SYSTEMIC INNOVATION AND COLLABORATION: NEW LEADERSHIP APPROACHES FOR PUBLIC POLICY AND SYSTEMS CHANGE

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Approval of the Dissertation

SYSTEMIC INNOVATION AND COLLABORATION: NEW LEADERSHIP APPROACHES FOR PUBLIC POLICY AND SYSTEMS CHANGE

This Dissertation by Roderick A. Campbell has been approved by the committee members below, who recommend it be accepted by the faculty of Saybrook University in partial fulfillment of requirements for the degree of

Doctor of Philosophy in Managing Organizational Systems

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Abstract

SYSTEMIC INNOVATION AND COLLABORATION: NEW LEADERSHIP APPROACHES FOR PUBLIC POLICY AND SYSTEMS CHANGE

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We are increasingly facing highly interdependent issues that span stakeholder, jurisdictional, and geopolitical boundaries which have to be managed rather than solved. We know that traditional policy and management approaches can make a useful contribution; however, the wide variety of wicked problems evident in contemporary public policy challenges call for new approaches. This dissertation proposes a framework for the use of systems and systemic leadership, including cybernetic aspects, to improve the way that organizations can be diagnosed in the complex change situations that must be managed.

Using the case study research method, this dissertation examines the main organizational and leadership dimensions emerging from members of the systems community represented by the International Society for the Systems Sciences and the OR Society. Through literature review and interviews, I identify several recent approaches to systems thinking. collaboration and coordination and the adaptive leadership roles of public sector leaders, policymakers and managers.

Study responses were analyzed to develop a new leadership framework which includes systems the systemic leadership. This framework could signify an opportunity to help build capacity to lead networks of individuals, organizations, and societies of people to learn together

systemically in pursuit of an aim of successfully managing the organizational and situational aspects of the issues that comprise most wicked problems.

The outcomes of this study of systems science use in public policy, specifically wicked policy problems, expand the use and application of systems-based approaches, methods, and strategies to include the field of public policy and administration. By identifying and articulating these approaches, this study fills in a knowledge gap in the literature and practical application of systems use in policy, and affirms the existence of a systems-policy interface, which serves as the basis for additional research and applications, prospective new theories and collaboration, and an emerging field of study.

Dedication

For Alex and Miguel.

Acknowledgments

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CHAPTER 1: INTRODUCTION

> Public policy practitioner approaches to management of problems that affect people can be broadly described under two categories. One is adherence to top-down, expert-designed projects, and the other is the involvement of people in the analysis of problems that affect them and in the design of potential solutions. In the latter participatory approaches, all those involved contribute both to the creative thinking that goes into problem solving and planning. (Jackson, 2019, p. 266)

Overarching Issue

This dissertation examines the main organizational and leadership dimensions emerging from systems-based approaches to addressing wicked problem complexity and stakeholder divergence based on the literatures on systems science, leadership theory, and the processes of stakeholder dialogue. By "wicked problems," I mean those that are complex, unpredictable, open ended, or intractable. Because most singular or set of leaders and decisionmakers (e.g., the manager or policy expert) and policymakers (an elected or appointed official, government agency or legislator) usually view public policy as "designating behavior of some actor or set or actors" (Anyebe, 2018), as originally defined (Churchman, 1967; Rittel & Webber, 1973) "wicked problems" seem incomprehensible and resistant to solution. As problems are conceived and described in the analytical frame, there is a historical terminology of "solutions" to wicked problems.

In fact, intractable disputes, according to Rein and Schön (1996), are likely to be grounded in different "frames" and value perspectives rather than disagreements about scientifically verified knowledge. Wicked policy problems therefore are not able to be understood and solved by scientific reports and new research. Such issues can only be understood and discussed clearly by addressing the value perspectives that frame the understanding of issues and possible solutions. Further, it is possible to frame partial, provisional courses of action against wicked policy problems. With this understanding, I can consider how

the structures and processes of public policy and management complicate the task of understanding these problems and of designing responses to them. As a result, managing wicked problems may call for policymakers and decisionmakers to design innovative ways of thinking, leading, and managing an organization that recognize the complexity of their issues and processes, and that make new demands not only on their own leadership and organizational systems but also on other relevant actors, stakeholders, and institutions in the policy environments.

Systems thinking in this way can be helpful in understanding the complexity dimension of wicked problems, but it is less applicable for addressing the ethical, voice, and equity related aspects of a wicked problem. The soft systems method approaches of cognitive mapping (Toulmin, 2001), causal mapping (Bryson et al., 2004), and logic modeling (Millar et al., 2001). The research literature on addressing complex problems suggests that public officials (policymakers and leaders) should forge new ways of thinking, learning, managing, and organizing that recognize the complexity of the issues and processes.

How do they do this? Policymakers engage at every level of a biological or social system hierarchy: cells, organs (i.e., composed of cells), organisms (i.e., independent life forms), groups (e.g., families, committees, working groups), organizations (e.g., communities, cities, corporations, universities), societies or nations, and supranational systems (Capra & Luisi, 2014). Engaging at these levels propels leaders and policymakers to solutions not contemplated before. These complex problems are the staple of policymakers' and researchers' operations in public sector environments. This raises the question: At what level should public policy dilemmas be assessed? Are real-world occurrences analyzed by events, patterns of behavior, systems structures, or mental models? Can policymakers gain a better understanding of how decisions are

made and work toward improved public policy solutions? Can policymakers, through systems approaches to practice, develop best practices for practitioners in the development of our nation's and global public policies? In the words of the Organisation for Economic Co-operation and Development (OECD), an international organization that works to build better policies, applying a systemic lens to complex problems is useful for mapping the dynamic of systems underpinning the problem. At issue is how system components affect suprasystem functioning and what interventions can lead to better results (OECD, 2019, p. 10). There is value to expanding our view of problems and problem sets we face, which occurs when we adopt and use the best tools to better comprehend policy dilemmas. For decades, policymakers have tried different techniques and approaches to address complex problems. In the disciplines of biology and ecology, scientists recognized the need to understand the best methods or a rubric for solving problems in their disciplines (Capra & Luisi, 2014, p. 39). Their experiences can be exemplary for policymakers, who similarly need to understand the interacting elements of systems they inhabit and expect to influence.

