalise problems and attempt to solve them through linear processes.

However, the shift in Agency X's approach appears to be in direct response to the limitation of these conventional practices to address such a complex problem. Interviewee 2 noted that "the [project] has been a huge help in shifting our thinking", and that lessons from the project had informed the redesign of the audit model to include great adaptability to each emerging problem. The agency has also recruited staff from a broader range of disciplinary skills including investigations and sophisticated data analysis, which has driven greater levels of experimentation with new ways of identifying, understanding and acting against the case study problem. This development may be moving the agency towards a transdisciplinary paradigm.

6.9. Conclusion

This case study aimed to understand the current practice of a regulator in addressing a complex problem, considered against the theoretical framework of practice and informed by insights from systems thinking and complexity theory. The research resulted in a broad range of findings, which are summarised in a table in Appendix C to inform the following sections of the research. The

findings highlight the complexity of the problem being addressed, challenges collaborating with other government entities and the willingness for Agency X to experiment with new approaches.

There is sufficient evidence that the regulatory practices used to address the problem were not adequate for the level of complexity, which validates the opportunity to trial an intervention from systemic design. This is also due to the limited guidance for regulators to develop new approaches instead on simply relying on enforcing established regulations.

The findings of this case study also provide indications that an intervention in this context is more likely to be successful if it:

- provides support for inter-agency collaboration and to build a shared understanding of the problem
- it respects the pressure on the agency to act with limited resourcing
- it involves staff who have indicated a willingness to experiment and adapt their practice
- it involves a diversity of staff skills and levels, and
- it supports early and proactive data collection.

Part two explores the practice of systemic design to develop an understanding of a more ideal model of practice, and uses this information to design the intervention to trial.

PART TWO

Understanding systemic design and the potential to support regulatory practice to address complex problems

Part two of this thesis explores the field of design to understand its potential to support regulatory practice to address complex problems and establish a more ideal model of practice. This includes a literature review of systemic design methodologies and principles. The findings of case study one are then considered a second time but this time specifically against systemic design principles. This highlights specific opportunities for systemic design to support the existing practice. These insights are applied in the development of a systemic design intervention, to be trialled by Agency X against another complex problem in case study two. The findings of case study two are then discussed.

7. LITERATURE:

Understanding systemic design as an alternative way to address complex problems

This section explores design, and more specifically, systemic design to consider the question: *what is systemic design and what would a more ideal practice include for a regulatory agency to address complex problems?*

Design is being increasingly explored as a way to enable innovation in the public sector (Bason 2014; Burns et al. 2006; Design Council 2013). This is relevant within a regulatory context because regulators are facing increasingly complex problems and need to find new ways to address them rather than relying on the application of predetermined regulations. The fields of systems thinking and complexity theory provided important insights for regulatory practice but lack guidance on the development and implementation of interventions. Alternatively, design is described by Ryan (2016) as “an interdisciplinary tradition of situated learning through action” (p. 4). Nelson and Stolterman (2012) also describe design as the ability to imagine what doesn’t exist and to bring this into being as a purposeful addition to the world. Nelson (1994) further distinguishes the strength of design for complex problems solving by contrasting this to the scientific traditions that are designed to explain the natural world but not create new, intentional action.

The elements of systemic design discussed within this section are highlighted in Figure 12 below.

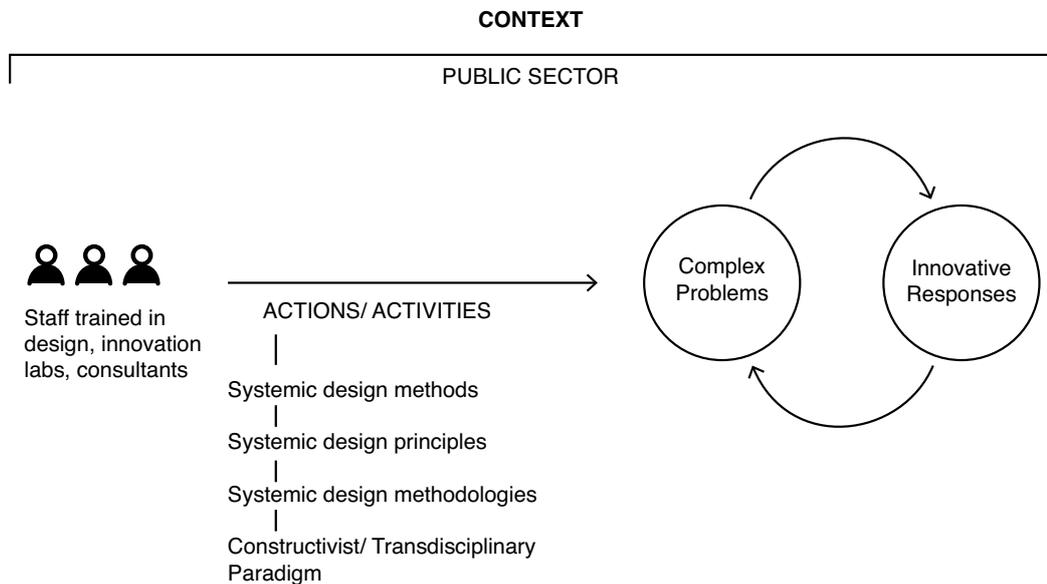


Figure 12: Conceptual framework of the application of systemic design within the public sector

7.1. History and key concepts of design

A common response when discussing the potential use of design with professionals in other fields is the assumption that design is about aesthetics, usually applied at the end of a process to develop a physical object. This misconception of design’s potential is based on design’s history as a profession; that of an early industrial design field that was established in the mid-1800s to guide the manufacturing of beautiful ornaments (Dorst 2015b). Later, design was applied to the production of visual and material objects, in the fields that we are also very familiar with including graphic design, architecture and product development. While these fields still focus on the production of visual or physical objects, they have developed a deep design expertise in how to conceive and create something new. This includes skills to understand and generate new value for stakeholders and to solve problems relating to integrating a new idea into an existing complex reality (Verganti 2009).

The concept of design thinking generated a significant following after its adoption as process to support business innovation in the 1990s (Szczepanska 2017; Brown & Wyatt 2010; Nussbaum

2013). However, more recently, design thinking has been criticised for adopting a linear process view from the current practice paradigms, which then reduce its ability to generate meaningful change (Walters 2011; Nussbaum 2013). The recent interest in design processes in businesses (and to a lesser degree in the public sector) has also led to a vast expansion of concepts, descriptions and methodologies, resulting in a segmented understanding of design knowledge (Dong, Maton & Carvalho 2014).

Other branches of design research have focussed on the use of design as an alternative approach to address complex problems. Dorst (2015b) notes that design has developed dramatically in the last twenty years with methodologies to reframe current problems and envisage new futures. Design is now being used more broadly in complex contexts, including to address public sector and societal problems (Bason 2014; Jones 2014).

7.2. Underlying paradigm of design practice

Design does not have such an old philosophical paradigm behind it as that of government regulatory practices. One of the first academics to study design Herbert Simon in the 1970s (Simon 1973) who viewed design from a positivist lens of searching for solutions in a field of possibilities, deconstructing problems to a manageable size, solving the sub-problems and combining these solutions (Dorst 2015b).

Donald Schön took a different approach to studying designers in the 1980s when he coined the term 'reflective practice' to describe the way expert designers interact with their materials, obtain feedback, make local decisions or experiments and observe the results (Dorst 2015b; Schön 1984). Schön stresses the importance of approaching each problem as unique, and utilising tacit knowledge, or knowing-in-action (Dorst 2015; Schön 1984). Schön's reflective practice is a pragmatist, constructivist theory that considers that knowledge is best created through action. This interaction of design inquiry and action forms another interesting contrast to the positivist paradigm, where inquiry and action are viewed as separate steps to first inquire, understand and 'fix' the problem, and then begin developing and taking actions to solve it.

7.3. Type of problem situations being addressed by design

Richard Buchanan first hypothesised in the 1990s that design could address wicked problems through a designer's unique ability to conceive and develop something that does not yet exist in the context of a complex system. Buchanan (1992) summarised four different domains (or problem

areas) of practice that design can be applied to. This starts with problems relating to symbolic communication and material objects, then suggests movement into more complex environments of human activity and services and then into complex systems and environments.

Jones (2013; 2014), in collaboration with VanPatter and Pastor (2016), elaborated on Buchanan's distinction between the domains of design practice, clarifying that as designers move into dealing with more complex problem areas that their skills and methods also need to evolve. Jones (2013) clarified that "things become complex when defining problem boundaries" (p. 22), which is a similar exercise to problem framing (Jones 2014). For example, climate change can be considered from the perspective of an individual's behaviour, the effects of a region, or national climate adaptation (Jones 2014). Jones' (2013; 2014) refers to the highest domain of design complexity as social transformation design, which involves situations that are complex and unbounded. These situations include social systems, policy-making and community design.

The problem in case study one was identified as complex, and unbounded when perceived within the broader system. Therefore, the design methodologies considered within this section are based on those that have been developed to address high levels of complexity.

7.4. Design methodologies

There is an emerging field of design practice being established to deal with domains of high complexity. As referred to by Ryan (2014), each school or area of practice establishes their own unique design methodology. Rather than selecting one methodology to inform the development of a design practice to address complex problems within a regulatory agency, four methodologies were identified and considered. Some of these methodologies have been specifically developed for application within the public sector, and all have been applied within public sector contexts. Considering a broad range of methodologies ensured that the researcher was able to gain a deeper understanding of the structure and dynamics of these design methodologies. This enabled a comprehensive comparison against regulatory problem-solving practice in section 6 and the development of a unique design intervention in section 8. It also ensured that the intervention could be tailored to the unique requirements of the regulatory context, preferences of the actors and nature of the design object.

The four methodologies considered were:

- a developing systemic design methodology led by Jones (2013; 2014), which is applied within complex healthcare systems
- a systemic design methodology by Ryan (2014) which is applied within the Alberta CoLab, the world's first systemic design team in government (Ryan 2016; CoLab 2016)
- a design methodology referred to as frame creation by Dorst (2015b) which is applied to public and private sector problems within the Designing Out Crime research centre in Sydney (Dorst, Kaldor & Kilppan et.al 2016), and
- a design system methodology applied to complex problems in the public sector by ThinkPlace (2016).

Since there is still a broad range of terminology used to describe the kind of design these four practices apply, for simplicity the term 'systemic design' will be used throughout the rest of this thesis. Systemic design in this context will refer to design practices that incorporate systems thinking or complexity theories in order to address high levels of complexity in the design of social systems.

Systemic design principles

Each systemic design methodology describes different levels of practice, from the more general to the more specific. In line with the theoretical framework, this section firstly describes high-level principles, as a "fundamental truth or proposition that serves as the foundation for a system of belief or behaviour" (Stevenson 2011). Dorst (2015a) highlights that a focus on design principles enables design practices to be adapted for use in other fields, taking into account the needs of the context the design is being applied within. This is a more flexible way to apply design into new contexts, instead of transposing established methods and techniques with little change. Methods are then discussed that align with each systemic design principle.

A summary from each of the four methodologies is provided below. In addition, Dorst's (2015b) summary of general design practices is also included since it provides an important overview of key design principles applied in practice.

Table 5: Comparison of systemic design principles to address complexity, and key general design principles

Proposed systemic design principles (Jones 2014)	Systemic design mindset (Ryan 2014)	Frame creation principles (Dorst 2015b)	ThinkPlace design principles (ThinkPlace 2016)	Key design practices (Dorst 2015b)
<p>Idealization – identifying ideal states to compel action</p> <p>Appreciating complexity – acknowledging dynamic complexity of wicked problems</p> <p>Purpose finding – identifying or redefining system purpose for collective benefit</p> <p>Boundary framing – determining the scope and conceptual inclusion for problems and systems</p> <p>Requisite variety – the complexity of a system must be reflected in the control system</p> <p>Feedback coordination – multiple levels of feedback within a system need to be designed and managed</p>	<p>Inquiring – curious, observant, asks rather than assumes</p> <p>Open – defers judgement, seeks different experiences and perspectives</p> <p>Integrative – avoids binary trade-offs, utilises tensions between world views</p> <p>Collaborative – listens actively, grows social cohesion</p> <p>Centred – reflective self-awareness, views challenges from a larger context</p>	<p>Attack the context – consider the current frame of the problem to find new ways to understand it</p> <p>Suspend judgement – preserve ambiguity to enable unique thinking</p> <p>Embrace complexity – move beyond simplifications of conventional problem-solving and take on the complexity of the world as it is</p> <p>Zoom out, expand and concentrate – widen the scope of the problem setting and stakeholders and allow common themes to emerge</p> <p>Search for patterns – consider patterns of behaviour to gain insight, not what people say they do</p> <p>Deepen themes – consider the deeper meaning of</p>	<p>Establish a clear intent – ensure focus and direction from the start</p> <p>Take a human-centred approach – work with complexity from the user’s perspective</p> <p>Drive collaboration and conversation – harness innovative thinking from multiple disciplines</p> <p>Seek exploration and innovation – foster divergent thinking by exploring from the outside in</p> <p>Early visualisation and prototyping – make ideas visible by iterating concepts and experimenting with new solutions</p> <p>Seek a balance of desirable, possible and viable – seek to balance these three</p>	<p>Coevolution – developing the formulation of problem and solution ideas in concert</p> <p>Developing problem situations – focussing on the definition of the problem</p> <p>Creating frames – a thinking tool to support the discussion of problem and solution</p> <p>Exploring themes – universal patterns of human behaviour that capture the underlying phenomena</p> <p>Fostering a discourse – develop an environment that nourishes inspiration and reflection</p>

people's needs and behaviour requirements

Proposed systemic design principles (Jones 2014)	Systemic design mindset (Ryan 2014)	Frame creation principles (Dorst 2015b)	ThinkPlace design principles (ThinkPlace 2016)	Key design practices (Dorst 2015b)
<p>System ordering – meaningful ordering of information to enable visibility and redesign of complex situations</p> <p>Generative emergence – explore environments to identify emergence patterns, then reconfigure designs</p> <p>Continuous adaptation – monitor adaption to designed interventions and adjust as necessary</p> <p>Self-organising – consider multiple actors as designers in complex social projects</p>		<p>Sharpen the frames – develop clear frames that evokes a clear picture for all the major stakeholders</p> <p>Be prepared – frame creation is intense, may require widening of the brief and time for deep exploration</p> <p>Create the moment – prepare information and strategically select participants to workshop ideas in an inspirational environment</p> <p>Follow through – rework workshop outcomes and support clients to accept frames that counteract conventional systems</p>	<p>Follow a disciplined and flexible process – customise the process and make it context specific, apply methods that work</p> <p>Design the whole system – uncover the ecosystem of relationships, interactions, dependencies and unintended consequences</p>	

Principles from the four practices were analysed and synthesised into seven common principles. These are listed below and provide a simpler framework to compare with regulatory problem-solving practice. Considering that systemic design methodologies have been developed to deal with complex problems, these principles also indicate a more ideal model of practice that regulatory agencies can begin to move towards. To support a deeper understanding of the nature of systemic design practice, the opposing approach to each systemic design principles was documented. This provides an interesting insight as it reflects many of the positivist aspects to conventional problem solving that have been identified in earlier sections of this thesis. This analysis helps to convey fundamental differences of design practice to most conventional practice.

Table 6: Synthesized design principles

Systemic design principles	Opposing approach
 <p>Explore the framing of a problem and solution to drive a new understanding of the opportunities.</p>	<p>The current frame of the problem or proposed solution is not questioned or is established with limited exploration.</p>
 <p>Explore human needs, motivations and deep themes to understand the problem and lead to solutions</p>	<p>Inquiry is focussed on quantitative analytics over a qualitative understanding of experience.</p>
 <p>Utilise divergent thinking – exploring many ideas and possibilities while deferring judgement on those ideas.</p>	<p>Focus on convergent thinking to determine a single, well-established solution or answer to a problem.</p>
 <p>Allow co-evolution and iterative inquiry where an understanding of the problem and solution emerge concurrently, through successive learning and integration.</p>	<p>Linear process stages with one leading logically to the next, without revisiting earlier phases such as problem definition.</p>
 <p>Use open dialogue to increase understanding of a problem, synthesise diverse ideas and support collaboration.</p>	<p>Dialogue is limited to debate, criticism and convergent thinking as dominant within Western culture.</p>
 <p>Apply whole systems thinking to understand the context, components and interactions of the problem situation and explore broader systemic responses.</p>	<p>Apply reductionist thinking to consider individual, objective problem components and develop responses limited by an imposed problem boundary.</p>
 <p>Experiment to understand and test ideas in safe experiments and inform development through the observation of patterns.</p>	<p>Implement solutions without experimentation, or apply solutions that have proven effective in different contexts.</p>

Each of these systemic design principles is discussed briefly below.

