PUBLIC SERVICE RESEARCH GROUP
ISSUES PAPERS SERIES

The PRSG paper series offers contemporary research-based thinking about topical themes for public service and the public administration community. These papers seek to: outline and summarise the existing evidence base around important topics; set out future research priorities; and, provide accessible summaries of new research. Through these publications we seek to help translate research into practice and to help build academic debate. The paper series comprises two types of papers: Issues Papers and Briefing Papers. Issues Papers are state of the art reviews of the literature around important themes within the public administration literature. These papers aim to map existing evidence, outline the main issues known on these topics, where the gaps are and what areas for future research might be.

TABLE OF **CONTENTS**

EXECUTIVE SUMMARY

Much has been written about systems thinking and its potential application in public administration. However, to date there is no clear consensus about its key concepts or methods, and very little empirical evidence exists to guide system level stewardship practice for those working in government. In this paper we review and synthesise the literature to first provide an overview of core systems ideas and theory. Second, we propose a practical application of systems thinking in four key areas of stewardship which may assist people working within and with government to deliver public policy outcomes in complex and dynamic service environments. In doing this we address the key question: how can governments and others design, deliver and evaluate effective policy and manage risk in complex and dynamic environments?

First we propose that stewardship needs to incorporate a focus on supporting cooperation among stakeholders if it is to achieve outcomes. Departments can apply policy levers to foster cooperation among actors within and interacting with service systems so that people can navigate the service system seamlessly and with confidence. Such a role involves designing and delivering policy under individual departments' purview, and also contributing to a service system that can work in concert across jurisdictions and sectors to achieve shared goals.

Second, we suggest it is important to understand the implications of different types of complexity in public service delivery. We apply the current policy literature to demonstrate how different types of complexity can impact on compounding marginalisation and increasing disadvantage, and policy activities that might be undertaken to address these.

Third, we argue that a systems approach encourages clarification of policy goals at multiple system levels and builds in capacity for learning and improvement. This involves a shift away from existing information structures and flows to a system that supports the collection and use of data across multiple jurisdictions to improve service and to understand and monitor changes in market conditions, client outcomes, and public benefit. We offer an employment services example that highlights how different types of de-identified data might be disaggregated and used at different levels of the system from micro to macro to interrogate and achieve different policy questions and goals.

Fourth, a systems approach forces a reconsideration of individualised incentives and support for collective action solutions and partnerships. A key weakness in the institutional architecture of many systems engaged in delivering public services to common groups of citizens is the lack of an incentive framework to act outside achieving individual program and organisational key performance indicators. Addressing policy issues like long-term unemployment, social and economic inclusion for people with disabilities, health or environmental issues calls for a coherent funding and performance measurement regime that rewards collective-action solutions and partnerships between services across jurisdictions to participate meaningfully in the community.

INTRODUCTION

Why systems thinking and why does it matter?

WHAT IS SYSTEMS THINKING?