A systems perspective should guide public policy practice, education, research, and policy for transformational change in public sector systems. In this dissertation, I reason that a systems perspective—a consideration of all individual, team and society boundaries, norms and values that impact policy and their dynamic interactions over time—should be central in future policy practice, education, research and policy. A critical way of advancing this objective would be to highlight key systems thinking tools and strategies that have the potential for transformational change in the systems of public policy and administration.

Policymakers need higher-level techniques, tools and skills like systems thinking to address business and policy problems. Policymakers think of systems thinking as Business

leaders who use systems practices have great insights. For instance, the case of Foodcom (Maani, 2016) explains why and how conventional management of the supply chain—whereby sales sets its own target, supply chain forecasts another figure, and finance budgets for another number—resulted in endemic dysfunctional behavior. Management and staff came to see that using simple systems thinking tools with novice users had profound and enriching effects within their organizations (Maani, 2016). This management breakthrough required the foundational concepts of systems theory, a process of reasoning called synthesis, and its counterpart process, analysis. It is but one example of why it is important for managers and policymakers to have knowledge of systems methodologies.

As the Foodcom example demonstrated, the dilemmas leaders face rarely present as issues of individual concern or as single problems); rather, decision makers more often face a series of interdependent problems that require a wider lens and consideration of multiple stakeholders. We have become aware that we are embedded in what theorists call "complex systems that are dominated by dynamics that are often beyond our control" (Probst & Bassi, 2017, p. 3). As policymakers begin to see the problems they face and, most importantly, can describe and articulate those problems to secure stakeholders' involvement, the better they become at addressing them (e.g., externalities and policy implications of one family facing homelessness, treating meth addiction in a community, mitigating ocean pollution.

Adopting the systems paradigm helps decision makers gain an awareness of their processes of reasoning and the corresponding assumptions, strengths, and limitations. That awareness requires the development of higher-level skills, such as critical and divergent thinking, analysis, synthesis, and problem solving. Acquiring these skills and competencies could enhance policymakers' ability to comprehend and address major problems afflicting them globally.

Systems thinking and practice can help leaders and policymakers respond to growing organizational and societal complexities by moving leadership out of a traditional bureaucratic model and into a more adaptive model better suited to today's complex organizations and environments. Jackson (2019) highlighted an IBM survey results of more than 1,500 chief executive officers worldwide and noted, "The world's private and public sector leaders believe that a rapid escalation of 'complexity' is the biggest challenge confronting them. They continue—indeed, to accelerate—in the coming years" (p. xvii). This should prompt inquiry into how leaders and policymakers like CEOs, governors, mayors, and alderpersons engage in complex environments. Surely, public sector institutions such as city councils, legislatures, and other policymaking bodies engage in policy interventions designed to address issues of concern at every level of hierarchy; but do the resulting policy interventions produce optimal, targeted outcomes given the complex environment? If not, can policymakers and researchers refine their processes to further develop approaches and combinations of approaches that will work in the environment?

The Value of Systems Approaches

For those that work with and in public sector systems, attempting to influence the unforeseen dynamics of well established, change resistant, and complicated governance systems is a perplexing challenge. According to Hammond (2003):

> The transition from manipulative to participatory conceptions of management can be seen most clearly in the evolution from the initial "hard" systems approaches of the 1940s and 1950s to the interactive and "soft" systems approaches represented in the work of Russell Ackoff and Peter Checkland and the more recent critical systems approach based on the work of Werner Ulrich, Michael Jackson, and Robert Flood. (p. 87)

As Hammond indicated, there is value in moving from hard management, often based on scientific management principles, to a soft systems approach. As we shall see, adding an ethical or social impact lens necessitates another lens, that of critical systems thinking.

Systems thinking practices, including critical systems thinking, are a way of moving from finding out about a problem to fixing it. Theorists have identified a process that policymakers can use that displays the systemic structures underlying the complex systems in which they operate and illustrates the value of systems thinking approaches in public issues decision making. Checkland and Poulter (2010) provided that systems thinking:

> Is an approach for tackling problematical, messy situations of all kinds. It is an action-oriented process of inquiry into problematic situations in which users learn their way from finding out about the situation, to taking action to improve it. The learning emerges via an organizational process in which the situation is explored using a set of models of purposeful action (each built to encapsulate a single worldview) as intellectual devices, or tools, to inform and structure discussion about a situation and how it might be improved. (p. 191)

Because policies are conceived, implemented, and orchestrated in intricate networks of physical, biological, ecological, technical, economic, social, and relational environments, attempts to inform this work with research must account for that complexity. Using a systems lens allows for translating mindsets and paradigms and fosters significant progress toward resolving dilemmas. As Weick (1995) described:

> The dynamic and uncertain quality of a turbulent environment reshapes the actors' field of possibilities. Recognizing the new field of possibilities, powerful actors compete or collude to construct the new "rules of the game" by attempting new constructions of the situation which would further their objectives. (p. 41)

Public systems leaders, if guided by a sense of civic pride and desire to serve others, could encourage both their organizations and the surrounding networks of oversight and subordinate agencies to operate in a more evergreen and sustainable manner. Policing, human services, environmental protection, planning, housing, waste, and energy are all domains in which systems approaches have proven or emerging efficacy (OECD, 2019). OECD argued for a focus on decision making and problematization to account for uncertainty while managing great complexity in a volatile environment.