Framing

Framing is considered to be one of the key principles of design and one that can enhance problem solving in the public sector. Framing is the ability to inquire into a broad problem situation rather than consider isolated problems, and to form a perspective to make sense and act upon the problem situation (Junginer 2014; Dorst 2015b; Schön & Rein 1996). Steinberg (2014) provides a unique description of problem framing as trying to understand a complex situation like a city by considering photographs, individual stories and drawings of the city to bring the perspective into a 360-degree view. Framing is said to help designers find the ‘problem behind the problem’ and come up with unique solutions that wouldn’t otherwise have been considered (Dorst & Tomkin 2011).

Various methods exist to support problem framing, including inquiry to state and restate the nature of the problem (Junginer 2014) and abstraction including metaphor, analogy and conjecture (Paton & Dorst 2010). Each individual is understood to have their own frame of the problem and so the process of framing enables these preconceptions to be made explicit and for commonly held problem and solution frames to be developed within a group (Paton & Dorst 2010).

Explore human needs

Design’s focus on understanding human needs and values (often referred to as human-centred design) is another differentiating factor of design and one that has a strong application in the public sector. This is particularly true in situations of high complexity where unpredictable human behaviour increases the turbulence of change (Junginer 2014; Bason 2014; Norman & Stappers 2016). This approach to designing aims to not only understand the objective facts and data of a problem situation, but to also understand the diverse human perspectives and experiences within that situation. Conventional practices often shy away from using human insights to inform a process because of the expected diversity of these perspectives. However, designers do not see this diversity as a constraint and may use a small number of qualitative studies to ‘spark’ insights into human needs and behaviour, make informed assumptions to represent specific stakeholder needs (e.g. through developing personas), or use research synthesis techniques to unearth the deeper human themes and mental models which underpin diverse perspectives and behaviour (CoLab 2016; van der Bijl-Brouwer & Dorst 2017; Sanders & Stappers 2008). While designing based on human needs often leads to novel ideas, this approach is also increasingly being recognised as critical to influence change within complex social systems. For example, when solutions are designed to enhance underlying human themes such as trust and resilience (Banerjee 2014; Bason 2014).

Ethnography (qualitative research to obtain an in-depth understanding of someone's experience), personas (a representation of a stakeholder to increase an understanding of the person's qualities, behaviour and needs) and journey mapping (a representation of stakeholder's experience over time) are just some of the methods available to gain insights into human needs within a problem situation (CoLab 2016; Sanders & Stappers 2008; ThinkPlace 2016). Co-design, a participatory form of design where a range of stakeholders are invited into the design process, can also provide a way to ensure a broad range of human needs and perspectives are considered.

Utilise divergent thinking

The concept of divergent thinking was first proposed as a key attribute of creativity by Guilford in the 1950s (VanPatter & Pastor 2016). Divergent thinking means to rapidly broaden the field of ideas and information before using convergent approaches to refine data and test ideas. The balance of divergent and convergent thinking has become well known as a key principle of design through its promotion in the Design Council's double diamond model (Design Council 2005). This contrasts to linear problem-solving processes used in the public sector which typically rely on first identifying and 'fixing' a problem situation, and then converging on a solution (likely to involve the application of past practice) without more broadly exploring the problem situation and different solution ideas (Veale 2014).

Methods to encourage divergent thinking include brainstorming and ideation sessions, whereas synthesising ideas through convergent methods include prototyping (developing simple models to quickly and cheaply test aspects of a design solution), testing and analysis (ThinkPlace 2016; CoLab 2016).

Coevolution and iterative inquiry

Other key design principles, which can be understood by the way that design activities are structured, are the co-evolution of problem and solution and iterative inquiry. Dorst and Cross (2001) identified that expert designers do not first fix the problem and then search for a solution, but rather develop and refine the formulation of the problem and ideas for a solution together, going back and forth between the two spaces throughout the design process. This constant iteration is also expressed as a more general 'squiggle design process' first published by Newman (Coorevits & Jacobs 2017) to convey that a number of different activities occur early on in the design process to identify patterns and insights and reduce uncertainty, leading towards a point of clarity at the end of the design process (refer to figure 12). While this may be confused with an undefined creative process, Nelson and Stolterman (2012) describe the high levels of design expertise that are required to apply discipline in both focussing on a design intention (as a general aim, not a defined

outcome) and managing a pragmatic process that resolves uncertainties and meets the needs of the client, while also letting go of assumptions and allowing a fluid creative process to unfold.

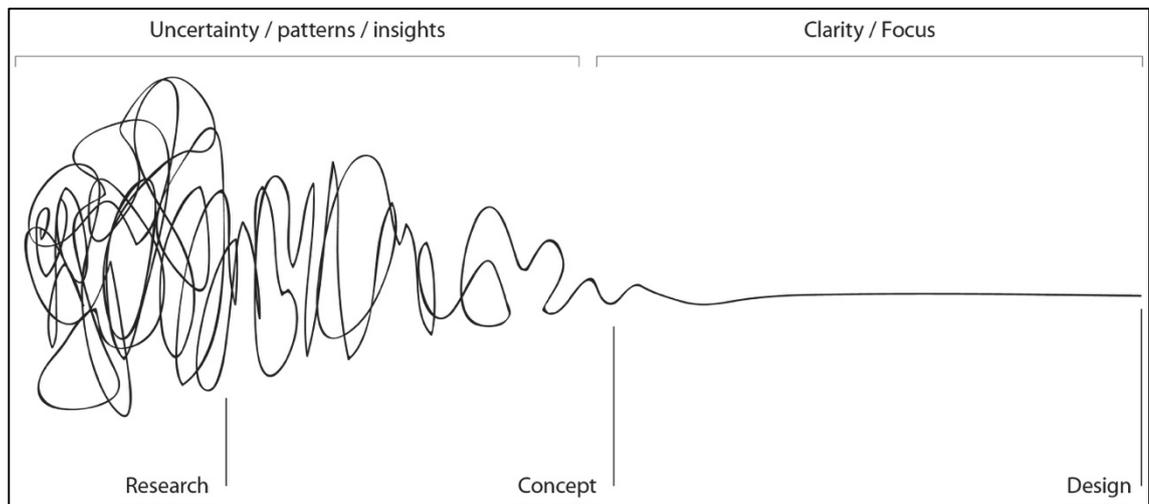


Figure 13: The Design Squiggle by Newman (Coorevits & Jacobs 2017)

Use of open, creative dialogue

The large numbers of stakeholders involved in complex problem situations has led to an increased use of workshops by designers to facilitate open and creative. Many authors now promote the importance of bringing stakeholders together to develop a shared understanding of the problem situation, an intent for action and desires for the future state (Body & Terrey 2014; Jones 2014). Nelson and Stolterman (2012) describe this process as 'centering' where a group develops a common centre of understanding. This highlights the relevance of a design facilitator, or collaborative forms of self-organisation, to support stakeholders to listen, understand and converge towards a common view where a future state can be co-created (Manzini 2016, Jones 2014). This is quite a different approach to our dominant forms of dialogue within Western institutions that often focus on debate from each disciplinary perspective and result in compromise to the lowest agreeable value (Hansen 2010).

The design of workshops can influence the success of collaboration, including selecting a shared or neutral workspace that encourage organisational hierarchies to be put aside (Dorst 2015b), inviting diverse participants with a level of variety that mimics the variety of the problem space or system (Christakis & Bausch 2006), and putting in place a design facilitator or form of organisation to support the integrative process.

Whole systems thinking

Section 4 described the field of systems thinking and highlighted the importance of considering the whole system rather than individual problem components. This principle is also embraced within systemic design. Whole systems thinking ensures that the broader scope and hidden influences of a problem are considered, and that relevance of stakeholders are realised beyond the obvious influencers (Dorst 2015b; ThinkPlace 2016). Nelson and Stolterman (2012) also highlight that design must incorporate broader systems in order for them to be sustainable when implemented within an existing context.

Methods that encourage whole systems thinking largely stem from systems diagramming, including stakeholder mapping, ecosystem mapping and rich pictures, as discussed in Section 4.

Experiment to test ideas

Designers are also well known for experimentation in their work—often through fast and cheap prototyping of solutions to reduce uncertainty about the likelihood of a concept succeeding. This concept also comes into complexity theory, through the use of ‘safe to fail experiments’ (Snowden & Boone 2007). When designing in areas of complexity, experimentation or probing is critical because we cannot predict how a complex system will respond to an intervention. This type of experimentation involves the careful observation of response patterns, which can then be enhanced or reduced (Snowden & Boone 2007).

Experimentation methods can involve low-resolution prototyping, testing scenarios with users and implementing small-scale system changes before broader implementation.

The overview of systemic design principles begins to convey the complex processes of design for complex problems, which take on a constructivist and transdisciplinary for of inquiry and action. Expert systemic designers manage an intricate balance, between aiming for an outcome while also letting go of assumptions and rigid processes; searching to understand a problem situation using scientific information of what is true, while also pursuing broad inquiries into the qualitative human experiences of problems that establish an integrative and human-centred understanding; and making unique judgements within this broad scope of understanding, as to which patterns and insights can be explored to lead to viable solution ideas. Systemic designers are supported through this process by another balance of action and reflection; actively testing insights and solution ideas to see what might be effective in the situation before making firm decision, and reflecting on outcomes to adjust and adapt a process as necessary.

7.5. Introducing design skills in a public-sector context

Considering that systemic design practices are very different to practice within the public sector and regulation more specifically, there remains a key question of how it can be introduced or adopted within the public sector. Bason (2014) outlines a number of current options of how design is being brought into public sector practice. These are:

- design and innovation labs, which can be created within government entities or sponsored by government. Labs provide a protected environment where design can operate without conforming to all of the contextual influences within the public sector. However, they are close enough to the public-sector context to be able to adjust the practice to suit the needs of this context and begin to influence the broader public-sector practice through engaging with staff, developing champions and demonstrating results
- building design skills for public sector staff through specific training programs, which need to acknowledge the unique public-sector environment
- employing trained designers in roles within the public sector. Bason (2014) notes the importance of designers needing to understand the public-sector context and to develop patience for the slow rate of change within this sector, and
- procuring design skills for specific projects through the use of design consultancies.

In addition, public sector staff can develop awareness of new practices and build skills through engaging in communities of practice. Several public-sector innovation communities of practice exist in Australia, including the Public Sector Innovation Network.

While designers need to adapt their approach to fit within the unique public-sector context, it is also important to note that some more complex applications of design are likely to still rely on practitioners with high levels of design expertise. The documentation of design methodologies by the systemic design authors listed previously, and the research work in this thesis, attempt to demystify design practice so it can be adopted by practitioners from other disciplines and in other contexts. For example, Dorst (2015b) spent around 20 years observing expert designers at work to distil their practice into a 9-step frame creation methodology and a range of principles and practices so that these can be applied more broadly. However, mastery of some practices such as framing, decisions on how to manage iterative design processes, and how to affect deeper system change require not just the application of a principle or method but a level of design expertise that has been developed over time to meet a wide range of design challenges. Lawson and Dorst (2009) classify seven levels of design expertise, based on a generic model of expertise developed by

Dreyfus, which moves from a novice designer who is still figuring out the rules of the game and applies standard methodologies, to the advanced beginner who recognises the uniqueness of each design situation, all the way up to a visionary designer who redesigns the field they are working within. Many of the design principles discussed would require a competent level of design to implement well and be able to adapt as required.

7.6. Affecting system change

The research considers complex problems within a regulatory context and the practice of regulators to address these problems. There has been a growing academic discussion in recent years in the fields of systemic design, systems thinking and complexity science of how to best design within complex systems so that the changes have an effect. This hinges on a discussion of whether a system can be redesigned at a large scale and whether these changes can then be implemented, or whether the implementation of large-scale changes is too difficult due to the overwhelming barriers in the existing context.

Banerjee (2014) highlights that since the rate of change in complex systems is exponential due to feedback loops, our responses also need to utilise feedback loops so they can also be leveraged exponentially. However, Norman and Stappers (2016) resolve after a discussion with designers working in complex systems, that the only approaches likely to be implemented in such complex systems are incremental changes. This returns to concepts a concept championed by Lindblom (1959) of 'muddling through', meaning to take small and incremental steps in a modular fashion, to address components of a system rather than attempting to make large-scale changes at one time. In case study one of this research, the complexity of the problem situation and the broader governance system indicates a number of influential barriers to change. This indicates that incremental change may be the most effective approach within a regulatory system.

8. INTERVENTION DESIGN

This research has gathered in-depth information about the complex nature of problems being addressed by Agency X and their current problem-solving practice. This information provides criteria for the development of an intervention, that would ideally move the regulators practice towards a more ideal practice, highlighted by the systemic design principles.

The design of the intervention is discussed below.

8.1. Opportunities for systemic design to support regulatory practice

The systemic design principles provide an insight into a more ideal model of practice that is appropriate to address complex problems. This provides a new framework to compare the previous findings of the current regulatory practice from case study one, and a way to identify components to include in the intervention design.

Each of the seven systemic design principles is outlined below, and a commentary made about how the current regulatory practice compares to this principle, as well as opportunities for improvement to guide the intervention design.

Systemic design principle	Opposing approach
 <p data-bbox="435 315 874 409">Explore the framing of a problem to drive a new understanding of the opportunities.</p>	<p data-bbox="943 315 1414 409">The current frame of the problem or proposed solution is not questioned or is established with limited exploration.</p>

Current regulatory practice: The problem was considered from many different perspectives based on the multiple components of the problem, and it became clear over time that different stakeholders and government entities had a different understanding of the problem and potential solutions.

Opportunity: Deliberate problem framing early on in the project may lead to a more comprehensive and explicit understanding of the problem, and could be done with other stakeholders to develop a shared understanding and provide a strong foundation for collaboration.

Systemic design principle	Opposing approach
 <p data-bbox="430 1003 895 1097">Explore human needs, motivations and deep themes to understand the problem and find solutions.</p>	<p data-bbox="943 1003 1374 1097">Inquiry is focussed on quantitative analytics over a qualitative understanding of experience.</p>

Current regulatory practice: The needs or motivations of individual stakeholders within the problem space were not specifically considered when understanding the problem and response. Stakeholders were mainly considered through interviews to understand compliance with business rules and complaints information that was analysed to identify quantitative trends and patterns. External stakeholders were not specifically included in the development of responses.

Opportunity: There is the opportunity to engage in design research methods that discover the lived experience of businesses and other stakeholders within the regulatory system to uncover human factors that lead to a new understanding of potential influences on compliance with regulations.

Systemic design principle	Opposing approach
 <p>Utilise divergent thinking – exploring many ideas and possibilities while deferring judgement on those ideas.</p>	<p>Convergent thinking to determine a single, well-established solution or answer to a problem</p>

Current regulatory practice: There was limited exploration of possible responses to the problem early on in the project with an early focus on determining solutions within the project plan. More divergent thinking occurred later in the project when different types of responses were trialled.

Opportunity: There is an opportunity for a greater level of exploration of both the problem space and solution ideas before determining a course of action.

Systemic design principle	Opposing approach
 <p>Allow co-evolution and iterative inquiry where an understanding of the problem and solution emerge concurrently, through successive learning and integration.</p>	<p>Linear process stages with stage completing and leading logically to the next, without revisiting earlier stages such as problem definition.</p>

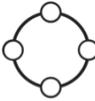
Current regulatory practice: The project utilised a linear process where the problem was investigated, response actions were determined and then implemented. More iteration was introduced later in the project when the project team realised they needed to adapt to the situation and trial different responses.