Many different definitions of systems thinking can be found throughout the systems community, and the term has been defined and redefined in different ways since it was first coined by Barry Richmond in 1987. Concerned with what he described as a growing web of dynamic interdependencies that were giving rise to increasingly complex and difficult problems in a globalising world, Richmond saw an increasing gap between the nature of problems and people's capacity to understand and solve them (Richmond, 1994). He argued for new ways to understand the underlying roots of complex problems and behaviours in order to better predict and ultimately to alter and reshape their impacts and outcomes. Systems thinking, "*the art and science of making reliable inferences about behaviour by developing an increasingly deep understanding of underlying structure*" (see Arnold, 2015, p.671), is manifestly concerned with the behaviour of systems and how elements within them interact to give rise to various outcomes.
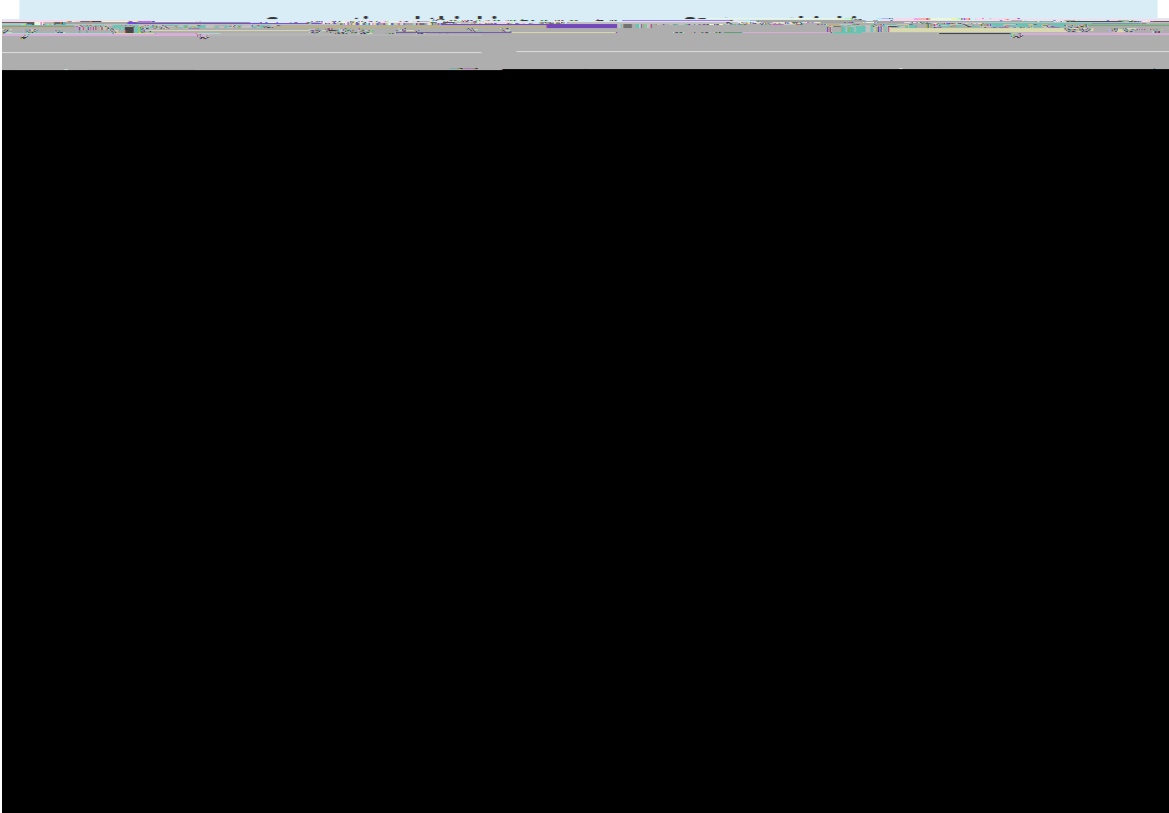
Senge (1991, p.683) described systems thinking as "a discipline for seeing wholes and a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots." Systems thinkers emphasize the dynamic, often unpredictable, interactions among diverse, and constantly adapting parts of a whole system. They study patterns of connection between components that give rise to larger wholes, not just the component parts themselves. Patterns of connection are more often web-like than linear and systems cannot be reduced to their individual parts, since the interaction of the elements produces outcomes that are greater than the sum of the parts themselves. Braithwaite, Churruca et al. (2017, p.5) note,

Reducing a system to its component parts is like inspecting the legs, body, neck and head separately and expecting to understand how a giraffe works. Instead of pursuing such reductionism, complexity scientists aim to study the properties and characteristics of the system.