Many policy problems are complex, interconnected, and characterized by causal relationships; when solved in isolation, they often contribute to successive, compounded problems. These policies are formed in environments that are dynamic and complex. Dynamism in these complex environments has been dubbed *VUCA* by the U.S. Department of Defense:

> The defense and intelligence communities have called this the VUCA world, which originally described the Volatility, Uncertainty, Complexity and Ambiguity left behind by the end of the ordering function provided by the Cold War. Today, technology, decentralization, the rise of no-state actors and other factors have accelerated the rise of VUCA in every domain. Labor markets and financial systems are more and more interconnected which means that it becomes increasingly difficult to identify causes and effects of complex problems. (OECD, 2019, pp. 2–16)

That difficulty exists for policymakers in VUCA policymaking environments from city councils to federal governments to international policymaking organizations such as the United Nations. For these leaders and policymakers, VUCA problems include issues of systemic racism; climate change; the challenges of public safety; specified populations' inability to access quality education and healthcare; barriers to combat sustained, inclusive growth; and the design of sustainable energy and water governance. To provide policymakers with the latest tool or combination of tools and strategies, this research will specifically focus on systems thinking practices in public leadership, organizations, and policy. It will also address the contribution of systems thinking to management practices generally and in specific organizations.

A critical reflection of this line of inquiry is that if policymakers seek to expand their influence in a turbulent policymaking environment, systems thinking tools can be helpful. Mohtar and Daherr (2016) provided that "improved exchange and the integration of scientific data and policy considerations into inclusive tools that address policy objectives and are technically viable for the perspective of sustainable resources utilizations" (p. 1) will have a substantial impact on policy implementation and policy systems. To understand the environments

in which policy is created, discussed, and implemented, a brief policy-oriented description of systems science is warranted. Systems science methodologies consider dynamic relationships between elements ranging from cells to individuals and organizations, and the impact that those relationships have on the entire policy system. Implications for research, policy and practice in public policy are significant (Homer & Hirsch, 2006; Sterman, 2006; Leischow et al., 2008). Many systems thinking approaches and methodologies have been successfully applied to health and other sectors (Jackson et al., 2003). Like health systems, public policy systems are bounded, defined, and circumscribed by the purpose(s) they hold. As public policy systems are generally outcomes-oriented, we can apply the definition advanced by Ackoff and Emery (1972), which stated the system is bounded and created to achieve its goal(s). Hence, elements of the system are operationalized based on their connection to the goal of the system. All systems thinking approaches have value if policymakers understand the rudimentary elements of systems thinking, its worldview, and applicable processes and practices. As Ison (2017) put it:

> It is possible to become more aware of the nature of this web. With awareness, new understandings are possible and form these new practices. One way to raise awareness is to ask new or different questions … *What do we do when we do what we do*? [emphasis added]. (p. 5)

As researchers, we know increased awareness of systems thinking and its tie to public policy can lead to new possibilities in problem solving in a VUCA environment. Existing research on multi-stakeholder decision making and systems approaches for managing complexity relies on proven systems approaches. These approaches are derived from historical systems concepts to address these nascent challenges and provide policymakers and researchers a road map for subsequent research and reflection. Systems thinking has the most promise for helping policymakers as they confront and resolve existing and future policy dilemmas.

Goals of This Research

There is renewed interest in using systems thinking to tackle wicked problems in policy (Bigland et al., 2020; Berry et al., 2018; Head & Alford, 2015). However, this creates a challenge because of the diversity and divergence of literature on the subject. Both systems thinking and the practices associated with it are highly complex and technical, and it is challenging for policymakers to master sufficient knowledge to apply properly. This problem can be addressed through systems education, literacy, and research that gives policymakers the tools necessary to address perplexing policy dilemmas. This study is designed to develop a conceptual framework for including systems tools in public policy deliberations to ensure evergreen, adaptable, and resilient leadership systems and collaborative, adaptive organizational structures. Through this research, I expect to discover leaders' systemic practices, perceptions, and lessons learned in the conception and implementation of public policy. I will inquire about how policymakers and systems practitioners use the theories and tools of organizational development, operations research, systems thinking, and management science to address societal problems. I expect to discover whether and how systems, methods, theories, models, and approaches provide improvements to current problem formulation and resolution.

Researcher Expectations

Most public policy problems involve multiple stakeholders with varied interests and different perspectives. The role of a leader is to develop ways to ensure all perspectives are accounted for and all parties understand the perspectives of one another. The first step in any multi-stakeholder situation is to create a shared understanding of the problem. For the participants in this research, who are actively engaged in real-world problem solving at every level of hierarchy, this requires a common language and visualization tool for participants with

diverse perspectives to communicate with one another. This need is universal; it exists whether a group is addressing a global or a neighborhood concern. The ability of stakeholders to be fully engaged is essential to effective facilitation and the full and frank participation of all affected stakeholders. Whether the issue at hand is social, political, ecological, or economic, addressing it requires an understanding of systems involving mutual adaptive interactions and the comprehension and manipulation of characteristic patterns of behavior. Researcher and professor Steven Wallis (2016), in discussing the science of conceptual systems, opined each conceptual system provides a "lens" or framework of understanding that enables us to understand and engage the world. He wrote, generally, "A conceptual system is any form of theory, model, mental model, or policy that fulfills that purpose" (Wallis, 2016, p. 582). At its core, the promise of systems thinking for policy application is the realization that science can help anticipate and understand key patterns in interdependent public systems that involve or concern humans, thus enabling wiser decisions about policy interventions. Wallis (2016) indicated:

> In taking a more purposefully scientific and systemic approach, we will begin by defining a conceptual system more specifically as a set of interrelated propositions, conceptual maps, strategic plans, and policies. Any place where a concept is described in relation to another concept. (p. 582)

This can be better explained through example. A city is a highly complex system with individuals and organizations interacting on social, political, economic, and physical levels and constantly changing and adjusting to one another. When developing or improving on public systems, I expect to see evidence of stakeholder development of conceptual systems, systems, and organizational improvement through the implementation of systems practices, and unforeseen systems benefits through the scientific approach of systems thinking. It is the same type of process that a mayor who proposes a multiyear infrastructure process goes through.

Through a query of consultants, academicians, policymakers in systems organizations, and practitioners, I expect to extract illustrative case examples of exemplary leadership, indefatigable challenges, and opportunities for change through difficulty. I will seek examples of teams, individuals, divisions, and organizations advancing strategy through stakeholder/partner engagement, direction, and consulting. Further, I plan to explore whether there are new and creative approaches for public policy applications. Through existing scholarship, research, and field observation, I will be excited to discover new and unique combinations of approaches to solve wicked problems. Lastly, I expect to find examples of how practitioners employed existing systems practices, applied them to public policy, and what they learned and reflected upon through the process.

Origin and Purpose of Study

This research concept arose from my interaction with past and present stakeholders associated with the International Society of Systems Sciences (ISSS) and extensive discussions with systems community practitioners. The ISSS (originally the *Society for General Systems Research* has members from 30 countries from virtually every recognized discipline and it believes it is uniquely positioned to take the next step to foster a more systemic view of science and technology. Organizationally the ISSS has created Special Integration Groups (SIG) to ensure global multidisciplinary scientific cooperation. Through these discussions, a line of inquiry was developed and formalized and a conceptual framework was established. That line of inquiry explores the application of systems theory generally, systems approaches for organizational and people complexity, and the application of those processes and approaches to the wicked problems of public policy.

As we prepare to help policymakers navigate levels of hierarchy, we recognize it must all be managed though human interaction and thought. The area of systems sciences most adroitly connected with this phenomenon is people complexity (Jackson, 2019). Scholars who study people complexity have found that "systems involving people are unique and, as a result a radically different kind of approach is required if they are to be successfully managed" (Jackson, 2019, p. 341). Combining this finding with existing research on the systems lens, systems structure and behavior, and systems principles (Cabrera & Cabrera, 2015; Meadows, 2008), it is possible to discover, elucidate, and disseminate new approaches or combinations. This research is designed to discover those new approaches among a specified community of practitioners, namely the ISSS and related groups.

Application to Policy

Though the policy area of systems science is still an evolving and emergent field of academic study, there have been some noteworthy contributions. In the application of complexity and systems science as applied to policy (Johnson & Cochran, 2016; OECD, 2011), research has shown it is not the discipline of complexity science that should drive our present inquiry into practical applications, but the nature of complexity itself:

> Complexity is of course inherently systemic. What is crucially important about it is that it is systemic without being conservative. On the contrary the dynamics of complex systems are inherently dynamic and transformational. (Burns, 2007, p. 21)

Complexity in the policy domain is often characterized by the interlinkages between the sectors of a wicked problem, resources, scales, and a need for stakeholder dialogue. often defined in terms of the number of links among the elements of a system. Systems with a large number of links have high *combinatorial complexity*. However, most cases involving policy are characterized by *dynamic complexity*: the often-counterintuitive behavior of systems that emerge

from the interaction of system elements over time. In fact, policy resistance (Forrester, 1994; Sterman, 2006) has arose from the mismatch between the dynamic complexity of systems we have created and our cognitive capacity to understand that complexity (Sterman, 2006). Probst and Bassi (2017) asserted recognizing the nature of dynamic complexity is relevant for public policymakers:

> Because most countries face several concurrent challenges that simultaneously affect (and are affected by) social, economic, and environmental dimensions. To reach any stated goal and to shift closer to a sustainable development pathway, we need decisive policy interventions that will simultaneously support socioeconomic development and environmental conservation. (p. 4)

In a complex system, it is not uncommon for small changes to have big effects, and big changes to have surprisingly small effects, or for effects to come from unanticipated causes (Ghaffarzadegan et al., 2011). A contemporary example comes from the San Francisco Bay Area, where a region-wide power outage by a local electric utility had intra- and inter-state reverberations with cascading malfunctions across many sectors. Likewise, if a policy problem is mischaracterized, it can hamper identification of what caused the original problem and limit analysis of future behavioral paths and impacts. By remaining cognizant of interdependencies and cascading effects of policy actions, policymakers can decrease the externalities arising from policy decisions and deliver sustainable solutions. This has implications for the present inquiry and subsequent improvement to public policy practice. The ties between public policy, systems awareness, practice and methods, and the dynamic complexity of public systems form the basis for my inquiry into the application of systems thinking in policy.

A Purposeful Inquiry

Through this inquiry, I expect to conceptualize and magnify the stream of systems and related research directly applicable to policy, including its development and its use in changing

static mindsets and paradigms within the policymaking environment. Policymakers understand the functioning of real-world complex systems cannot be fully explained most of the time. However, they can use systems thinking applications to inform policy deliberations, implementation, and evaluation, and help decision makers better deal with organizational and dynamic systemic complexity. By accessing the talented pool of systems practitioners involved with policy, diverse policy areas like the environment, ocean literacy, and transportation policy can be better understood and future challenges can be more easily overcome.