Opportunity: An understanding of co-evolution and iterative inquiry would support the agency to manage a more experimental response to the problem.

Systemic design principle	Opposing approach
 <p>Use open dialogue to increase understanding of a problem, synthesise diverse ideas and support collaboration.</p>	<p>Dialogue is limited to debate, criticism and convergent thinking as dominant within Western culture</p>

Current regulatory practice: Agency X did engage with external government entities but most engagements were based on formal meetings to seek information and provide updates, rather than a focus on generating a shared understanding and agreed way forward.

Opportunity: There is the opportunity for Agency X to hold co-design sessions with other stakeholders in the system to establish a shared understanding and develop responses using open and facilitated dialogue and design methods. This also provides the opportunity to involve staff at different levels, including staff that may be involved in implementing responses, to ensure that they understand the problem and are empowered to contribute to the response.

Systemic design principle	Opposing approach
 <p>Apply whole systems thinking to understand components and interaction in the current problem space and explore broader systemic responses.</p>	<p>Apply reductionist thinking to consider individual, objective problem components and develop responses limited by an imposed problem boundary.</p>

Current regulatory practice: While Agency X attempted to gain a broader understanding of the problem by consulting with other agencies in the system, they did not have a comprehensive way to understand or take action against the problem as a whole system.

Opportunity: There is a strong opportunity for Agency X to utilise whole systems thinking to structure the framing of the problem, understand the broader systemic influences and identify new leverage points and response options.

Systemic design principle	Opposing approach
 <p>Experiment to understand and test ideas in safe experiments and inform development through the observation of patterns.</p>	<p>Implement solutions without experimentation, or apply solutions that have proven effective in different contexts.</p>

Current regulatory practice: Agency X conducted some experimentation in terms of trialling variations to their standard regulatory approach and implementing new regulatory responses within the legislation that they had not used in the past.

Opportunity: However, there is a lot of scope for increased experimentation throughout a problem-solving project, particularly if managed in a safe to fail environment, to gain a deeper understanding of the problem and potentially effective responses. An iterative approach to managing experimentation ensures that findings are considered through reflective practice and the project approach adjusts accordingly. Safe experimentation may also assist when there is contextual pressure to act quickly. This enables actions to be taken to demonstrate progress but at a small scale before being fully implemented. While experimentation is an important opportunity for the regulator to pursue, it had limited application in the systemic design intervention which was focussed on the early stages of problem framing and solution development.

8.2. Developing a systemic design intervention

In a very positive sign of the perceived value of systemic design, a manager from Agency X approached the researcher to seek assistance with this new systemic risk, suggesting “it would be nice to develop a model for the future about how problems are framed and strategies developed using a design approach”. This provided a relevant opportunity for a systemic design intervention to be developed and applied within Agency X context. The proposed intervention provides an alternative method to address complex problems to the current practice, which is based on regulatory and project management methodologies. The systemic design intervention focussed on supporting Agency X to understand the problem and develop new regulatory responses, rather than relying on the enforcement of predetermined regulations.

The intervention design was based on three sources of criteria:

- factors identified in case study one that were likely to influence the success of the intervention (highlighted in the conclusion of Section 6)
- opportunities identified in Section 7 to move the agency's practice towards the more ideal systemic design principles, and
- additional criteria developed in discussion with a senior project leader in Agency X.

The additional criteria from Agency X are listed below, specifying that the systemic design intervention should:

- be adequate to provide assistance in addressing systemic/complex problems that the regulator is responsible for addressing
- be able to be implemented by Agency X, taking into account their position in the broader governance system
- be a safe experiment that did not require significant resources or use particularly experimental/unproven approaches
- not require ongoing investment in design expertise due to the limited scope of the researcher's involvement
- take into account contextual factors within the public sector including the need for approvals
- be able to be implemented by someone with an entry level of design expertise (the researcher and regulatory staff)
- be able to be communicated in project plans, updates and meetings to develop buy-in for the systemic approach.

While this additional criterion limits the possible approaches to those requiring more advanced design expertise, it led to the creation of a realistic and manageable systemic design experiment that was able to be implemented by people with limited design expertise and within the regulatory context. The scope of involvement of the researcher meant that the design intervention focussed on the early stages of the regulatory project. This stage emphasises the problem understanding and framing and generation of responses.

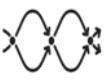
The researcher developed a series of systemic design activities taking into account the principles and methods from the systemic design literature, and responding to the intervention design criteria

that had been established. This included taking into required regulatory processes, such as the need for approvals, Agency X's established environmental scanning method and the development of a project plan in the agency's established project planning template. A description of the main design criteria and how the intervention responds to these is provided at Appendix D. The design intervention is described in Table 7.

Table 7: systemic design intervention for case study two

Principle	Method	Aim	Participants
Current practice 	1. Systemic problem identified by regulator in environmental scan	Identification of systemic problem	Risk team or similar
Current practice 	2. Authority sought within regulatory agency to commence project to address problem. Includes authority for resourcing and establishment of a project scoping team	Authority to proceed with problem-based regulation	Organisation leaders
	Initial understanding of the problem space and confirmation of complexity	Information to be gathered, synthesised and shared with project stakeholders. This begins the process of problem framing.	Project scoping team
Framing  Divergent thinking 	3. Problem scoping (based on archaeology method in frame creation methodology, Dorst 2015) Key questions: <ul style="list-style-type: none"> • What do we know about the problem? • What has been done in the past to solve the problem? • To what extent was this successful? 	Raise all relevant information about the problem that may not be considered in a standard project.	Can be managed as a facilitated group session, conducted by a small working group or individual. However the greater diversity of perspectives the better.

Principle	Method	Aim	Participants
<p>Human-centred</p>  <p>Whole systems</p> 	<p>4. Stakeholder map (based on frame creation methodology, Dorst 2015)</p> <p>Key questions:</p> <ul style="list-style-type: none"> • Which stakeholders are involved directly in this problem? • How do these stakeholders appear to contribute or benefit from the problem? • Which stakeholders exist within the broader system of the problem that could be considered part of the solution? <p>Document information in a 'fried egg' template with the directly involved stakeholders in the centre 'yolk' and the indirectly involved stakeholders in the 'white'.</p>	<p>Identify all relevant stakeholders to the problem and solution, including unusual suspects that may not usually be included.</p>	<p>Can be managed as a facilitated group session, conducted by a small working group or individual. However the greater diversity of perspectives the better.</p>
<p>Whole systems</p> 	<p>Compare the problem against indicators of complexity (Snowden & Boone 2007)</p> <p>Key questions about the system the problem arises within:</p> <ul style="list-style-type: none"> • Are there a large number of interacting elements? • Are there non-linear interactions producing disproportionate effects? • Is the system dynamic, where the whole is greater than the sum of parts? • Is the system unordered (not constrained through boundaries?) <p>If yes, the system the problem arises within is complex and a systemic design approach should be used to address it. If no, existing regulatory responses are likely to be sufficient.</p>	<p>Identify whether the problem is complex and requires a systemic design approach.</p>	<p>This step requires analysis and synthesis of existing information and an understanding of systems. Can be completed by an individual or small working group.</p>
<p>Current practice</p>	<p>Development of a project plan outlining proposed methodologies, expected outcomes and resourcing including cross-functional project team.</p>	<p>Communicate intentions to gain authority for project</p>	<p>Project scoping team</p>

✓			
Principle	Method	Aim	Participants
Current practice ✓	Authority sought within regulatory agency to commence project including systemic design methodologies.	Authority to proceed with project including systemic design methodologies	Organisation leaders
Current practice ✓	Authority sought to involve other stakeholders or government entities in the design process	Authority to engage external stakeholders	Organisational leaders
	Commence systemic design approaches	Commence more in-depth systemic design approach following confirmation of complexity	Cross-functional project team
Divergent thinking  Human-centred 	Data collection Collect all relevant data on the problem, including quantitative information. Collect data about the key stakeholders in the problem, through existing data, stories from frontline staff, online research or empirical data collection techniques such as ethnography.	Understand the problem space through data and stakeholder information	Conducted by a small working group or individuals.
Human-centred 	Represent stakeholder information Develop templates to build visual representations or stories that help build empathy with unfamiliar stakeholders. Options: Personas: <ul style="list-style-type: none">• Develop an archetype of a stakeholder in the system. Consider including a photo/image and representing their motivations, needs, expectations and goals	Synthesise stakeholder information in a way that enables project staff to build empathy with stakeholders and users.	Conducted by a small working group or individuals.

	<p>Journey map:</p> <ul style="list-style-type: none"> Identify the experience of a stakeholders along a timeline, including the different systems they interact (may include government entities and policies) 		
Principle	Method	Aim	Participants
<p>Framing</p>  <p>Open dialogue</p>  <p>Human-centred</p>  <p>Whole systems</p>  <p>Coevolution</p> 	<p>Co-design workshop 1: problem framing</p> <p>Organise workshop with range of stakeholders, including those involved in frontline delivery to stakeholders and those expected to be involved in the implementation of responses. This may include representatives from different government agencies and/or external stakeholders. Ideally the information gained on the problem space is sent to participants in advance of the workshop.</p> <p>Activities</p> <ul style="list-style-type: none"> Introduction – make aims clear Construct/discuss pre-prepared personas of stakeholders in the problem space Construct/discuss stakeholder journey map Reflection on artefacts and problem framing: <ul style="list-style-type: none"> What are the highest risks from different stakeholder perspectives? What are the impacts, problems, gaps within the system (government entities and policies?) What makes this problem hard to solve (is there a paradox present in the problem space?) Document any response ideas that are raised 	<p>Include diverse perspectives in the problem framing and generate a common understanding of the problem space.</p>	<p>Facilitated group session</p>

Principle	Method	Aim	Participants
<p>Framing</p>  <p>Open dialogue</p>  <p>Human-centred</p>  <p>Whole systems</p>  <p>Coevolution</p> 	<p>Co-design workshop 2: problem response</p> <p>Send any additional information on problem framing to participants in advance of the workshop.</p> <p>Activities:</p> <ul style="list-style-type: none"> • Introduction – make aims clear • Confirm main problem components revealed in co-design workshop 2 • Vote on problem components with the greatest opportunity to disrupt the problem • Brainstorm possible responses to problem components, utilising diverse group knowledge, considering: <ul style="list-style-type: none"> ○ What is the current situation? ○ What are we already doing? ○ What is the ideal situation? ○ How do we get there? ○ Are there ideas from other regulatory markets we can leverage? ○ What else do we need to know about the problem? • Discuss ongoing collaboration, considering: <ul style="list-style-type: none"> ○ What can individual government entities do? ○ What can the group do collectively? 	<p>Include diverse perspectives and encourage collaboration in the development of problem responses</p>	<p>Facilitated group session</p>
<p>Current practice</p> 	<p>Update project plan to report on progress and provide to project stakeholders</p>	<p>Maintain project buy-in</p>	<p>Organisational / project leaders</p>

Current practice ✓	Authority sought to proceed with proposed responses	Authority to proceed	Organisational leaders
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9. FINDINGS:

Case study two

The intervention was designed and applied in response to an emerging systemic risk that Agency X had identified and were seeking support for how to address. The risk was related to international consumers accessing Australian business services that were being offered both in Australia and overseas. Agency X was concerned about the poor quality of services being provided to international consumers and potential non-compliance with established business standards. This had the potential to harm consumers and negatively impact the reputation of the Australian business sector. This sector had particular policies relating to the involvement of international consumers and there was the risk of these policy arrangements being exploited by both the consumers and the businesses. There was also a concern about collusion between the businesses, the consumers and agents who benefitted from the service arrangements, and made it difficult for the regulators to identify components of the problem.

A committee of government agencies and regulators had already been formed to monitor this emerging risk. This committee had been meeting for several months and was focussed on sharing data on the problem and discussing relevant developments or required actions. So far, the committee had not taken any coordinated action against the problem. The regulatory agency had reflected on how quickly the risk being addressed in the first case study had become a harmful problem to consumers and attracted political and media attention that drove a reactive response. They decided to establish a cross-functional systemic risk project team (with staff borrowed part time from existing teams) to more fully identify the problem and determine possible proactive responses that could be implemented to reduce the likelihood of the risk becoming a substantial

problem. This included some of the same staff members as the project team in case study one, with additional staff who were seen as subject matter experts in this area.

The design intervention was applied within Agency X through facilitation by the researcher with support from the established project team. This part of the research aimed to address the question: *what are the results of introducing systemic design within regulatory practice to address a complex problem?* Note that the approach to this evaluation was formative, in that the systemic design intervention was an experimental trial which could be further developed and improved upon in further research. A summative evaluation to conclude on the relevance or effectiveness was not possible within the scope of this research and would require further iterations to develop and trial the intervention over time and to measure longer term results.

The elements of practice considered in this experiment are highlighted in Figure 14 below:

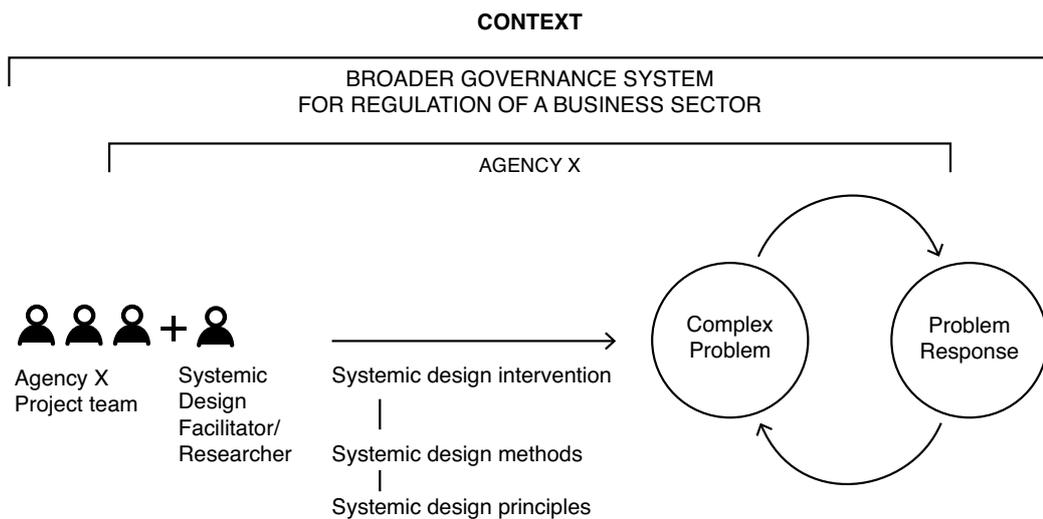


Figure 14: conceptual framework of the application of the design intervention in case study two

The research question was addressed through three sub-questions below:

- What were the design outcomes of the application of each systemic design method?
- What were the benefits and limitations of each systemic design method?

- What is the likelihood of adoption of the systemic design intervention by Agency X?

The first two questions are addressed in section 9.1, against each method within the systemic design intervention. The third question is addressed in section 9.2. Recommendations to further develop the systemic design intervention are then outlined in section 9.3.

9.1. Design outcomes, benefits and limitations of the systemic design intervention

Method: Problem scoping and stakeholder map

The researcher facilitated a teleconference with the project team to undertake the problem scoping and develop a stakeholder map.

What were the design outcomes of the application of the systemic design method?

- These methods quickly raised key information about the problem, including the problem components, the limited understanding Agency X had of the broader system which the problem was part of, and concern that their regulatory role within the system was not well understood.
- Stakeholders were mapped, including many stakeholders the regulator had not previously considered to be relevant. Stakeholders were also identified to involve in a co-design workshop
- A process was developed to gain authority to conduct the workshop and invite participants

What were the benefits and limitations of the systemic design method?