Taking a systems thinking approach challenges mechanistic assumptions of causality, moving beyond reductionism to more nuanced notions of cause and effect (Chapman, 2004). By exploring the connections between elements, and giving the connections equal status to elements, systems thinking focuses on understanding the inter-relationships, interactions and system boundaries that give rise to, and at the same time constrain or enable, possibilities for action and change (Abercrombie, Harries & Wharton 2015; Johnston, Matteson & Finegood 2014).

In focusing on connections, systems thinking reframes how problems are understood and addressed, and how people and resources are engaged in such processes. While there are different approaches to systems thinking and it remains a rather loose collection of analytical perspectives, there are consistent themes around connection, shared responsibility, and the importance of context. Normative examples that illustrate key differences between systems and conventional thinking have been developed by a number of different organisations. An example from the Australian Prevention Partnership identifying differences in the way problems are identified and resolved is shown in Table 1 (Australian Partnership Prevention Centre 2019 p.3).

Such understandings point to fundamental conceptual difficulties in applying traditional notions of planning, monitoring and evaluating policy and program interventions. Although complexity-aware approaches are gaining strength, there is still little empirical evidence of what it takes to implement them in practice. This raises difficult questions, not least, the extent to which policy makers can be held accountable for policy outcomes when these depend on interactions among so many actors, ideas and structures in complex systems. How should they go about understanding their role in relation to implementation of policy and how best can they do it in circumstances where there may be limited opportunities for shaping interactions?

Early proponents of systems thinking (see for example de Greene, 1993) argued that all people in decision-making roles should have a solid grasp on systems thinking since it was seen as providing the theoretical and practical tools for seeking solutions to messy social and organisational problems at multiple levels

PROPERTIES OF COMPLEX SYSTEMS

Meadows (2009) suggests that a system is a set of organized related components that work together in a particular environment to perform whatever functions are required to achieve the system's objective. A system is delineated by its spatial and temporal boundaries, and is surrounded and influenced by its environment. One way to recognise a system is to describe its purpose and the way the structure supports that.

The Cynefin model (Box 1), a widely recognised model for classifying systems, posits the existence of four types of systems: complex; complicated; chaotic and simple (Snowden and Boone 2007).

Complex systems are greater than the sum of their parts: Parts interact, share information, combine and recombine to produce systemic behaviour

Flux: Neither the system nor its external environment are constant

Individuals within a system are independent and creative decision makers

Uncertainty and paradox are inherent within any system. Problems that cannot be solved can nevertheless be "moved forward". Effective solutions can emerge from minimum specification

Opportunities for leverage: Small changes can have big effects

Attractors: Behaviour exhibits patterns, termed attractors. Change is more easily adopted when it taps into attractor patterns

Emergence: larger things emerge from smaller parts

Emergent behaviours: Behavioural patterns can change quickly accelerated by behaviours not part of the original design

Interconnectedness: Systems thinking requires a shift in mindset, away from linear to circular.

Feedback loops: Since everything is interconnected, there are constant feedback loops and flows between elements of a system. We can observe, understand, and intervene in feedback loops once we understand their type and dynamics.

Path Dependency: It is difficult to change established practice and time will be needed to reconcile new with old arrangements. Changes that contradict lessons from the past will be most resisted

Tipping points: Systems can be about to undergo a period change which may or may not be obvious to observers

Causality: as a concept is about being able to decipher the way things influence each other in a system. Understanding causality leads to a deeper perspective on agency, feedback loops, connections and relationships, which are all fundamental parts of systems mapping.

Synthesis: As opposed to analysis, which is the dissection of complexity into manageable components and fits within a mechanical and reductionist worldview, synthesis is about understanding the whole and the parts at the same time, along with the relationships and the connections that make up the dynamics of the whole.