Field of Research

While there has been previous research on systems practices in policy (Ison, 2017; Johnson & Cochran, 2016; OECD, 2011, 2019; Probst & Bassi, 2017), the field is far from established or exhausted. This dissertation augments and furthers existing research by focusing on people complexity and decision makers' designs for acquiring useful knowledge to solve policy problems. According to Churchman (1967), understanding the environment and the components of a system can provide a vehicle that prompts further exploration of systems thinking across sectors. As with most research projects, this dissertation is a platform where emergent issues in this area of research can be explored. My intention is to provide a research vehicle where issues such as climate change or the health of financial systems can be framed or reframed so a new solution and possible methodology can emerge. I expect to ascertain the combination of system approaches used presently in VUCA policy environments and across different areas of policy.

Public policy, developed within international policy arenas in response to universal wicked problems, is conceived and implemented all over the world. I expect practitioners within this environment trying to solve a policy problem to provide contours and explanations about the

problems, situations, circumstances, and contexts. That environment contains policy problems have metastasized into systemic, interdependent challenges, their understanding, and a need to change (OECD, 2019, p. 9). The public policy sector is characterized by multiple layers of nested organizations, which make it ripe for interorganizational scrutiny. The public servant ethos requires decision makers to see their work as providing vital services, such as guarding over our air and water. Since these organizations are such vital guardians for communities, policymakers place great emphasis and importance on sustainability and longevity.

Thought leaders in this field of management have noted the challenges in solving wicked problems brought about by scarcity of resources and limited knowledge. They write:

> The increased promulgation of service provision competition, and limited funding sources, creates a scarcity of resources that can be allocated by policymakers for their constituency. This scarcity creates problems for policymakers charged with allocating vital public dollars for a community's services. Policymakers are often faced with these situations whose implementation often contends with interlinked problems, navigate nonlinear course of action, unpredictable change processes, and a diverse range of stakeholders. (Ramalingam et al., 2008, p. 4)

The previous quote and this Senge et al. (2014) quote, written just a few short years later, highlight the current situation and the future orientation of thought leaders in this field. Previously, Ramalingam et al. (2008) articulated the challenges brought about by competing priorities amid scarce resources, which force public-sector leaders to "constantly engage, renew and regenerate – even create organizations to address emerging crises" (Senge et al., 2014, p. 46). But, as Senge et al. (2014) argued, there is another, more systemic way to view the environment in which the challenge exists. Senge et al. (2014) posited:

> Expanding management boundaries and anticipating limits that might shape the future means challenging established ways of thinking and unquestioned mental models. Organizations that fail to develop these abilities tend to react to growing problems with shorter-term fixes more within their control…there is nothing wrong with that, but often short-term solutions become part of a strategy of consistently avoiding deeper problems. (p. 46)

The inability to collaborate, as well as the proliferation of management silos, can be debilitating. Senge et al. (2014) alluded to a solution in his model for future organizations that starts with the mental models of the people and their organization. His fundamental theory of the internal reflection as an organizational determinant in change processes is not a new one. Rather, organizational development theorists provide by expanding the conceptual frame beyond what is evident, it is possible to expand areas of responsibility and control and eventually start thinking solely of areas within policymakers' leadership foci. For instance, Martin Buber (2012, as cited in Santos & Cunha, 2011) commented on the impact of organizational citizens' ability to see themselves in relation to others in a turbulent environment:

> This perspective, in which a man sees himself only as an individual contrasted with other individuals, and not as a genuine person whose transformation helps towards the transformation of the world, contains a fundamental error. The essential thing is to begin with oneself, and at this moment a man has nothing in the world to care about than this beginning. Any other attitude would distract him from what he is about to begin, weaken his initiative, and thus frustrate the entire bold undertaking. (p. 5)

Policymakers find themselves in a unique position. Complex policy systems have characteristics that make their behavior hard to predict and which present challenges to policymaking. Policy interventions in complex policy systems will often need to evolve over time in response to the way in which the system is adapting. Policies must be delivered in a constantly changing environment which creates unstable policymaking implementation and evaluation.

The employment of systems thinking and practices focused on people complexity, cognizance of the effect of operating in a VUCA environment, and the cognitive capacity to combat policy resistance and deal with the dynamic complexity of public sector systems can be effective in administering sustainable policies.

The desire of policymakers and researchers is to ascertain what current practices, theories, or methods are in current use. To answer this question, I intend to query practitioners selected for a global perspective on these matters. This research will be based on responses from participants recruited from two international systems organizations, the ISSS and the Operations Research (OR) Society, whose members are at the forefront of systems applications to policy in countries around the world. Through this dissertation, I expect participants to expand and enhance their boundaries for policy development and leadership development. Study subjects will be recruited to share contemporary practices and insights from their respective practices. As representatives at the intersection of systems and policy practitioner communities, these subjects will have extensive practical experience in the development of systems-level leadership, organizational development, and societal change. This study aims to inquire about and obtain relevant data on systems thinking practices among policy practitioners and researchers and analyze and synthesize collected data to determine best practices.