- Benefits of these methods included quickly pooling current knowledge about the problem from the project team within Agency X and the beginning of problem framing to establish a shared understanding. There were also benefits of prompting the staff to consider stakeholders within the broader field. It was clear that these stakeholders had not previously been considered as relevant and some staff identified that they might provide access to useful information about the problem.
- The difficulty gaining access to external stakeholders to include in a qualitative understanding of the problem reflects the difference in cultural norms and a 'dominant logic' assumed within the public sector (Prahalad 1986) as opposed to the design approach. The regulatory staff in this case were concerned that involving external stakeholders might 'scare the horses' in a business sector that has experienced reputational damage in the

past, or tipping off businesses about potential increased regulation for this specific sector. However, safe/low impact design methods to include external stakeholders could be explored in additional research to ensure that human factors are properly considered.

Method: Compare the problem against indicators of complexity

This was conducted briefly by the researcher prior to gaining authorisation for the co-design workshop.

What were the design outcomes of the application of the systemic design method?

- The problem crossed the jurisdiction of three key regulators within overall policy and regulation settings that are managed by one central government department. The problem also involves international consumers. This indicates that the system the problem exists within is unordered and not constrained by boundaries. A full comparison of the problem against indicators of complexity is provided in Appendix H.

What were the benefits and limitations of the systemic design method?

- The indicators of complexity (Snowden and Boone 2007) are challenging to apply in full. A simpler diagnostic is recommended section 9.3 that could be applied by existing regulatory staff, along with the inclusion of a systems map to make it easier to determine system boundaries and interactions.

Method: Data collection and represent stakeholder information

The researcher worked with the project scoping team for a one-week period to collect relevant data on the problem and its key stakeholders and to plan the workshop. This involved contacting other agencies to collect quantitative and qualitative data about the problem, research to prepare examples of types of stakeholders involved (personas) and research to draft the skeleton of a stakeholder journey map. Key questions were determined to explore throughout the workshop, including exploratory questions for the stakeholder journey, including ‘what activities are involved in this step?’, ‘what stakeholders does the consumer interact with in this step?’, ‘what government agencies or regulators are involved in this step?’, and ‘what main problems arise at this step?’. The workshop plans and materials were reviewed and endorsed by Agency X.

What were the design outcomes of the application of the systemic design method?

- Quantitative data from business regulation and complaints indicated an increase in the problem, with the risk it beginning to negatively impact the reputation of the business sector.
- The regulator only had qualitative information on the characteristics of business stakeholders. The project scoping team contacted the other regulatory agencies to obtain information on the characteristics of different types of consumers and business agents.

What were the benefits and limitations of the systemic design method?

- Obtaining quantitative information is an existing area of expertise for Agency X. However, the collection of qualitative information on stakeholder characteristics was a novel exercise and had the benefit of requiring the project team to engage with frontline staff and external government agencies. This broadened the input of perspectives to the problem and initiated a collaborative approach.

Method: Co-design workshop 1: problem framing

Cross-agency participants had been nominated to attend the workshop following a senior level discussion about the problem. 20 participants attended and represented the three regulatory agencies involved in the problem system (including the Agency X) and the central government department. Participants included a mix of senior level leaders, operational staff and some frontline staff.

A meeting space was booked offsite from the government offices with ample space to place visual artefacts and butchers paper. The workshop was held as an all day, catered session. The activities were held in accordance with the prescribed intervention in Table 7.

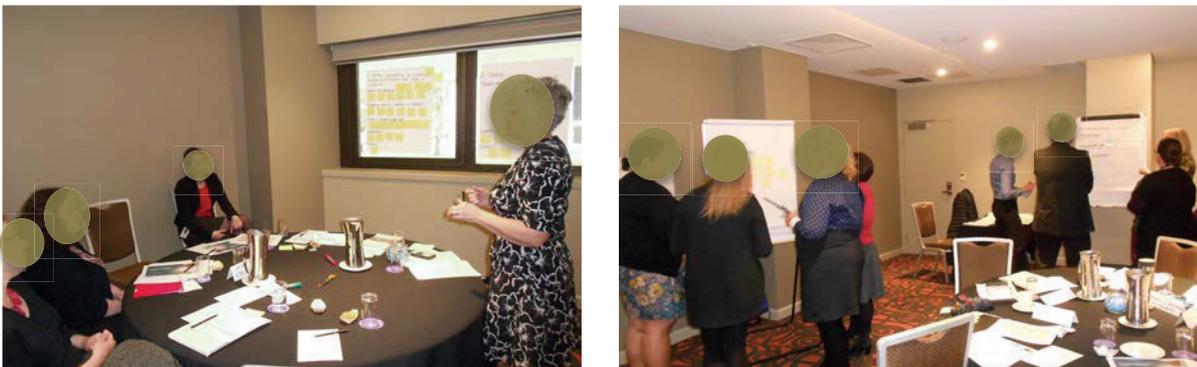


Figure 15: Participants developing the stakeholder journey in workshop one

What were the design outcomes of the application of the systemic design method?

- Stakeholder personas were further developed with participants providing input on their involvement in the problem and their motivations.
- One additional stakeholder persona of a 'business agent' was developed since many of the participants were unfamiliar with their characteristics.

What were the benefits and limitations of the systemic design method?

- Participants were highly engaged in this activity and it appeared to broaden their perspective to consider the stakeholders in the problem. Interviewee 7 noted this activity helped them to identify behavioural drivers of the problem that they had not considered:

"My realizations around well some of the drivers are in...[behaviour of the consumer]...it's not all collusion, sometimes [businesses] might be trying to help [consumers] in a situation... and it sort of highlighted the complexity of the whole thing and that it's not just straight forward".

- However, it was unclear whether this information affected the development of problem responses.

Discussing the stakeholder journey

What were the design outcomes of the application of the systemic design method?

- Specific components of the problem were identified, as well as regulatory overlap and gaps in the system. This enabled different components of the problem be understood in more detail, as well as the relationship of these components to the broader system.

What were the benefits and limitations of the systemic design method?

- Participants from the Agency X found this a particularly useful activity to gain a broad overview of the system, since they only participate in one aspect of it (the business regulation). Interviewee 6 described trying to regulate in such a complex system as "it's like putting a jigsaw puzzle together without having the lid" and that "I think what we did gave us a better idea of the picture".
- Providing an overview of the system and the various areas of regulation also enabled some participants to identify potential leverage points. Interviewee 7 identified a "light bulb moment" when information about different regulations identified potential way to disrupt the problem.
- The limitations of this activity were the lack of genuine external stakeholder perspectives (e.g. business operators or agents). This was highlighted by Interviewee 7:

“I think what that [stakeholder journey] was about was having a look at the [customer] journey across the board and working out where the holes are in the regulatory map, which is a bit different to working out, I guess we could have identified where the problems could be but not where the problems are. And to do that you’d probably need to talk to stakeholders who know more about the groups we consulted”.

Group reflection workshop artefacts and problem framing

What were the design outcomes of the application of the systemic design method?

- This discussion enabled specific risks to be discussed and as well as the relative importance from each government entity’s perspective. The problem was further explored in terms of the areas of collusion between the three main stakeholders (consumers, businesses and agents) which provided an additional level of insight into human behaviours within the problem space. A discussion was held on the different terminology that was used to describe the problem and what this meant to each agency, revealing differences of interpretation.

What were the benefits and limitations of the systemic design method?

- This open discussion to reflect on the findings of the workshop improved the group’s understanding of the problem framing and each agency’s areas of responsibility. This occurred within one day, whereas resolution on problem framing and regulator responsibilities had taken many months to achieve in the previous case study one. Interviewee 6 highlighted the increased understanding of the role each agency plays in the comment below:

“I think it was probably a bit of a light bulb moment for say [agency] that [other agencies] don’t do certain things either. And I can’t remember now but I remember it was [participant] that was sitting there and was like ‘so you guys don’t...whatever it was’ and I was like ‘no we don’t do that’, that’s not within our jurisdiction. So I think there were probably a few light bulb moments for people in that workshop”

Method: Co-design workshop 2: problem response

The second workshop was held approximately six weeks later over a full day with a similar group of 16 participants and facilitated by the researcher. Participants had been sent a report with the findings from workshop one in advance. In line with feedback from the project manager, workshop two was structured quite logically and included conventional problem-solving questioning. Note

that these requests were accommodated to ensure that the agency was comfortable with the nature of the systemic design experiment, however this did have an effect on the levels of innovation.

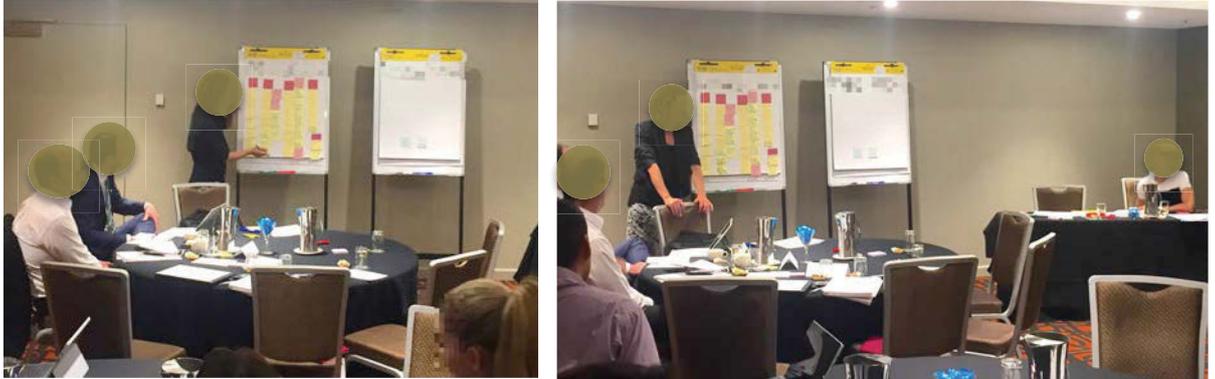


Figure 16: Participants confirming the components of each main risk in workshop two

What were the design outcomes of the application of the systemic design method?

- Problem statements for the main problem components were proposed and refined. The group identified the highest priority problem components to focus on. The current state and an ideal state was identified for each problem as well as possible responses to get to the ideal state. The proposed responses were grouped into themes, which covered:
 - strengthening regulation
 - publicity/communications
 - collaboration (within government agencies and international jurisdictions)
 - encouraging good behaviour
- A discussion was held about next steps, however the participants recognised that further work required higher-level approvals to be gained first.

What were the benefits and limitations of the systemic design method?

- The main benefits of this method appeared to be the utilisation of the collective knowledge of the group to develop responses and build buy-in for a collaborative problem response from the agencies. This was evidenced by the request from the group to keep working on responses collectively rather than breaking into smaller groups so they could combine their knowledge, as well as positive comments about the willingness to collaborate. One participant noted in the survey “We each have a different focus, powers, legislation. It would be nice if we were all one big agency”. The main response that the group decided to pursue was the development of a collective dashboard to identify increases in the problem with pooled agency data.

- Although seen as successful by Agency X, the design limitations of the second workshop are evident in that the developed responses were still based on conventional regulatory ‘carrots and sticks’ approaches. It is acknowledged that greater levels of design expertise may be needed to communicate the value and relevance of more abstract design methods that move away from conventional approaches.

9.2. Likelihood of adoption of the systemic design intervention by Agency X

Overall, the cross-agency participants were highly engaged in the systemic design intervention that was applied and supportive of the outcomes achieved. The interview participants from Agency X noted that they would be interested in further trialling of the methods but are not yet equipped to do this themselves and would need to again be supported by a trained design facilitator.

The interviews for case study two were conducted six weeks after the completion of the systemic design trial, which enabled the interviewees to reflect on the acceptance of the workshop results which had been presented at the cross-agency steering committee. This revealed two contextual factors which impacted on the adoption of the systemic design outputs—accountability requirements limiting opportunities for collaboration (this was also a strong contextual factor of case study one) and a hesitation to commit to proactive problem responses. It is clear that Agency X would need more support from a practitioner with a level of systemic design understanding or experience to help to navigate these challenges and enable a broader adoption of the methods trialled in the intervention.

Accountability requirements limiting opportunities for collaboration

While most of the government entity leaders supported the group continuing to work together on responses that resulted from the systemic design intervention, the leaders of one of the government departments was not supportive of committing resources to continue to collaborate on the problem with the group. Interviewees believed that this was due to the fact that the department was undertaking alternative action to resolve components of the problem within their jurisdiction and did not need to engage in additional responses.

Hesitation to commit to proactive problem responses

Agency X intentionally sought to take proactive action to collectively understand this emerging risk with other agencies in the governance sector before it became a major problem. However, the interviewees felt that the lack of support from the leaders of the disengaged department was also due to the fact that the risk had not yet become a crisis, and was currently being adequately managed. This is a difficult position for government agencies—while case study one identified the difficulty for agencies to innovate when there is significant political and media pressure to act, when this pressure does not exist there may not be the political will or resourcing to support proactive action.

9.3. Recommendations to further develop the systemic design intervention

Improving the systemic design intervention

The researcher was introduced to the concept of system diagrams after case study two was completed. Creating a visual diagram of the system makes it much easier to identify problem components and boundaries to identify whether it is complex problem (see Appendix H for a system diagram of the problem). Therefore, developing a system diagram is recommended as an additional method in the design intervention prior to the comparison against the indicators of complexity. This is defined in table 8 below.

Table 8: Recommended activity to add to the systemic design intervention

Principle	Method	Aim	Participants
<p>Whole systems</p> 	<p>5. System diagram</p> <p>The initial problem scoping and stakeholder map should identify enough information about the problem to develop a system diagram.</p> <p>Key questions:</p> <ul style="list-style-type: none"> • What broader systems is the problem part of? • How do people, policies or processes interact within this system? <p>Draw the system diagram, identifying interconnecting elements.</p>	<p>Represent the problem within a system and identify problem boundaries. This enables an analysis of whether the problem is contained within an ordered system and the level of complexity.</p>	<p>This step requires analysis and synthesis of existing information and an understanding of systems. Can be completed by an individual or small working group.</p>

In addition, Snowden and Boone’s indicators of complexity provide a useful diagnostic, but are lengthy and challenging to apply without a reasonable understanding of complexity theory and systems thinking. It is recommended that a shorter diagnostic tool be created. For example, if Agency X has identified the risk as being a repeating issue, and crosses into the jurisdiction of other regulatory agencies (i.e. it is not solely bounded by the rules enforced by one regulatory agency) it can be considered complex.

The systemic design intervention could also be improved by trialling more in-depth and abstract design methods beyond simple idea generation techniques. These might include frame creation (Dorst 2015) and designing ideal states to work towards (Nelson & Stolterman 2012). This would likely result in more non-conventional regulatory responses.

Improving the adoption of systemic design

The project team in Agency X were hesitant to explore systemic design methods that broadened the scope of stakeholders involved in the response. This is understandable, based on the huge numbers of stakeholders interested in the sector regulation and limited agency funding to manage broad consultations. However, implementing ‘safe’ design experiments throughout the agency may increase the acceptance of stakeholder inclusion and improve outcomes. Safe experiments can involve considering stakeholder needs without directly involving them, or inviting stakeholder representatives into co-design sessions and careful management of expectations for further inclusion.

Potential for application in other regulatory contexts

While the systemic design intervention was developed specifically to support Agency X address the complex problem identified in case study two, it is generic enough to be trialled in other regulatory contexts. Further research would improve the understanding of the applicability of the methods and the relevant influences in different agency contexts.

Case study two was conducted as an initial trial of systemic design to support Agency X address a complex problem. Overall it provided very positive outcomes for the agency, although relevant barriers to the full implementation of systemic design were also identified. Case study two concludes the research. The overall findings and conclusions are discussed below.

10. RESEARCH DISCUSSION

Many themes have already been raised in the findings throughout this research. This section aims to touch on some additional themes that have not been fully explored.

Strong relevance of combining systems thinking, complexity and design in a public-sector context

The inclusion of systems thinking and complexity theories with design is a reasonably new development (Jones 2014; Ryan 2014). This research has demonstrated the strong relevance of combining these methodologies within a regulatory context. On its own, design can be perceived as inappropriately playful within formal government settings and when addressing serious problems (Bailey & Lloyd 2016). One of the co-design participants in case study two provided an indication of this perception, asking if the methods were “just another brainstorming technique”. The inclusion of methods linked to systems thinking and complexity theory seem to add to the seriousness of the approach and connect more directly to the nature of the problem by revealing it realistically within a whole system. Due to the fact that government entities operate in compartmentalised systems and address highly complex problems, the methods that encourage practitioners to understand and navigate these systems are highly relevant. These encourage regulatory practitioners to look up and out, rather than focussing only on the manifestation of problems within their agency mandate.