Four types of complexity can present in complex systems (French and Lowe 2018):

- **Compositional complexity**, which results from the interdependence and inter-determinance of causal factors leading to the creation of outcomes
- **Dynamic complexity**, which results from the coevolution of interacting factors and the instability inherent to complex systems over time
- **Experiential complexity**, which results from the variation in how outcomes are experienced by individu-

SYSTEMS METHODOLOGIES AND POLICY TOOLS

The focus on dynamism and uncertainty in complex systems draws researchers away from traditional linear methods and the use of grand theory in understanding change processes (Cairney, Heikkila & Wood 2019). Greenhalgh and Papoutsi (2018, p2) explain:

Because the system is dynamic (turbulent, even), the conventional scientific quest for certainty, predictability and linear causality must be augmented by the study of how we can best deal with uncertainty, unpredictability and generative causality. For this, we need research designs and methods that foreground dynamic interactions and emergence – most notably, in-depth, mixed-method case studies that can act as concrete, context-dependent exemplars, including powerful ethnographic narratives paying attention to interconnectedness and incorporating an understanding of how systems come together as a whole from different perspectives.

The most advanced systems methodologies seek to model systems and/or subsystems to identify potential leverage points for intervening in a system to create change (Carey, Malbon et al. 2015). Hard systems methodologies produce quantitative dynamic models to examine system dynamics. Soft system methodologies emphasise the contingent nature of policy making and problem definition, and focus on the human activity side of systems (Checkland & Scholes, 1999). They draw on qualitative action-based research and case study analyses, often focused on understanding change processes or innovation.

The most common systems methodologies include: systems mapping, systems dynamics, network analysis, agent-based modelling, system effects, action-based research and case studies. Table 2 contains a description of systems methods outlining examples of their application and contribution to knowledge.

Table 2: Systems methodologies

System Effects	The System Effects methodology emphasises the varied nature of social phenomena, their causes and consequences, while at the same time giving policymakers tools to understand the complex nature of how those varied factors manifest at the community — or population — level. System Effects can be used to support the design, implementation and evaluation of interventions aimed at changing the structure of complex adaptive systems to drive particular outcomes. By beginning from the 'user' understanding of complex systems, the methodology helps to re-centre lived experience in social science and policymaking practice.	Craven 2017; Roesel et al. 2018
Case studies	Case studies explore contemporary phenomenon within their real life contexts, especially when the boundaries between the phenomenon and the context are not clearly evident	Greenhalgh 2018; Gardner 2010

Some authors advocate a shift away from theory toward tools to guide policy action. Adopting an action focus is critical to many systems thinkers. Price, Haynes et al. (2015) for example developed the Brighton Complex Systems Toolkit containing 7 key tools for policy makers. These are outlined in Box 3.

Box 3: The Brighton Complex Systems Toolkit

1. Identify the properties and members of the system
2. Think of leadership as the actions of many people, not just a CEO
3. Encourage a sense of self-organisation in systems rather than seeking top-down control
4. Accept that people must use short cuts to gather information and make decisions
5. Develop appropriate ways to scan for information
6. Experiment with policy interventions rather than seeing policy as key events
7. Evaluate policies regularly to 'do more of what works and less of what doesn't

In a similar vein, the Lankelly Chase Foundation in the UK has identified common qualities in systems that they suggest are effective in responding to severe and multiple disadvantage (See Box 4). They argue that perspective, power and participation, rather than any specific methodology, are the keys to addressing complex policy problems (Lankelly Chase, 2019), a view consistent with other models of systems thinking.

Box 4: Lankelly Chase System Behaviours

The focus on change is paramount for systems thinkers. A key principle is that change can be achieved through identifying leverage points or as Meadows (2009) puts it, places in systems where small changes could lead to large shifts in behaviour. She identifies 12 main places to intervene in a system (Box 5).