Research Questions

Research questions are often formalized versions of puzzles that practitioners have been struggling with, and perhaps even acting on, for some time. The decision to do more systematic inquiry on a puzzling issue involves asking, “What issue or problem am I really trying to solve?” or “How might data shed light on this?” (Anderson & Herr, 2015, p. 4). It is a respite from what is often a daily struggle to gain perspective through systematic inquiry. Systematic inquiry is also a way to excavate other dimensions of an issue that are currently beyond people’s awareness or not yet realized (Johnson & La Salle, 2010). By examining factors contributing to when and in what fashion systems practitioners use systems methods (e.g., to diagram dynamic voting processes), it is possible to assess and improve how policymakers use systems thinking to better

identify complex problems (e.g., U.S. election security), approach problems as situational messes, and develop a sustainable regenerative governance system to combat them. To achieve this, we ask the following questions:

1. With critical systems thinking as one of the core analytical lenses, what are the key elements of how policymakers can practically use systems thinking to model the impact of and ways to resolve wicked problems in public ecosystems?
2. What are the strengths and limitations of the core theories or approaches being discussed among the systems community, represented in this research by the Operations Research (OR) Society and the International Society for the System Sciences (ISSS)?
3. What critical systems thinking skills and competencies can policymakers and researchers use and promote to propel the acceptance of systems thinking methods and produce organizational change? What should the initial direction and recommendations for research be?

These questions will help me determine areas in which systems thinking will be useful in the public sector while gaining insight in how systems approaches have been used in different public sector contexts. I expect to be able to outline the contextual differences in applying systems thinking in practical, contemporary situations, and I hope to identify and enumerate the challenges and possibilities for systems thinking in the public sector. If successful, I will be able to generate awareness about the potential of systems thinking in the public sector.

Overview of Methodology

The case study approach was chosen in light of the type of data to be collected. Case study research is a qualitative approach in which the investigator explores a real-life, contemporary, bounded system or multiple bounded systems (i.e., cases) over time. Detailed, in-

depth collection involves multiple sources of information and reporting includes a case description and case themes. One way of presenting data in research is to develop and craft participant profiles or vignettes of individual participants or organizations that exemplify the phenomenon under scrutiny; these participants may also be grouped into categories. Miles and Huberman (1994) described a vignette as "a concrete focused story" and one that is illustrative of phenomena found in the real world. Vignettes will be useful as I seek to provide examples of systems thinking in resolving policy problems, thus making case study an ideal methodological foundation for this exploration. I plan to use case study, along with a systems orientation, to contribute to existing knowledge of individual, group, organizational, social, political, and related phenomena. Researchers have used case study as both a methodology (a type of design in qualitative inquiry) and an object of study (Creswell, 1998).

One of the intentions of my research is to provide policymakers and decisionmakers with key elements of system thinking theory and practices that can lead to improved policy implementation, outcomes, and evaluation. By using systems thinking practices, policymakers can access a paradigm that makes it easier to address wicked problems and moves stakeholders towards a conceptual framework for the resolutions of future wicked policy problems. Any specific public policy is a temporary point of compromise reached in the course of competition between mosaics of numerous interest groups with cross-cutting membership. The diversity of these stakeholders requires policymakers to possess a policymaking process that is infused with a systems view that takes a more holistic view that traditional policymaking approaches.

Previous studies suggest that devised solutions—or more accurately, interventions—and methodologies are highly context dependent (Churchman, 1967; Rittel & Webber, 1973). I expect the case studies to shed light on the specific preconditions that have enabled some public

sector actors to engage systems approaches effectively. This research will analyze the value of systems approaches when dealing with complex problems in the public sector. Systems thinking has a long history, but there has only been a call to adopt systems approaches in recent years. I will look at if, when, and why systems approaches can deliver value to policymakers in Chapter 5, and what key principles and tactics of systems approaches exist for policymakers in Chapter 4. There is no clear overview of how frequently policymakers use systems approaches, but emerging evidence suggests systems thinking has a role in instigating public debate, redefining government objectives, and dealing with policy uncertainty in very complex situations.

Chapter Summary

Systems thinking in policy is a broad conceptual lens informed by a multidisciplinary body of established theories, tools, and methods. In addition to its applicability to public policy concerns, systems thinking incorporates the concepts of such fields as organizational behavior and systems dynamics. Further, it focuses on relationships and conditions rather than on individual elements of the system. Among policymakers, the case for improved policymaking though the use of systems thinking has academic and practitioner appeal. Research-based systems approaches can and should be an integral aspect of every leader's and policymaker's toolkit. Applying systems principles to public policy decision making is an outgrowth of a need to remedy stakeholder overreliance on outmoded reductionist thinking borne of the hierarchical and institutional nature of public systems. For those where policymakers are privileged to engage, wicked policy problems cannot be solved by traditional methods that are craven by crisis.

Finding new ways to solve problems is a primary driver of this research agenda, which seeks to discover new and unique combinations of approaches to solving wicked problems.

Further, through this study I hope to compare real-world examples with current literature and field observations. Finally, I plan to expand on the conceptual framework used in this study. This research will explore whether there are new and creative approaches to public policy application of systems concepts. I expect to discover new combinations of systems practices that will enhance decisional capacity of policymakers, and I anticipate developing ways to improve leadership capacity while expanding this nascent field of research.

Key Definitions and Terms

- Adaptation: Process of change directed toward improving the "fit" between an ever-evolving system and its environment.
- Boundary: The borders of the system, determined by the observer(s), which define where control action can be taken: a particular area of responsibility to achieve system purposes (Ison, 2010).
- Environment: That which is outside the system boundary and which is coupled with or affects and is affected by the behavior of the system; alternatively the "context" for a system of interest.
- Feedback: A form of interconnection, present in a wide range of systems.
- General Systems Theory: A logico-mathematical field in which the principles that are applicable to systems in general are derived and formulated (Von Bertalanffy, 2010).
- Hierarchy: Systems organized in such a way as to create a larger system; subsystems within systems; layered structure; the location of a particular system within a continuum of levels of organization. This means that any system is at the same time a subsystem of some wider system and is itself a wider system to its subsystems.