Changing paradigms

This thesis includes a discussion on the underlying paradigms of practice, due to the impact of an agreed perception of reality on practice. This comparison highlights the opposing nature of regulatory practice, which generally reflects a positivist paradigm; systems thinking and complexity theories, which reflect a transdisciplinary paradigm; and design, which reflects a constructivist/transdisciplinary paradigm. Introducing systemic design into regulatory practice raises the question of whether this begins to adjust the paradigm of this practice towards being transdisciplinary. Meadows (1997) highlights that changing the mindset or paradigm out of which a system arises is the most powerful point to intervene in a system. However, how can you change a paradigm? The experience for the researcher throughout this Master of Design process to move from working full time in regulatory professional practice, to developing an in-depth understanding of systemic design practice, provides an interesting perspective on changing paradigms. The systemic design approach, without being able to be adequately summarised into a neat series of steps or tools, is difficult to understand, and takes time and practice to establish a deeper and more nuanced understanding of inquiry and action in this new paradigm. We cannot expect a change towards a systemic design practice to happen quickly, and need to accept that it will take time, experimentation and courage to embrace this new style of practice. Information on how you change a paradigm, or develop practitioner mindsets to embrace transdisciplinary approaches, would be an important area for further research within this topic.

The role of a translator to bridge regulatory and systemic design practices

The facilitation of the workshops by the researcher with experience in both regulation and systemic design was a critical component to the success of this systemic design method. Throughout this research project, it has become clear that design and regulation practices involve very different paradigms with assumptions about the nature of reality and how to best influence change. Therefore, it was important for the facilitator to integrate these practices by recognising the strengths in the existing regulatory practice while introducing new methods from design. This includes being able to understand regulatory concepts and use appropriate language to build trust with participants and connect regulatory concepts within appropriate design methods. The risk alternatively is to diminish the value of the existing practice and reduce the openness to try something new. This builds on findings by Yee and White (2016) that it is essential for a designer to build trust with public sector clients for innovation to be adopted. They also suggest that this may be best achieved through an embedded position within the organisation.

This finding raises the question of how systemic design can be introduced within a regulatory context and suggests that this work may best be conducted by a regulatory employee with training in design, a design lab situated within a government context, or by a design consultant that is based within the context for a period of time to develop familiarity and empathy for these existing practices.

Championing the value of design

Following discussions with several systemic design experts after the completion of this research, it is clear that more designerly aspects could have been brought into the intervention, including greater levels of open exploration around the problem and solution which can naturally lead to solution ideas, in particular to discover the lived experience of more people directly involved in the problem situation. However, it is also acknowledged that managing the open exploration of a design process within a time and resource constrained project requires a certain level of design expertise which the researcher was only beginning to acquire at this time. Working within the public sector also requires an increased level of design expertise to be able to understand the intrinsic value of approaches such as open exploration and user research so that this can be clearly communicated to the project leaders when developing new approaches.

Paradoxes limiting the ability for regulatory agencies to address complex problems

Both case studies in this thesis demonstrated Agency X applying dedicated effort to address two different complex problems. However, numerous barriers arose relating to a regulator's role in the broader governance system and limitations collaborating with other government entities. When considered against the literature of complexity theory, these barriers can be considered paradoxes, or opposing forces that make progress particularly challenging. These paradoxes are identified below:

Table 9: paradoxes limiting the ability for regulatory agencies to address complex problems

The nature of complex problems	Paradox relating to a regulator’s role in the system
Complex problems exist beyond the focus of a single government agency	The ability for government agencies to collaborate is restricted due to each organisation being held account to a narrowly focussed mandate.
Complex problems involve the interests and perspectives of many diverse stakeholders in a whole system	Government agencies are established to pursue a narrow mandate with limited funding. This resourcing doesn’t allow for diverse stakeholder engagement across a whole system.
Complex problems cannot be controlled by predetermined rules because they are unpredictable and dynamic.	Regulators are established to enforce predetermined rules (regulations, legislation etc.).
Complex problems are best addressed through collaborative and experimental approaches in a non-hierarchical context.	Governance systems are established as a hierarchy where a regulatory agency is traditionally seen as an implementer of policy and not one to lead collaborative and experimental design of new responses.
Correct solutions for complex problems do not exist, and progress can only be made through collaborative experimentation.	Public sector staff and agencies are rewarded for correct answers and perceived control of situations.

While the research also identified possible ways for a regulatory agency to navigate around these paradoxes, including through collaboration, representation of stakeholder needs without direct consultation, the development of non-regulatory responses and safe experimentation, it still highlights the challenging position that regulatory agencies are in when being asked to both deliver on their mandate and address emerging problems.

11. CONCLUSION

This research involved two case studies conducted within an Australian Government regulatory agency to firstly understand the current practice to address complex problems and secondly experiment with the introduction of a systemic intervention to support this practice. Findings to each of the main research questions are documented briefly below.

Q1: What are the opportunities for innovation in a regulatory context?

Relevant literature indicates that the problems we face today are growing increasingly complex and our current public-sector practices are not adequate to manage these challenges. Within the context of regulation, agencies are being challenged by authors in the field to move beyond their traditional role of enforcing pre-determined regulations, to being able to identify and address complex problems through the development of unique responses.

Q2: What is the relevance of design within a regulatory context?

Design practice has been increasingly explored as a way to enable innovation in the public sector. The focus of design within the public sector and regulation has been initially in service design, some instances of organisational design and more recently policy design. However, the ability for design to generate new ideas and bring them into being also makes it a relevant practice to support regulators to develop new ways to address complex problems.

Q3: What can be understood about regulatory practice to address complex problems from current literature?

The typical role of regulators is to enforce rules to manage societal and economic problems. Regulatory agencies exist within a compartmentalised governance system, including a hierarchy of government entities and regulations established to address specific sectors or problems. Within the Australian Government, regulatory agencies are typically established as statutory authorities. The staff within a regulatory agency may include a broad range of skills with an emphasis on service delivery, administration and compliance. Regulatory authors concur that regulators are facing increasingly complex problems, including systemic risks that occur repeatedly throughout a sector and may cross-jurisdictional boundaries. However, the public-sector context includes well-known barriers to innovation that may inhibit the ability for regulators to develop new approaches, including risk aversion, a short-term political focus and the lack of mobility of staff between the public and private sector.

Regulatory methodologies to develop responses to problems are reasonably limited and include risk management, the application of predetermined regulations, the regulatory response pyramid to categorise regulatory responses based on the severity of the problem and some experiments with behavioural economics. Problem-based regulation has recently been adopted by regulators and highlights the need to identify systemic problems and address them uniquely through the establishment of cross-functional teams and the exploration of new responses. Regulatory methodologies largely reflect an underlying positivist paradigm that is characterised by the assumed predictability and objectivity of problems and assumed control of reality. The positivist paradigm has been criticised for its limitation to support effective action in complex systems.

Q4: What is systems thinking and complexity theory and can insights from these fields support regulatory practice to address complex problems?

Systems thinking and complexity theory are diverse fields that provide insights on how to address complex problems. Systems thinking is an umbrella term to consider the way things exist as interconnected systems, including the concept of the adaptive whole which responds to its environment and component parts of sub-systems. Soft systems methodologies are the most relevant to this research because they bring a greater recognition of human values within systems. In particular, the visual representation of problems as they exist within systems is relevant to this research. Complexity theory includes a focus on systems, particularly those involving human actors, but is mainly concerned with the dynamic process of change. These theories highlight that change within complex systems cannot be predicted in advance and is affected by many different forces, meaning that goal orientated and linear strategies are not effective. The Cynefin Framework from

complexity theory is adopted within this research to diagnose the nature of the problem and the appropriateness of different types of responses.

Insights from systems thinking and complexity theory highlight that the application of predetermined regulatory responses is unlikely to be effective in addressing complex problems. The problem-based regulation methodologies have the right intention to experiment with different responses, however it proposes use of a goal-based and linear problem-solving model that is unlikely to encourage experimentation. While both systems thinking and complexity theories highlight an important new way of seeing problems within broader complex systems and identifying appropriate responses, they do not provide sufficient guidance on how to act against these problems.

Q5: What is the current regulatory practice to address a complex problem and how can this inform the development of a systemic design intervention?

Case study one conducted within Agency X followed a project over a period of five months in which the agency attempted to address a complex problem. The findings demonstrated a regulatory agency attempting to address a highly complex problem using problem-based regulation and project management methodologies. Significant challenges were experienced, including limited willingness from other government entities in the system to collaborate on the problem response, perception of the problem as a range of problem components and inconsistent problem framing with other stakeholders in the system, only incremental innovation to Agency X's standard regulatory response which did not effectively target the problem and the late identification of project issues due to the linear implementation of the project plan.

However, practitioners within the project demonstrated a strong willingness to experiment and began to identify factors that led to improved levels of innovation. This included the selection of staff with a greater capacity to adapt their practice and the inclusion of more diverse skills sets in the project team. The practitioners also implemented more reflective practices towards the end of the project, which led to the redevelopment of their audit model and finding more flexible ways to utilise existing regulations.

This research validated that there is scope for the agency to improve its practice to address complex problems and also informed factors that would influence the success of an intervention. These included the need to support collaboration, respect limited resources and involve staff demonstrating a willingness to experiment and adapt their practice.

Q6: What is systemic design and what would a more ideal practice include for a regulatory agency to address complex problems?

Design is now considered a viable alternative to conventional problem solving. A specific section of the design field is developing methodologies that enable design to be applied within highly complex contexts, including for the design of social systems and policy. Many of these practitioners include concepts from systems thinking and complexity theory for the development of new methodologies referred to in this thesis as 'systemic design'. Systemic design practices include key principles that guide action and are flexible enough to allow these methodologies to be adapted into new contexts. Key systemic design principles are considered to be framing, human-centred design, divergent thinking, co-evolution and iterative inquiry, open and creative dialogue, whole systems thinking and experimentation. The systemic design approach differs from a positivist approach in it aims for an undefined outcome while letting go of assumptions of how to get there, undertakes broad inquiries into not just the quantitative information but also qualitative insights within a problem situation, and balances both action and reflection to test and adapt the process along the way. These systemic design principles indicate a more ideal practice for a regulatory agency to move towards when addressing complex problems.

Design has been introduced to public sector practices in a variety of ways including through labs, building the design skills of existing public-sector staff, employing trained designers and procuring external design expertise through consultants. The way that design is introduced should take into account the level of design expertise required, since more complex design methodologies are best led by practitioners with higher levels of design expertise. However, considering the extreme difference of systemic design practice to conventional practice, even a novice application of systemic design methodologies within a regulatory context may lead to new outcomes. The challenge of implementing innovation within complex systems including those in which regulatory agencies operate, means that incremental changes may also be an appropriate strategy in addressing complex problems.

Q7: What opportunities exist for Agency X to move towards more ideal practice to address complex problems?

The challenges highlighted in case study one represent multiple opportunities for the application of systemic design principles and methods to support the agency to address complex problems. These include:

- deliberate problem framing
- considering the problem through a whole systems approach
- exploring stakeholder needs and including stakeholders in co-design sessions
- divergent thinking to encourage greater exploration of the problem space and solution ideas before determining a course of action
- use of open and creative dialogue to engage different stakeholders in solutions
- co-evolution to further develop responses as the problem space is better understood, and
- increased experimentation of responses prior to implementation.

Q8: What should the systemic design intervention include to move Agency X towards more ideal practice?

A systemic design intervention was developed in conjunction with Agency X to help them address a second complex problem that arose. This was designed based on criteria developed from the findings of case study one, including that the intervention should support the agency to collaborate with other government bodies and stakeholders, ensure that the pressure to act quickly is respected, engage with staff that have shown a willingness to experiment and adapt their practice, involve staff with a diversity of skills and experience, and responding to the opportunities to move towards a more ideal systemic design practice. The intervention was implemented through a week-long problem exploration with Agency X and two co-design workshops led by Agency X involving representatives from four government entities.

Q9: What were the results of introducing systemic design within regulatory practice to address a complex problem?

Case study two was conducted as an initial trial of the systemic design intervention to support Agency X address a second complex problem. The intervention led to collective problem framing with the government participants and the ability for participants to understand the problem within the broader system. The identification of unknown regulatory gaps, potential leverage points and different interpretations of terminology were identified through the intervention. The government participants collectively developed responses, which although they did not differ significantly from standard regulatory responses, established a strong foundation for ongoing collaboration. Contextual factors were identified which limit the broader application of systemic design, including a hesitation to engage directly with external stakeholders, accountability mandates limiting collaboration and barriers to taking proactive action against problems.

11.1. Research limitations

The main limitations of this research are the limited number of case studies within one regulatory agency, due to the scope of the Master's project timeframes. The findings would be strengthened through further research within additional regulatory agencies.

11.2. Research recommendations

The research covered a very broad topic and so many insights have been raised which could be explored through further research. In addition, the research raises recommendations for regulatory agencies addressing complex problems and governing institutions that manage the design of overarching governance systems.

Recommendations for future research

The findings of this research would be strengthened through conducting additional case studies in other regulatory agencies, particularly for further testing and development of the systemic design intervention. Each area of the conceptual framework of practice could also be investigated in more detail, particularly the role of practitioners and their mindsets and skill development, and longer-term research to understand the effectiveness of innovations in regulatory responses.

There is also a wide scope for further research to test more advanced methodologies in the areas of systems thinking, complexity theory and systemic design to support complex problem solving within regulation. These could include the proactive use of emergence, attractors and leverage points from systems thinking and complexity, and more in depth framing and future scenario building from design.

Recommendations for regulatory agencies addressing complex problems

Although challenging, the work to address emerging complex problems has proven throughout this research to be a critical area for regulators to develop. The systemic design intervention showed a strong possibility of supporting this practice and methods from this intervention could be trailed by regulatory staff in other agencies. However, the research also documented strategies that the regulatory agency developed through their own experience that could be adopted by other agencies, including developing a consciously reflective practice, incorporating greater

experimentation into the practice and encouraging innovation by the diversification of skills and selecting staff with more adaptive practices.

Recommendations for the design of governance systems

The recognition that complex problems exist beyond individual agency mandates and need to be addressed through collaborative approaches highlights the limitations of compartmentalised governance systems. Taking an incremental approach to change, the government may be able to support regulatory agencies to address complex problems within the current system by:

- encouraging collaboration through the requirement of a percentage of budget to be spent on whole of government projects, or requiring KPIs on collaboration
- enabling government agencies to pool resources to enable broader stakeholder engagement on systemic problems
- ensuring regulations include the flexibility for regulatory agencies to develop unique responses to emerging problems
- providing support and guidance for regulatory agencies to engage in safe experiments of new regulatory approaches.

12. RESEARCH REFLECTIONS

This research degree provides the opportunity to explore research approaches and develop skills as a researcher. Some brief reflections are provided about the research approach below.

Use of the Design Research Methodology

Use of the Design Research Methodology (DRM) (Blessing & Chakrabarti, 2009) provided a useful structure for the research and supported the rigour in which it was conducted. However, there were several aspects of this methodology that were considered inappropriate for this research. DRM typically includes setting a research hypothesis to be tested throughout each stage of the research. While the concept of establishing a hypothesis initially helped to clarify the assumptions of what may be found through the case study analysis, it was later determined to not be appropriate within an explorative study within a complex social system. Hypotheses are more aligned with an objectivist ontology, which considers social reality to be known and to be understood through cause and effect. When taking a constructivist perspective that social reality is constantly changing and can only be known through meaning established by the various stakeholders, proving whether the researcher's initial assumptions were right or wrong is a difficult task since theirs may be one of many valid perspectives. In any case, the scope of this thesis project was not extensive enough to categorically prove any hypothesis to be correct or incorrect, instead providing useful insights to develop and relate to theory about complex problem-solving practice within a regulatory context.