Box 5: System levers

PLACES TO INTERVENE IN A SYSTEM - (in increasing order of effectiveness)

12. Constants, parameters, numbers (such as subsidies, taxes, standards).
11. The sizes of buffers and other stabilizing stocks, relative to their flows.
10. The structure of material stocks and flows (such as transport networks, population age structures).
9. The lengths of delays, relative to the rate of system change.
8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.
7. The gain around driving positive feedback loops.
6. The structure of information flows (who does and does not have access to information).
5. The rules of the system (such as incentives, punishments, constraints).
4. The power to add, change, evolve, or self-organize system structure.
3. The goals of the system.
2. The mindset or paradigm out of which the system — its goals, structure, rules,   delays, parameters — arises.
1. The power to transcend paradigms

http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/

In terms of designing successful stewardship interventions in complex systems it is of note that the interventions most likely to create real change are reconceptualisations of the goals, structure and rules; creating new ways of working (paradigms) or seriously changing the power differentials. As we apply this in the next section the reasoning behind using a system lens to create alternative ways of delivering public service becomes apparent if there is to be real change - for example, some current approaches in Indigenous affairs seek to change the power distribution across the system.

HOW HAS SYSTEMS THINKING BEEN APPLIED TO STEWARDSHIP OF PUBLIC SERVICES?

A large body of literature applying systems thinking to stewardship and policy processes has sought to reconceptualise the nature of policy processes themselves, and to better understand how change happens in complex systems and how change and improvement might best be supported. Contributions fall largely into three areas (see Appendix 2 for example papers)

here is that individual actors in such systems have different drivers and different levels of tolerance for risk. It is reasonable to assume that private firms deliver public services and support on behalf of governments to serve the best interests of their shareholders, not to maximise the public good. From their perspective, sharing information, networks, power and resources may not be in their best interest. Similarly, it is also reasonable to assume that not-for-profit organisations may not willingly share their information, networks, power and resources with private firms seeking commercial gain from that exchange. Such systems require careful stewardship and astute use of data and policy levers.

Such a role involves designing and delivering policy under individual department's purview, and also contributing to a service system that can work in concert across jurisdictions and sectors to achieve shared goals. As the Productivity Commission (2017, p. 85) describes:

Government's stewardship role involves making sure that those providers that are best placed to achieve outcomes *are in a position to do so. Good stewardship should ensure that the only barriers to entering (and exiting) a market are those necessary to ensure positive outcomes for users and the overall effectiveness of service provision.*

2. Understand the implications of different types of complexity in public service design and delivery

The four types of complexity identified by French and Lowe (2018), referred to earlier in this paper, are not mutually exclusive. They flag where government should consider the implications of policy decisions and action from different perspectives.

Table 4: Implications of different types of complexity in stewardship of public services

Type of complexity	Features	Example of potential action
Compositional complexity	Individual characteristics, geographic, familial, social, systemic, societal and economic factors can compound people's marginalisation on multiple fronts	Person-centred design
Dynamic complexity	Systems are not fixed and stable, which can hamper cross-government and cross-sector collaboration and increase some people's disadvantage over time	Monitor service gaps and overlap and identify shared areas for improvement.
Experiential complexity	People facing multiple and complex barriers to participating fully in society and the economy struggle to access public services built on underlying assumptions about their needs and circumstances.	Co design
Governance complexity	Various arms of government, their agents and organisations providing public services to common groups of citizens have competing or conflicting demands, aims or drivers.	Identify shared problems and common goals. Factor flow-on effects of policy reform into cost-benefit analysis.

levels of the system and agreeing collections of data with different stakeholders.