- Hierarchical complexity: The diversity displayed by the different levels of a hierarchically structured system.
- Intervention: The action of acting upon leverage points with a system to shift its paradigm (Meadows, 2008).
- Language (in the context of system thinking practices): Tool for understanding complexity and dynamic change. System thinking language unravels underlying cause-and-effect relationships and makes divergent mental models transparent.
- Limiting factor: Necessary system input that limits the activity of the system at a particular moment.
- Linear relationship: Association between two elements in a system that has constant proportion between cause and effect; can be drawn with a straight line on a graph. The effect is additive.
- Measure of performance: Criteria against which a system is judged to have achieved its purpose. Data collected according to measures of performance are used to modify interactions in the system.
- Mess: A set of conditions that produces dissatisfaction. It can be conceptualized as a system of apparently conflicting or contradictory problems or opportunities. A problem or an opportunity is an ultimate element abstracted from a mess.
- Networks: An elaboration of the concept of hierarchy which avoids the human projection of “above” and “below” and recognizes an assemblage of entities.
- Paradigm: Encompassing mindset that animates dynamic relationships that influence the behavior of complex systems.

- Perspective: Way of experiencing that is shaped by our unique personal and social histories, where experiencing is a cognitive act.
- Public policy: a policy developed and implemented by government agency and officials, though non-state actors and factors may influence its process (Anyebe, 2018).
- Resources: Elements that are available within the system boundary and enable a transformation to occur.
- Soft systems methodology: An action-oriented process of inquiry into problematic situations of all kinds which includes structured thinking about and intervention in, complex organizational and societal problems.
- System: A set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviors, often classified as its "function" or "purpose."
- Systems: An integrated whole distinguished by an observer whose essential properties arise from the relationships between its parts; from the Greek *synhistanai*, meaning "to place together" (Ison, 2010).
- Policy: A relatively stable, purposive course of action followed by an actor or set of actors in dealing with a problem or a matter of concern (Anderson et al., 1997).
- Systems Thinking in Policy: A broad conceptual lens informed by a multidisciplinary body of established theories, tools, and methods. In addition to its applicability to public policy concerns, systems thinking incorporates the concepts of such fields as organizational behavior and systems dynamics (Ison, 2010).

- Systems leadership: Leadership focused beyond organizational and professional boundaries in order to address cross-cutting “wicked” problems.
- Systemic intervention: To address the conflicts that occurs between groups when they hold different views about the facts and values that are relevant to the problem situation. SI is the ability to address boundary judgments at the start of any systems study (Jackson, 2019; Midgley, 2000).
- Systemic leadership: Systems leadership + systems thinking, including utilization of the tools of Boundary Critique, Critical Systems Heuristics, the Strategic Choice Approach, The Viable Systems Model, Soft Systems Methodology and Community Operations Research in the decision-making process around wicked policy problems.
- Systems of interest: The product of distinguishing a system in a situation, in relation to an articulated purpose, in which an individual or a group has an interest (a stake); a constructed or formulated systems of interest to one or more people, used in process of inquiry; a term suggested to avoid confusion with the everyday use of the word “system.”
- Systems thinking: A process of developing a shared vision and system thinking skills among diverse stakeholders through iterative dialogue, and translation into firm commitments for collaborative action (Swanson et al., 2012).
- Task: Highlights significant issues in the problem situation.
- Tools: Systems perspectives and other creativity-enhancing devices employed to ensure that viewpoints from different paradigms receive proper attention.
- Transformation: Changes, modelled as an interconnected set of activities or processes which convert an input to an output which may leave the system (a “product”) or

become an input to another transformation Transformations are sometimes referred to as “processes” (Ison, 2010).

- Trap: Way of thinking that is inappropriate for the situation or issue being explored.
- VUCA: Acronym for volatility, uncertainty, complexity, and ambiguity; describes the general state of global affairs today. The term was coined by the U.S. Army War College to describe the fallout left by the end of the Cold War.
- Wicked problems: Complex challenges where conflicting interest and priorities, as well as incomplete and contradictory information, make establishing shared facts and understanding difficult.
- Worldview: View of the world that enables each observer to attribute meaning to what is observed; sometimes the German word Weltanschauung is used synonymously.

CHAPTER 2: LITERATURE REVIEW

> Indeed, to some extent it has always been necessary and proper for man, in his thinking, to divide things up. If we tried to deal with the whole of reality at once, we would be swamped. However, when this mode of thought is applied more broadly in man's notion of himself and the whole world in which he lives (i.e., in his worldview), then man ceases to regard the resultant decisions as merely useful or convenient and begins to see and experience himself and this world as actually constituted of separately existing fragments. What is needed is a relativistic theory, to give altogether the notion that the world is constituted of basic objects or building blocks. Rather, one has to view the world in terms of universal flux of events and processes.
>
> —David Bohm, *Wholeness and the Implicate Order*

Introduction

With this review, I will outline the pertinent existing literature that addresses the intersection of systems and policy. As policymakers seek to solve the problems they face, they have the tools of systems thinking as they practice conceptualizing, delivering, and evaluating public policy. This review and critique of the literature, combined with my own experiences and insights, will contribute to the development of a conceptual framework for the design and conduct of this study. This review highlights the most relevant research in the use of systems thinking practices and methodologies in public policy systems. For policymakers seeking to affect change in society, the change aspect of systems thinking can lead to a societal transformation. That transformation can be influenced by dynamic relationships within and between individuals and institutions that compose the policy system; therefore, the manner of that transformation should be explored in the current literature. It is the reason why a systems-based understanding of the decision-making process is critical to navigating the dynamic complexity of a VUCA policy environment.