In addition, it is clear in hindsight after the researcher had been exposed to more constructivist design approaches and experts, that the way that the intervention was developed by applying the DRM framework, was quite rational. This involved taking direct observations from case study one

and requirements from the agency and responding to these with one intervention design. While this was partly influenced by the time limitations due to the agency needing to respond to the new systemic risk quickly, a more designerly approach would involve more iterations to frame the intervention, and to develop and test small prototypes to identify the most relevant systemic design practices. This is also reflective of the time that it takes to understand and move into the practice of new paradigms, since the researcher was not fluent in design approaches prior to this research.

Use of case study research methodology

Case study research proved to be an appropriate approach to study complex organisational phenomena such as practice. While the broad scope of the research topic and the explorative nature of case study research made interpretation of the wide range of findings challenging, it was also an appropriate approach to allow important themes and findings to emerge. In a similar way, the use of semi structured interviews as a data collection method allow for the research to be adaptable and themes to emerge that are most relevant to the perspective of the interviewee and their needs within practice.

Use of the conceptual framework

The conceptual framework went through several iterations, but proved to be a critical component of the research to be able to interpret and compare such a wide range of findings. The conceptual framework helps to highlight underlying patterns within the research findings that enable the researcher to then identify those same patterns in other organisational settings. This was a powerful realisation of possibilities in research—to be able to identify patterns and then aim to influence them to achieve more desirable outcomes.

The concept of mindset arose quite frequently throughout the research but was not in scope to explore explicitly in the literature. However, future research should consider this as an important factor of practice to be included in the conceptual framework, possibly in relation to the influence of the practitioner on the practice.

In relation to the way that the research was constructed and presented, it is also clear after engaging with several experts, that this thesis presents quite an analytical analysis, which is useful and contributes to the field. However, to become more consistent with approaches of design inquiry, the research could be more explorative and balance a greater level of action (experimentation) with reflection, as well as presenting the findings as a more compositional whole. As a researcher, it is exciting to have shifted my perspective towards that of the design field

and now to be able to conceptualise how my perspective and practice can continue to move to integrate this more holistic and innovative approach.

13. APPENDICES

Appendix A: Interview questions—case study one

1. Can you briefly describe your role in the [problem-solving project] to me?

Assessing the problem

2. Can you describe the systemic risk or problem to me?
3. What makes this problem hard to solve (are there any opposing forces to the problem?)
4. Has anyone attempted to solve this problem before?
 - a. Were you able to find out what difficulties they encountered?
 - b. Was this information included in your approach to the problem?
5. Were different stakeholder needs considered when assessing the problem?

Developing solutions

6. What steps did you take to address the problem?
7. At what point did you start generating solutions?
8. How did you generate solutions?
9. Were the solutions able to be tested before they were implemented?
10. Did the solutions evolve throughout the project?
 - a. How did this occur?
11. Were other stakeholders involved in the development of solutions?

Project approach

12. There was a project plan established for the project – how much did you stick to the plan and how much did you deviate?
13. The project plan included project outcomes – are these still relevant now that the project has progressed?
14. Did previous projects or established theories influence the approach you took?

Reflections

15. Has your view on the problem changed as you've moved through the project?
16. What were/are the major challenges you have faced in the project?
17. Based on what you've learnt, how would you do it next time?

Appendix B: activities and application of defined methodologies or implicit expertise in case study one

#	Activity	Aim	Outcome	Methodology / implicit knowledge
1	Environmental scan with broad stakeholder input	Identify risks in the sector	Results identified a potential systemic problem with specific business service	Risk-based regulation methodologies from Sparrow (2000; 2008)
2	Initial analysis of case study agency complaints data	Understand the nature of the problem relating to a specific business service	Results indicated the problem was present in more than one business service and related to a government assistance program	Standard data analytics methodologies
3	Meetings with related regulatory agencies in the broader sector	Seek additional information on the problem and discuss concerns	Relationship established & deeper understanding of problem obtained	Problem-based regulation methodologies from Sparrow (2008) to seek broader regulatory input to manage systemic problems
4	Broader analysis of case study agency complaints data	Identify nature of the problem relating to government assistance program	Results identified potential businesses involved and problem behaviours	Standard data analytics methodologies
5	Cross-government roundtable	Discuss problems relating to government assistance program with policy departments, identify responsibility and action	Positions on the problem and willingness/ ability to act clarified	Formal meetings held in alignment with standard government practice (implicit expertise)
6	Legal mapping of regulatory agency responsibility to components of the problem	Clarify government responsibilities	Regulatory responsibilities and gaps identified	Concerns about lack of understanding of regulator responsibilities led to legal mapping (implicit expertise)

#	Activity	Aim	Outcome	Methodology / implicit knowledge
7	Further engagement with related regulatory agencies	Discuss possible collaborative action with other related regulatory agencies	Established agreement from other agencies to collaborate but only within the scope of their established agency priorities	Problem-based regulation methodologies from Sparrow (2008) to seek broader regulatory input to manage systemic problems
8	Decision from senior leaders to take action from within their own jurisdiction	Commence action against the problem	Project by case study agency formally commenced	Implicit expertise used to judge that action needed to be taken against the problem without waiting for greater buy-in from other government agencies
9	Small internal reference group develop project plan	Define the problem and recommend action, timing, costs, resourcing and expected outcomes in a project plan	Proposed plan to address problem follows the development of a project plan (informed by project management methodologies) and	Development of the plan relied on implicit expertise. Use of a project management template based on project management methodologies
10	Plan reviewed by senior leaders	Gain endorsement of plan	Endorsed plan and approval to proceed	Decision to commence the project following a formal briefing to the Commissioners, informed by regulatory methodologies established to maintain accountability of decisions
11	Project plan given to different team to implement	Assign project to team with available skills and resourcing	New team adopts responsibility to implement project plan	Implicit expertise to separate planning and implementation (although not consciously recognised, this is based on a methodology from management science)
12	Cross-functional team established by basing the project in one team and drawing on support from staff in other teams	Utilise diverse input to project and spread resource impacts across teams	Resources accessed but eventual outcomes are inconsistent	Problem-based regulation methodologies from Sparrow (2008) to address systemic problems through cross functional teams

#	Activity	Aim	Outcome	Methodology / implicit knowledge
13	Additional data on the problem obtained from policy department	Increase understanding of problem effectiveness of solution	New information on the problem to target action	Problem-based regulation methodologies from Sparrow (2008) to seek broad data and inputs to understand the problem
14	Interviews with consumers conducted	Gain new insight into specific aspects of the problem and businesses involved	Large variation in results from different teams. Where interviews were done well the information was useful	This was an innovation to the agency's standard audit approach based on implicit expertise to seek greater consumer information
15	Tailored audits of individual businesses conducted	To understand nature of problem and businesses involved	Audits do not always identify aspects of the problem, but collect standard information about compliance with legislation. Business that don't comply with legislation identified	Implicit expertise was used to adjust the standard agency audits. The standard audits are based on audit methodologies, refined into a standard process over time by Agency X
16	Internal Steering Committee established to meet weekly	Provide stronger oversight of ongoing project to address the problem	Increased understanding and coordinated action as well as lengthy time commitments from case study agency staff	Implicit expertise from a senior leader to seek stronger oversight led to the establishment of the committee. The committee was run as a formal meeting, in line with government methodologies focussed on maintaining accountability of decisions
17	Audit reports on individual businesses produced	Identify business behaviour that can be addressed with regulatory response	Evidence that most businesses audited demonstrate poor business behaviour (are part of the systemic problem)	Audit reports in line with the agency's standard audit methodologies

#	Activity	Aim	Outcome	Methodology / implicit knowledge
18	Senior leaders make regulatory decisions on individual businesses	Apply regulatory responses to reduce harm being caused by individual businesses	Established regulatory responses applied - cancelled business registration, increased regulator monitoring, public shaming, increased education. New response applied within legislation of imposing conditions on registration. Case study does not track overall effectiveness	Decisions made through a formal process established by the agency to ensure accountability
19	Regulator publishes project findings and actions against individual businesses	Demonstrate effectiveness, provide a warning to influence businesses to improve behaviour	Some stakeholders are satisfied by response, others make further enquiries. Case study does not track overall effectiveness	This was an innovation to the agency's standard regulatory approach; however the publishing of regulatory findings is an established regulatory methodology aimed at influencing behaviour by public shaming
20	Broader policy recommendations made to policy department	Impact the problem as a whole rather than on individual bases within case study agency's regulatory jurisdiction	Policy recommendations do not appear to be adopted, although later policy changes were made without consultation with the regulator case study agency	Standard government methodologies for agencies to write formal briefings the minister or central government departments in order to influence decisions
21	Joint audits and investigations conducted with other regulatory agencies	Joint strength to address the problem from multiple regulatory jurisdictions	Deeper and more conclusive information about poor business behaviour. Responses applied from multiple regulatory jurisdictions	Implicit expertise around the possibility of improved regulatory outcomes drove the planning and implementation of joint audits with other agencies
22	Case study agency reflection leads to general audit model restructure	Improve general organisational practice based on project learnings	Significant improvements to audit model to be more tailored to unique problems	Implicit expertise by a senior leader to take stock of the challenges and learnings in the project and use this to drive broader changes in the regulator's practice.

#	Activity	Aim	Outcome	Methodology / implicit knowledge
23	New kinds of data analysis trialled	Increase effectiveness in understanding hidden elements of the problem	New insights into unseen elements of the problem and potential solutions	Implicit expertise from staff with different skills used to see new patterns in the data about the problem
24	Specific staff selected to do more audits who are able to adapt their process to each situation	To achieve a more precise understanding of the problem and recommendations targeted to the problem	Improved information, new ideas and more effective audit reports	Implicit expertise from senior leaders to select the kind of staff that would thrive in a more experimental environment
25	Increased use of investigative staff	Obtain information about the problem in a more targeted and direct way	More in-depth findings about the problem that may have not been uncovered in audit process	Investigations practice driven by specific methodologies in the investigations field. Implicit expertise of senior leaders to recognised the positive outcomes from applying investigations expertise to this project

Appendix C: Summary of findings from case study one

Context

- Central government department responsible for developing regulations
- Small national regulator (Agency X) responsible for enforcing regulations
- Mandate to regulate large and diverse business sector

Problem

- Misuse of a government assistance program by businesses and agents with potential harm to consumers and economy
- Demonstrated to be highly complex and impacting across a broader system than the regulator's mandate

Actions

- Reliance of methodologies from the regulatory, public sector and management disciplines
- Linear process to address the problem
- Reliance on implicit expertise to develop project plan
- Stakeholder engagement in problem identification but limited engagement in development of responses
- Separation of planning and implementation
- Greater levels of reflection and adaptability much later in the project

Problem response

- Regulatory action against individual businesses (appropriate to simple & complex context)
- Publishing findings (appropriate to complex context)
- Publishing policy recommendations (appropriate to complicated context)

Influence of context

- Other agencies not accepting responsibility or viewing the problem as a priority
- Different understanding of the problem impacting collaboration
- Hierarchy limiting open collaboration
- Concern that engagement would divert the agency's focus on its mandate
- Accountability requirements limit opportunities for collaboration
- Pressure to act limiting innovation

Influence of practitioners

- Willingness to experiment
- Requirement for staff adaptability
- Increased innovation with skill diversity

Other challenges

- Difficulty obtaining and integrating data about the problem
- Lack of flexibility in established IT systems
- High resourcing requirements to deal with complexity

Underlying paradigm

- Positivist conventional regulatory and management approaches
Move towards experimental and interdisciplinary approaches

Appendix D: Intervention criteria and design

Findings from case study one	
The intervention should:	How this was addressed in the intervention design
support the agency to collaborate with other government bodies and stakeholders involved in the problem and support them to develop a shared understanding of the risks	Collaboration was an important starting point in the design of the intervention and a key focus of the problem scoping, data collection and both workshops.
support collaboration in more informal information-sharing environments that are not constrained by existing organisational and inter-agency hierarchies.	The collaboration efforts were structured outside of formal meetings and roundtable discussions and occurred either in preparatory teleconferences or group discussions and then in the workshops, which were held in an informal, creative setting with a mix of staff from different levels.
ensure that collaboration is undertaken with the understanding that each agency needs to remain focussed on delivering on their own mandate and accountability requirements, and	The workshops included discussion on how the agencies could collaborate, as well as what their responsibilities were under their own regulatory mandates.
ensure that the pressure for the agency to act with limited resources is respected.	The intervention worked within resource constraints, including not engaging in public consultation and keeping the time requirements of staff to a minimum.
engage with staff who have already shown a willingness to experiment and who have demonstrated adaptability; or actively builds the capacity for experimentation and adaptability	Agency X had already identified and chosen staff with these attributes to be involved in the problem-response team, and additional staff with these attributes were invited to participate. Note that broader efforts to build the capability of staff was outside of the scope of this research.
include a diversity of staff skills and levels to be involved in the intervention.	A broad range of staff were invited to participate, including front line auditors and senior managers.
seek to obtain data about the problem as early as possible utilising proactive collaboration approaches	Learning from the challenges in case study one, the intervention included a week-long intensive to collect data proactively from other agencies and seek input into the problem framing.
ensure that the high resourcing needs to innovate are considered and addressed by efficient design of the intervention.	As indicated, the intervention was kept to a small experiment with staff time optimised by pooling knowledge and expertise early, and making sense of this as a group.

Findings from comparing current practice against the systemic design principles

The intervention should:	How this was addressed in the intervention design
undertake deliberate problem framing early in the project in a group setting with other stakeholders	The intervention commenced with a problem scoping to obtain background information commonly used in problem framing. Problem framing was then the focus of the first workshop, and solution framing the focus of the second workshop.
seek to understand the lived experience of stakeholders in the regulatory system to understand how behaviour affects compliance	Broader stakeholders were brought into the scope of understanding the problem early, with a stakeholder mapping to highlight the diverse range of people involved and qualitative information sought to understand their potential experiences. While direct public consultation was not authorised, perspectives were proposed through the use of personas and journey maps.
encourage divergent thinking to explore many ideas and perspectives before determining a single course of action.	The problem scoping encouraged participants to broaden their perspective on the problem, and a broader range of data than normal was sought, including qualitative perspectives. Many aspects of the problem and solution options were also explored before settling on the strategy.
allow the problem and solution framing to emerge, and undertake reflection to adjust the practice based on new understanding.	The explorative aspects of the workshops allowed the problem and solution framing to emerge without being set. However, this principle is also important in the ongoing exploration and implementation, which is beyond the scope of this research.
involve facilitated group sessions that encourage open discussion that leads towards a synthesised understanding.	The workshops focussed on facilitating discussion to enable the participants to understand other perspectives of the problem and move towards a common understanding.
seek to understand the problem space as a whole, and understand how the component parts inter-relate and influence each other.	Stakeholder mapping broadens the perspective on the problem from involving known stakeholders, to potential involving many more people and perspectives, and the user journey map enabled participants to appreciate the complexity of the problem. Complexity in the problem space was also highlighted by undertaking a diagnostic of the level of problem complexity.
increase its experimentation of problem responses in a safe-to-fail environment before proceeding down a course of action.	Experimentation to test solution ideas was outside of the scope of this research, which occurred at the beginning of a problem response. However, it is an important part of ongoing exploration and implementation.

Appendix E: Survey questions for co-design workshop one, case study two

The survey was conducted via an online survey account managed by Agency X. Participants could enter their personal details if they chose.

1. Did the workshop help you to identify and understand risks in the sector? (Likert scale & comments)
2. Did the workshop help you to determine how risks are viewed by different government agencies operating in this sector? (Likert scale & comments)
3. Did the workshop help you to clarify regulatory responsibilities and possible regulatory gaps in the international student sector? (Likert scale & comments)
4. Was the workshop effective in facilitating cross-agency collaboration on risks in the international student sector? (Likert scale & comments)
5. What design methods or parts of the workshop did you find most useful? (Comments)
6. What design methods or parts of the workshop did you find least useful? (Comments)
7. Is there any additional information you think we need to more fully understand and frame the risks in the international student sector? (Comments)
8. I approve my feedback being used for the UTS Master of Design research project (Y/N)

Appendix F: Feedback session questions for co-design workshop two, case study two

Participants were asked three questions and prompted to write their responses on post-it notes. They were invited to share responses with the group.