Figure 1: Conceptual framework for using data in the employment services systems
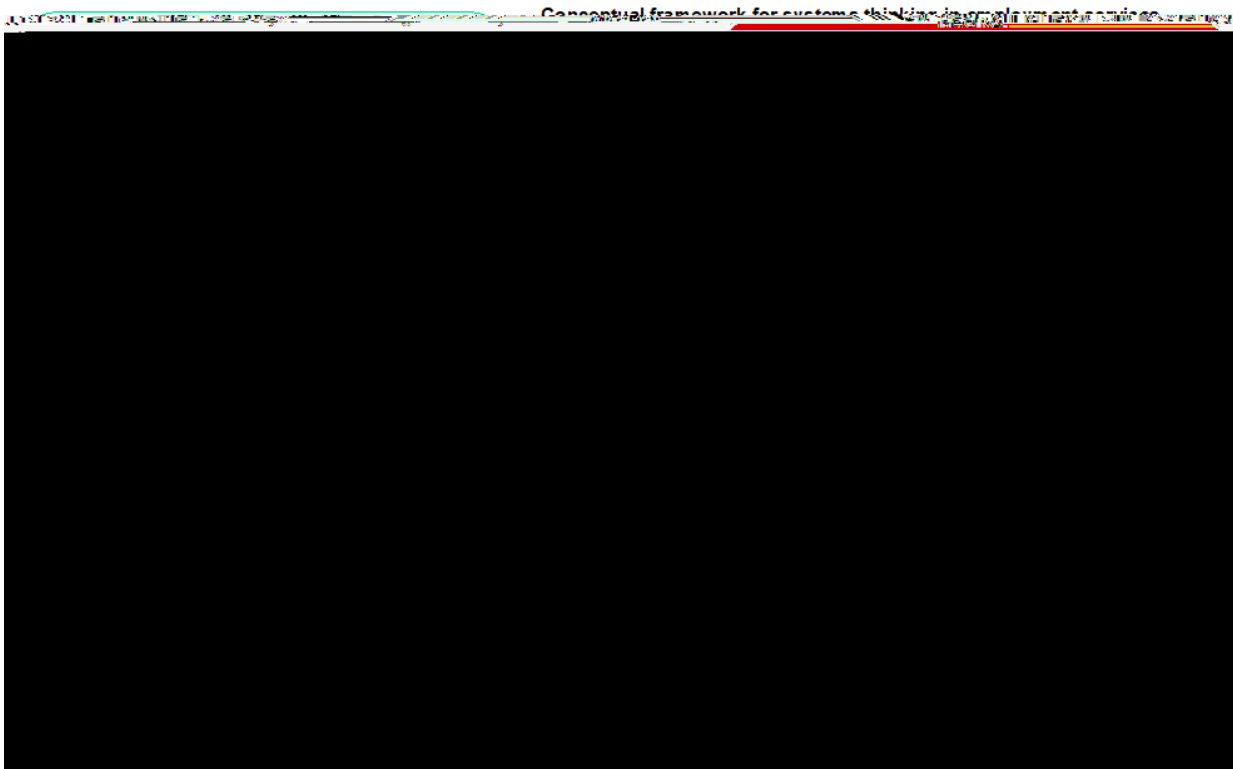
4. Reconsider incentives and extend performance management processes to support collective-action solutions and partnerships

There is usually no requirement or incentive for service providers within or outside government to consider the consequences of their interaction with people beyond their individual key performance indicators, and their efforts are not always mutually reinforcing. This is a key weakness in the institutional architecture of many systems engaged in delivering public services to common groups of citizens. Addressing policy issues like long-term unemployment, social and economic inclusion for people with disabilities, health or environmental issues, for example, calls for a coherent funding and performance measurement regime that rewards collective-action solutions and partnerships between services across jurisdictions to participate meaningfully in the community.

In theory, the market model of government services promises responsiveness, td326 r2Tronmentalpae9.rleln theo

From: Gardner, Olney, Dickinson 2018, https://health-policy-systems.biomedcentral.com/articles/10.1186/s12961-018-0401-2

This review has highlighted areas in which systems thinking can be applied to future research and practice. It is hoped that applying lessons from the literature and taking action across any or all of the four areas of stewardship discussed above will assist policy makers and other stakeholders in government and the services sector to improve the design, delivery and evaluation of effective policy and to manage risk in complex and dynamic environments. For the Public Service Research Group, systems thinking and stewardship will continue as major areas of research activity in an effort to further develop the evidence base.

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APPENDIX 2 EXAMPLE PAPERS

NOTES