1. Is there anything you have changed your mind about, or have you had any new realisations during this workshop?
2. What did we succeed with today?
3. What didn't we succeed with today?

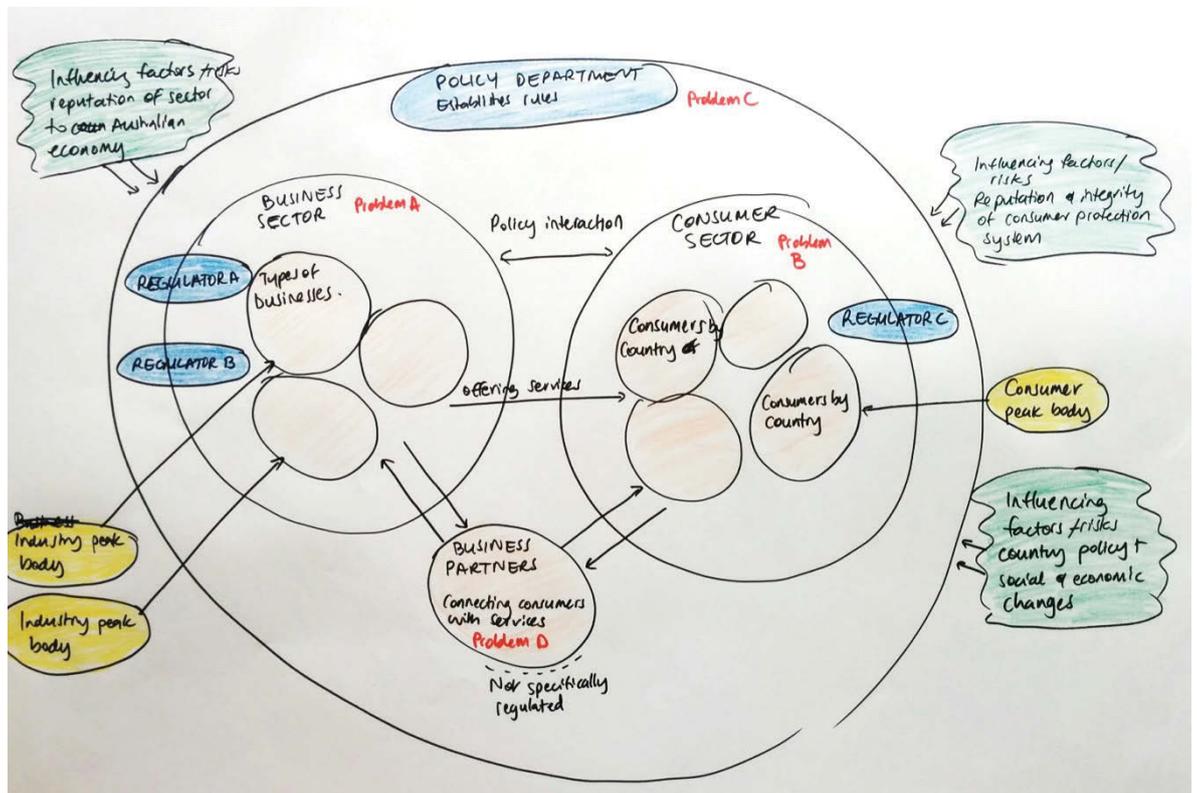
Appendix G: Interview questions for case study two

1. What's happened with the project since the workshop?
2. Did the workshop help you develop a better understanding of the problem?
3. Do you see the problem in a different way now?
4. Do you think that considering the problem as a broader system is helpful?
5. Can you envisage new ways of engaging with the other government agencies now?
6. What design methods brought out useful ideas?
7. What design methods didn't work so well? Were you surprised by any of the solution ideas?
8. Were any of the solution ideas viable?
9. What do you think the challenges will be in implementing the approach that was developed?

Appendix H: System map and indicators of complexity for the problem in case study two

With the knowledge gained from the literature review in systems thinking, complexity science, and design; the researcher can now better represent this risk as a visual systems map. This helps to understand the risk and compare it to the Cynefin Framework's indications of complexity. It is also a very useful communication tool to represent the risk and refine this understanding with other stakeholders. The risk is represented below to provide an overview to the reader of this thesis, however this representation was not available during the empirical research phase.

Figure 17: Systems diagram of complex problem being addressed in case study two



The system map highlights:

- the four government agencies that are involved in the governance of the system (in blue):
 - A central policy department
 - Two regulators for different types of business that offer business services that are at risk of poor quality / non-compliance
 - One consumer regulator
- The four main components of the problem (in red):

- A: Behaviour of the businesses offering services
- B: Behaviour of the international consumers accessing services
- C: Problems relating to the lack of policy or regulatory integration in the system, and
- D: Behaviour of business partner agencies who are not specifically regulated.
- the relevant consumer and industry peak bodies (in yellow), and
- recognised influences on the system (in green).

Complexity of the problem compared to the Cynefin Framework

When the problem context is assessed against the indicators of complexity in the Cynefin Framework, it can clearly be identified as a complex:

Large number of interacting elements

The systemic risk has an even larger number of interacting elements than the first problem addressed in the case study, due to the involvement of additional rules and policies relating to international consumers. This includes additional consumer peak bodies.

Non-linear interactions where minor changes can produce disproportionate effects

Similar to the first problem addressed in the case study, this risk could be dramatically changed through adjustments to policy from one of the agencies in the governance system, or changes in ownership or staff of the regulated businesses. In addition, the risk was affected in non-predictable ways by policies and social and economic trends in the consumers' country of origin.

Dynamic, where the whole is greater than the sum of parts and a solution emerges through circumstance

The regulator was aware that there were many component parts to the problem and one or more could affect the greater whole by impacting on the business reputation of the entire sector.

The system has a history and evolution is irreversible

This business sector had suffered international reputational damage before and many of the policies had been established to manage risks that led to this outcome.

The system is unordered (not constrained by boundaries). Agents within the system constrain each other in unpredictable ways

As with the first problem in the earlier case study, several constraints were in place regarding rules and policy for businesses and consumers. However, like the first problem, there were identified gaps in the regulatory system (business partnering agencies were not specifically regulated) and the problem existed on many levels internal and external to those system boundaries.

The system involves human actors and decision-makers who make changes unpredictable

The problem context involved the unpredictable nature of business owners, staff, business partnering arrangements and consumers. It is also influenced by unfamiliar and unpredictable human behaviour from different international cultures.

Appendix I: Paper published in the proceedings of the RSD5 Symposium, Toronto

Developing a Systemic Design Practice to Support a Regulatory Agency in Addressing Complex Problems

Bridget Malcolm and Mieke van der Bijl-Brouwer, University of Technology Sydney

Abstract

Regulatory agencies are an important stakeholder in addressing complex societal problems and are beginning to recognise that these kinds of problems cannot be managed using traditional regulatory tools. In this paper, we examine existing regulatory problem-solving theories and identify their limitations in addressing complex problems that are dynamic, unordered and exist within social systems. We build on these findings by describing the outcomes of a case study examining the problem-solving practice of an Australian Government regulatory agency. We propose numerous opportunities for the development of a systemic design practice within a regulatory context. The development of a systemic design practice would support regulators to navigate disjointed governance systems and establish a shared frame of reference to problems, disrupt traditional thinking patterns, enable solutions to be co-designed and encourage practices to incorporate active reflection and iteration.

Introduction

Government regulatory agencies are almost always an existing stakeholder within the systems that complex societal problems emerge. Regulatory agencies can play a powerful role in addressing these problems because they are specifically funded and legally empowered to manage problematic conditions within specific business and community sectors (Organisation for Economic Co-operation and Development 2012). For example, the financial regulator in Australia has the power to help stabilise financial markets by monitoring the conduct of company directors and prosecuting them if they fail to act in the best interests of the corporation or its shareholders.

We adopt the view of Jackson (2010) and Veale (2014) that regulatory agencies operate from within a positivist paradigm that relies upon a hard-systems methodology to address problems. This conventional approach aims to reduce complexity by defining and compartmentalising problems and controlling them through pre-defined rules and strategies. While the conventional approach has been effective to manage simple and well-framed problems, it becomes counter-productive when the complexity of a problem increases (Ryan, 2016).

Outside the regulatory context, new approaches have been proposed to address complex problems that acknowledge the interconnected and dynamic nature of these problems and the requirement to respond with experimental, iterative and reflective approaches (Dorst 2015b; Snowden & Boone

2007). The field of systemic design is evolving to support organisations to deal with increasing complexity and shift their thinking to develop radically innovative approaches (Jones 2014).

Regulatory agencies around the world are beginning to identify that there are systemic problems in the markets that they regulate and these cannot be managed using existing regulatory tools. This new focus on 'problem-based regulation' (Sparrow 2008) and the search for new strategies provides a fruitful area for the development of a systemic design practice. The objective of this research is to explore the opportunities for systemic design to be adopted as an alternative approach for complex problem solving within a regulatory context.

In this paper, we first describe the dominant problem-solving approaches within regulatory theory and their limitations in addressing complex problems. We then develop a deeper understanding of real life practice that results from applying these regulatory theories to a complex problem through an in-depth case study at an Australian Government regulatory agency. Based on the findings of the case study, we recommend opportunities for the development of a systemic design practice within this context. This research approach is in line with the accepted idea from design research methodology that it is important to understand the nature of the context and the existing practice to inform the development of a new practice (Blessing & Chakrabarti, 2009).

Dominant Regulatory Approaches and Their Relevance for Complexity

Three clear problem-solving approaches can be identified within regulatory theory – these are responding according to legislative mandates, responsive regulation and problem-based regulation. These approaches are also apparent in regulatory practice, including in documented strategies of the case study agency.

Responding according to legislative mandates

Regulators act under a set of legal rules (legislation) that prescribe what a business or individual can and cannot do, possible actions by the regulator such as audits and investigations and possible responses the regulator can enforce when rules are broken (for example to revoke a business licence, issue a fine or prosecute an individual). The term regulation literally means 'to control by rule'. These rules are based on an assumption that problems can be predicted and controlled by pre-determined responses, which is contradictory to new ideas about the non-predictable nature of complex problems, particularly when they involve human behaviour (Kurtz & Snowden 2003).

When serious unforeseen issues occur in a market, the legislation is amended with more rules and stronger powers for the regulator to clamp down on these problems. Dorst (2015) comments that the authoritative knee-jerk reaction to create more rules to prevent incidents limits an organisation's ability to improvise and innovate; paradoxically setting an organisation's possible responses to be even more static while the world around us becomes more dynamic. Excessive legal definition of a problem and response may also limit the frame to which agencies are likely to envision the problem and possible solution.

Responsive regulation

A popular regulatory theory of responsive regulation encourages regulators to address problems based on a scale of escalating responses, including actions that may not be specifically outlined in regulation such as education or public shaming (Braithwaite 2011). The basis of the theory includes useful principles in the context of complex problems, including considering the issue within its context, not imposing a preconceived theory, actively listening to stakeholders and responding to problems in a probing way with a series of escalating sanctions. However, in use the theory tends to be distilled down to a central concept of the responsive regulatory pyramid (often referred to as a cooperative compliance model), see figure 1. This provides a guide for certain tools or responses to be applied based on the level of risk of the problem and the attitude of the organisation or individual. For example, if a business was supplying natural medicines into Australia and not complying with the labelling rules, the relevant regulatory agency would respond based on the level of risk the non-compliance posed to the community. This could range from providing education material to the company to issuing a criminal penalty to its directors.

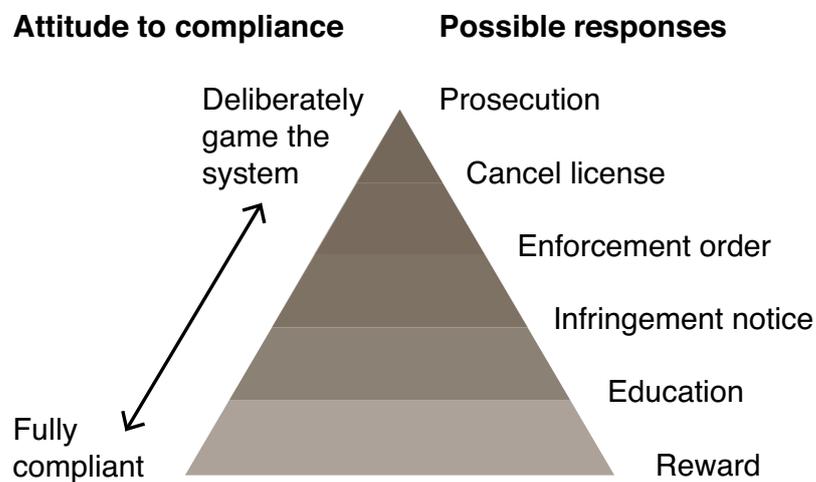


Figure 1: Responsive regulatory pyramid

The responsive regulatory pyramid is based on rational choice theory (Braithwaite, 2011), a fundamental economic theory that assumes that humans make efficient, self-interested decisions to efficiently achieve their desires and that their behaviour and choices can be modelled to determine outcomes (De Jonge, 2012, Lakoff, 1999).

While it is easy to see how rules-based procedures may be necessary to support high volume decisions on simple matters, systemic designers and complexity theorists are clear that this is an inadequate approach for decisions on complex problems. Firstly, rational choice theory is inadequate to understand human decision making which relies more on emotional reasoning (Kahneman & Tversky 2000) and contextual influences (Kurtz and Snowden, 2003). Secondly, categorising problematic behaviour and applying actions that are considered best practice based on a successful past response (such as providing education to businesses that demonstrate minor non-compliance), will only be effective if there is a clear cause and effect relationship and the right answer is undisputed (Snowden & Boone 2007). Snowden and Boone (2007) describe the relevant situations for best practice as being simple, ordered contexts such as process issues.

Problem-based regulation

In the last ten years, a focus on problem-centric regulation has permeated regulatory practice following the popular work of Malcolm Sparrow (2008). Sparrow emphasises that the fundamental purpose of regulation is to solve societies more intractable problems. He proposes that regulators become more flexible in making choices in how to respond to issues by developing new strategies outside of the legislation as well as relying on existing tools. Sparrow recommends that regulators use risk assessment approaches to identify systemic problems, or specific patterns of risk that are revealed repeatedly in the sector, which might manifest as crime problems, environmental issues, drug smuggling etc. Once identified, Sparrow recommends that regulators act like saboteurs to find new ways to disrupt the problem, and that this should be done by leveraging different skills through cross functional teams.

In observing past practice that can be used as inspiration, Sparrow provides a case study of a US customs agency who were trying to address drug smuggling on the Mexico/US border. A probing strategy was enacted, where the agency trialled different interventions such as sniffer dogs and tyre spikes in several sites. They adjusted their response based on the reaction of the various entities until they came up with a solution that worked in most cases. This type of response reflects the recommended action against complex problems by Kurtz and Snowden (2007) to create environments and experiments that allow patterns to emerge and to then reflect and adjust the approach.

However, in contradiction to the inspiring case study, Sparrow recommends that regulators attempt these systemic problems using a linear problem-solving protocol based on the policing SARA model (scan, analyse, respond and assess) (Sparrow, 2008).

Table 1: Problem-solving protocol, Sparrow 2008, pp 158

<i>Problem-Solving Protocol</i>
Stage 1: Nominate & select potential problem for attention
Stage 2: Define the problem precisely
Stage3: Determine how to measure impact
Stage 4: Develop solutions/interventions
Stage 5(a): Implement the plan
Stage 5 (b): Periodic monitoring/review/adjustment
Stage 6: Project closure, and long-term monitoring/maintenance

This hard-systems approach to problem solving was established during operations research in the Second World War, where industrial and technology problems were able to be controlled and manipulated to achieve a pre-determined goal. This way of thinking was adopted within management science, establishing the notion of the organisations as rational, goal seeking entity

able to control problems through compartmentalising them, selecting an appropriate tool and evaluating the results (Checkland 1994b).

This goal-orientated approach to problem solving has come under much criticism from authors in systemic design and complexity who claim that it is being incorrectly applied to complex problems within social systems. Social systems are fundamentally different to the ordered realms of industry and technology due to the nature of human intellect and the diversity of our experience and responses (Nelson & Stolterman 2012). The increased complexity in an interconnected and globalised world also means that it is almost impossible to predict the impact that actions will have within a complex social system (Dorst, 2015; Kurtz & Snowden, 2003).

Systemic design to support innovation within regulatory practice

We believe that Sparrow has captured the imagination of the regulatory community and focused their attention on the critical issue of addressing society's most difficult problems. However, the tools and strategies that Sparrow recommends are inadequate to prepare regulators to innovate against the complexity of such problems. This is especially difficult within an organisational paradigm that relies primarily on hard-systems methodologies from the fields of law, economics and management.

Systemic design and complexity theories arise from more diverse and transdisciplinary paradigms and help us to consider the broader systems that problems operate in. They accept that organisations are continually changing social constructs and that problems can have many different interpretations based on the mindset and vested interests of the person perceiving the problem (Checkland, 1994; Nelson and Stolterman, 2012). Systemic design encourages practitioners to take a broader view of a situation to appreciate these multiple perspectives and shift thinking away from the assumption that problems can be objectively defined and controlled.

We believe that practices from systemic design can be adapted to support regulatory agencies to address complex problems. This is supported by previous successful case studies in the application of systemic design within government (Ryan & Leung, 2014; Veale, 2014) and the application of design to public policy and services (Bason, 2014; ThinkPlace, 2016).

The above analysis of regulatory theory indicates that there is limited guidance to support regulatory agencies to deal with complex problems. To understand how these theories are applied and what other factors influence problem-solving practice, we conducted a case study within an Australian Government regulatory agency. These insights provide a foundation for the development of systemic design interventions in a regulatory context.

Case Study Overview: Problem-solving Practice in a Regulatory Agency

Case study subject and context

The unit of analysis in the case study was a project undertaken by an Australian Government regulatory agency to address a systemic risk or problem that they had identified using methods recommended by Sparrow (2008).

This project was undertaken within an Australian Government regulator responsible for ensuring quality of goods and services provided by a specific business sector. The organisation is reasonably small, and employs a majority of staff with an extensive history of regulation within the sector, as well as some newer staff from other industries and sectors.

The business sector being regulated is large and very diverse, ranging from family operated businesses to large multi-national enterprises. The customer base is also extremely diverse. There is a complex governance arrangement around this sector. This includes separate federal government departments responsible for setting policies, developing legislation and providing assistance programs, state government departments providing funding, and regulators responsible for related segments of the market covering consumers, fair-trading and company and tax law.

Objective

The objective of the study was to understand how the regulatory agency addressed a complex problem and the potential for systemic design interventions in this context. This drove the following research questions:

- Q1: What is the level of complexity of the problem that the case study project aimed to address?
- Q2: What practices were used in the case study project to address the problem?
- Q3: What other contextual factors impacted the problem-solving practice within this case study?
- Q4: Which elements of practice in the case study project might benefit from a systemic design approach?

Research method

We conducted an in-depth case study involving:

- Policy and project document analysis
- Observation of project steering committee meetings
- Semi-structured interviews with six project managers and officers which were transcribed and iteratively coded to research questions and emerging themes

Case Study Findings

Q1: Complex nature of the problem

The organisation had recently adopted the recommendations of Malcolm Sparrow to implement more sophisticated risk assessment that took into account a range of external perspectives through environmental scanning. Through this work, a new systemic risk emerged which related to the potential misuse of a government assistance program. This appeared to be linked to poor business practices which negatively impacted a high number of consumers. The regulatory organisation took this as a first opportunity to experiment with Sparrow's problem-based regulatory approach. This required an experimental stance since there were no business rules or past practice to rely on.

The nature of the problem itself could be described as complex (Snowden and Boone 2007) since it involved:

- large numbers of interacting elements, including businesses, agents and consumers
- a complex governance arrangement with policy and funding settings that changed over time without necessarily interacting with other agencies in the governance system
- unclear cause and effect, with many aspects of the problem unknown and hidden through collusion or lack of information
- a dynamic broader system since the issue impacted many industries and aspects of business (and hence drew interest and influence from other governance bodies and public entities).

In addition, staff recognised the problem as complex and one that they weren't sure how to tackle:

[Interviewee 4] "...I think that's probably been the biggest part that it is very much a multi-dimensional problem and it's not just one particular thing we are looking at. There are a lot of factors we have to keep up in the air at all times".

Q2: Current problem-solving practices

The problem quickly gained the attention of the media around the time that it was being identified as a systemic issue by the regulatory agency. Due to the external public pressure, the agency acted quickly with limited time or resources invested in understanding the nature of the problem and developing the approach.

There was initial engagement with other government agencies to discuss the nature of the problem and determine which agency should take responsibility to act against specific concerns. This included the case study agency mapping specific concerns against regulatory agency responsibility for the various government entities in the sector. However, this work gained limited buy-in from other agencies so the case study agency commenced a project to address the problem from within their own regulatory jurisdiction.

A project manager was assigned and worked with another staff member to determine how to proceed. Internal complaints data was used as the main problem indicator and there was limited access to broader information including from other government agencies. A strategy was developed to gain more insight into the problem through a variation to the standard regulatory audit approach. This included conducting stakeholder interviews, varying the standard scoping rules for audits and including control audits with businesses not seen to be engaging in the problematic behaviour. The strategy was written into a project plan which included expected outcomes, KPIs and a project timeline. The strategy was given to another team to implement.

The team that gained responsibility for implementing the project aimed to utilise a cross-functional team by drawing on staff from different areas of the business. However, various challenges arose at this stage due to a hesitation by staff to adjust the original plan, a lack of understanding and reluctance for staff to implement audits that went against their normal business practices, and pressure to act quickly in order to report back through a parliamentary inquiry process which limited the depth and usefulness of some of the activities.

The initial regulatory activity to uncover the nature of the problem took a significant period of time and eventually led to responses enabled under the legislation such as imposing conditions on business registration, cancelling business registration, enhancing monitoring by the regulator, 'public shaming' by publishing concerns about particular businesses and increasing public education on compliance expectations. In the meantime, the scale of the problem was being recognised as more significant and growing.

The case study agency found some success in sharing data with other government agencies involved in the problem area and undertaking collaborative action. However, there remained a gap in understanding between many of the agencies of what the true problem was and how to best address it. This became apparent through the central government department adjusting policy settings and regulatory mandates without communication or agreement from other agencies, something that the case study agency believed would add to their workload but not increase their effectiveness against the problem.

The problem has continued to be monitored and addressed through a small team of staff who come together to discuss findings and issues in a steering committee with broader organisational leaders once a week.

Case Study Discussion

Q2 Current problem-solving practices – limitations of responding according to legislative mandates and the responsive regulatory pyramid

The dominance of relying on approaches established through legislation is clear in the scope of responses that were considered in the early stage of the project. These were limited to a variation on existing practices to understand the problem and categorising findings to apply established actions such as imposing conditions on registration, cancelling registration and education. This study did not extend to assessing the overall effectiveness of these actions on managing the systemic problem. While there is certainly strength in a regulator being able to impose legal

conditions on the operation of a business, from a systemic design perspective there are likely to be many more leverage points to disrupt the problem beyond this scope of actions. This could include broadening the regulators influence by working on collaborative actions with external stakeholders interested in the problem, such as consumer groups, not for profit organisations and other business entities.

Q2: Current problem-solving practices – trialling problem-based regulation

This case study was the first opportunity for the regulatory agency to trial a problem-based regulatory approach following the recommendations of Sparrow (2008). It was clearly the right approach for the agency to identify this systemic problem and treat it with dedicated project resources since it proved to be a particularly systemic and harmful public issue throughout the project. This is opposed to treating instances of the problem on a case-by-case basis which would occur through a standard audit process. The project was viewed as an opportunity to trial a new approach without any previous business processes to follow and led to rich learning for the organisation. As the initial project manager commented:

[Interviewee 2] "I grabbed it as an opportunity. It took the life out of me. But that was about shifting our risk model at that time into this new way. Because the only way I know in this organisation to get things moving is to show them how it can be done. And this was the biggest win. So crisis was our friend".

It is not unexpected that the agency's initial approach against the problem was limited to a variation on existing regulatory practice while following the linear problem-solving protocol as recommended by Sparrow (2008). The linear problem-solving protocol was evident in project planning documentation (define problem, determine how to measure impact, develop solution, implement) and the initial lack of reflective practice and iteration to frequently re-evaluate the understanding of the problem and redesign responses. Sparrow's emphasis on 'defining the problem precisely' at the beginning of the project was also followed with the agency forming a hypothesis without extensive input from external stakeholder perspectives. As stated by other authors including Veale (2014), the perception of an objective and knowable problem leads people to converge on a solution, usually relying on past practice to inform a solution. This is in contrast to a divergent design approach which broadens the perspective and considers and develops many possible responses before selecting one or many to trial.

Implementation of a linear problem-solving approach was also compounded by staff feeling pressured to act quickly:

[Interviewee 4] "The [case study agency] is exceptionally fast paced in comparison to other agencies. So one of the biggest problems that we had in working was that we were - let's get this done, let's go do it you know, let's work this out... That also does have a negative though, from a toolbox and a project perspective because we need to just get in and get it done. You don't really have that time to reflect and to think of new ways of doing it".

Interestingly, the agency did adopt a much stronger reflective practice towards the end of the project when they realised the ineffectiveness of using rules-based approaches to investigate a

complex issue. This led to more dynamic group discussions at a steering committee level, trialling of more experimental analytics and investigations methods and the redesign of existing audit models to encourage staff to make more unique judgements in response to each situation.

While learning through challenging experience is necessary, we propose that regulators can be better supported to deal with complex problems through the introduction of new approaches from systemic design.

Q2: Current problem-solving practices – separation of planning and implementation

The teams involved in the project adopted a common practice in management and policy of having one team plan the project and a separate team implement it. While this was partly done to navigate resource constraints, it was clear that many of the staff involved in the implementation phase did not properly understand the problem or the rationale for the adopted strategy and did not feel empowered to make adjustments. This was evident from some staff ignoring instructions to vary their audit approach and reverting to standard practice. Other staff were aware of issues in the original project plan including unrealistic timeframes but did not feel empowered to make adjustments. In contrast, a systemic design approach aims to build a core design team including staff with diverse skills and expertise to drive a project throughout planning and implementation phases. This allows a common frame of reference to be developed and for the strategy to be frequently adjusted based on project learning (ThinkPlace, 2016).

Q3: Contextual factors influencing problem solving – networked problems and separated government entities

One of the most interesting findings from a systems perspective were the challenges the regulatory agency had in acting against a problem which exists in a much broader context than its own organisational focus. As Dorst has identified “The passing of structures and systems of the industrial age and the rise of the networked society have resulted in open, complex, dynamic and networked challenges that can only be successfully met by organisations that are ready to become open, complex and networked themselves” (2016, p. 7). While the case study agency acted as a leader in an attempt to bring other government stakeholders together, these efforts were hampered by other agencies not viewing the problem as a priority, not accepting responsibility to help address the problem and having different perceptions of the problem.

We believe that a major contributor to the difficulty in government agencies collaborating on a problem that exists broadly in the sector, is the strong structural separation of these agencies and the emphasis on accountability through demonstrating control and effectiveness. Each government agency has objectives within a specific area that they are held accountable for. Although guiding policy documents usually always encourage a ‘whole-of-government’ or ‘joined up government’ approach, when an agency’s budget assurance (i.e. job security) and public reputation (i.e. pride and personal wellbeing) are tied to demonstrating effectiveness against stated objectives, it is easy to see how collaborative efforts may slide. Stacey (in Stacey and Griffin 2007) writes extensively about this issue and the “cult of performance that replaces purpose” (pp.15-42) within public sector organisations when private sector accountability models are imposed. As one of the case study agency managers expressed:

[Interviewee 2] “Everyone’s got their own priorities and that was part of the clash in [case study problem], you know, everyone tries to focus on their own priorities and each other’s may not be shared”.

Seen from a systems perspective, establishing government agencies to manage issues within very specific segments of a market is akin to compartmentalising problems in order to improve the whole (Veale 2014; Dorst 2015b). Soft-systems and complexity theorists claim that while this approach may be adequate to manage very ordered systems, it is not effective to manage whole systems which are dynamic and in constant flux (Checkland, 1994; Snowden and Boone, 2007). This is the realm of complexity, which practices like systemic design are evolving to address.

Q4: Which elements from practice might benefit from a systemic design approach?

A range of initial case study findings and opportunities for systemic design were presented to the case study agency as below.

Case study findings	Systemic Design Approaches
Difficulty developing common understanding, acceptance of responsibility and response to the problem amongst other organisations within the system	Jones (2013) states that participatory methods are an important foundation for design within complex social systems. Facilitated workshops offer the opportunity for stakeholders to come together around a problem and develop a shared frame of reference, consider various perspectives and to develop a pathway for action (Dorst, 2016).
Reliance on internal skills and data to address the problem	Design methods focus on understanding a range of perspectives through research, collaboration or simply mapping and considering the needs of broader stakeholders (Jones 2014).
Early focus on solutions without a broader understanding of the problem and its context	Design methods focus on gaining a broad understanding of the problem context so that a problem can be reframed before solutions are developed. This encourages a divergent approach – where new information leads to new responses, rather than a convergent approach where solutions are determined based solely on the information at hand, limiting perspectives, solutions and effectiveness (Dorst, 2015).
Separation of planning and implementation with a view by some staff that plans cannot be adjusted	Design approaches encourage a core design team to be developed around a problem to support consistency and cohesive understanding throughout various stages of a project (ThinkPlace, 2016), as well as methods that co-evolve the understanding of a problem with the development of solutions (Dorst and Cross, 2001). Reflective practice is encouraged to adjust project plans throughout implementation (Schön 1984).
Incremental innovation until much later in the project	The introduction of design innovation methods early in the project disrupts traditional thinking and explores many ideas and opportunities quickly and cheaply. Ideas have an opportunity to be raised and testing in a more dynamic group environment (Dorst, 2015).
Difficulty of staff accepting and implementing new approaches	It is recommended that some staff involved in the implementation phase are involved in design workshops to ensure they understand the issue and contribute to a solution. Representation from various skill

Case study findings	Systemic Design Approaches
	levels within an organisation also ensures diversity of perspective. Frontline staff in particular can provide valuable information about stakeholder needs (ThinkPlace, 2016).
Working aesthetic limited to written documentation, data analytics and formal steering committee meetings	While the dominant government working aesthetic is connected to making serious and accountable decisions (Bailey & Lloyd, 2016), creative practices introduce visual and playful learning which have the ability to disrupt traditional patterns of thinking (Dorst 2015). Systemic design includes deeper methods to understand the complexity of a system and fast, generative methods to stimulate new ideas.

Based on these recommendations, a series of systemic design workshops were designed and implemented to support the agency address a new systemic risk that emerged. The workshops prioritised building a partnership approach with other government agencies, understanding the problem from multiple perspectives, and considering new ways to address the problem outside of only standard regulatory practice and legislated activity. Future research will include an analysis of these systemic design interventions and whether they need to be adjusted for adoption within the regulatory context.

Conclusion

In this paper we consider how regulatory agencies address complex problems, firstly from a theoretical perspective and secondly from the findings of a practice-based case study. It is clear from this study that regulatory agencies are beginning to recognise complex or systemic problems in the markets that they regulate and consider how they can be better addressed. Systemic design methods provide an opportunity for regulators to develop interventions which better address the complexity of social problems and help to navigate the challenges of disjointed governance systems through framing and co-design.

Introduction of new methods such as systemic design would need to be supported by a strong understanding of organisational learning and change. This is particularly important within an environment that maintains long-held rational assumptions about the ability to predict and control problems through pre-determined strategies. However, the case study agency has already demonstrated a willing openness to experiment with new approaches. Developing a systemic design practice may just require further opportunities to trial new methods, documentation of outcomes, and iteration within this specific context.

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