Increasingly, this research will be conducted at a time when decision makers need help to tackle the messes and wicked problems that proliferate in this age of complexity. With this chapter, I will situate the study in the context of previous systems, management, complexity, and

systems research literature, including research at the intersection of systemic management practices and public policy. The literature skews to little-known and more contemporary theorists, as the field of inquiry is evolving. The chapter is composed of this introduction, my perspective on the literature, the conceptual themes found in the literature, and a chapter conclusion. Most research cited is from a 5-year publishing window of this dissertation, and my expectation is this review will provide a clear understanding and critique of each strand of literature presented.

With the education of policymakers and decision makers in mind, this review outlines a proposed conceptual framework delineated by themes of research. These sources create the Cartesian plane of the literature relevant to the present study; what follows is an extensive review and distillation of articles, books, videos, and other sources on public policy management, systems thinking, and methodologies. I also describe the methodologies I believe would be most useful to decision makers and policymakers engaged in improving contemporary wicked problems.

My Perspective

This dissertation outlines a perspective and framework based on Edgar Schein's insights and ideas from 50 years of research, teaching, and helping and humble consulting with people and organizations. Schein (2016) and Schein and Schein (2021) provided that everything you say or do is an intervention that determines the future of a relationship, and the framework used in this study is based on his approaches. The framework provides an organizing structure both for reporting this dissertation's findings and for the analysis, interpretation, and synthesis of said findings. Moreover, this review and the resulting framework establishes the boundaries of the literature for the use of systems thinking in the administration and practice of public policy. It is

comprised of literature from the field of organizational systems theory, which allows us to develop new lenses on organizational issues and problems.

When this framework is combined with the research design described above and helping and noticing tools also described herein, it can be used to evaluate a leadership or organizational practice and identify recommendations to address the systemic problems as they exist or will appear. The conceptual framework outlined in this dissertation helps focus and shape the case study research process, inform the methodological design, and influence the data collection instruments to be used. The conceptual framework will also provide the basis for the various iterations of my coding scheme. In this manner, the conceptual framework will greatly influence how I conduct this dissertation study.

In my own professional practice, I manifest a solution-based consulting or helping posture when addressing client problems—whether they be leadership, policy, or organizational—by becoming more methodological and systematic in my efforts. Campbell described, "Word and actions take their meaning out of the perceiving individual's personal field of experience, a construct of the individual's particular biographic store of episodic memories" (Mason, 2002, p. 184). My helping approach combats this inclination by fostering a willingness to see a situation more fully. It also helped to recognize that we are interrelated, and to acknowledge there are often multiple interventions to a problem. If policymakers and decision makers maintain this position in their relationship, it can lead to collaboration and breakthroughs in the policy environment.

According to Senge (1990), the systems thinking framework evokes a set of general principles spanning fields as diverse as physical and social sciences, engineering, and management. As a way of understanding complex problems where real change can be created,

systems thinking provides tools and methods to deal with the complexity of public policy issues. It also offers a key to structuring problems so true leverage points for change can be identified and acted upon. Checkland (2000b) wrote:

> The kind of holistic thinking which then came to the fore, and was the concern of a newly created organization, was that which makes explicit use of the concept of 'system,' and today it is 'systems thinking' in its various forms which would be taken to be the very paradigm of thinking holistically. (p. 7)

Thinking holistically and systemically connotes an attitude of noticing and awareness. The discipline of noticing is advanced by Mason (2002) and provided a practical approach to becoming more methodical and systematic in professional development. The author offered advice on how noticing can be used to improve other research approaches or as a research paradigm in its own right.

For my purposes, I see Checkland's (2000) method as a clear, persuasive, and practical way to understand and use our inherent power to notice and be awake to possibilities. This act of noticing, combined with a systems orientation, allows for increased understanding of a system by examining the linkages and interactions between elements that compose an entire system. By taking the overall system and its parts into account, this paradigm offers fresh insight that is not accessible through the more traditional reductionist approach.

This research queries systems community practitioners in the International Society for Systems Sciences (ISSS). These individuals hold memberships and affiliations with the International Leadership Association (ILA), International Federation for Systems Research, International Institute for Applied Systems Analysis, American Society for Cybernetics, and the International Council on Systems Engineering (INCOSE). It is designed to solicit current practices, new theories, applications, and methods for the development of public policy and the

practice of public administration, leading to a decrease in policy resistance at all levels of governance systems.

In conceiving this research, I informally surveyed scholars in the ISSS community and asked for their recommendations given my topic. My search through the literature bases of social science, public administration, public policy, cybernetics, complexity science, systems science, organizational theory, leadership theory, and mindfulness laid the foundation for this review. In addition to sources on general systems theory, I was also guided toward sources on decision making, critical systems thinking, and systems thinking applications and approaches. Combining these sources with the limited writing on policy and systems thinking yielded this review.

Bolman and Deal (2017) provided, "One direction of thinking suggests that each theory is a lens or frame that we use to understand and/or engage the world around us" (p. 11). I view this literature review as defining the systems lens through which we can view policy dilemmas. It describes how the lens or perspective includes the individual, organizational, and societal application of systems principles and thinking to the conceptualization, deliberation, consideration, application, and evaluation of public policy. The sources cited outline the general frame or concepts of the public policy systems paradigm and undergird the conceptual framework described herein.

Systems Thinking and Public Policy

Systems thinking approaches invoke a systems paradigm to address wicked problems. Historically, systems thinking has been suggested as a way to gain a better understanding of situations in the policy world (Dennard, 1995), as well as in a variety of business operations (Eisenhardt & Brown, 1998), management activities (Wheatley, 1992), and individual ways of thinking and interacting (Senge, 1990; Senge et al., 2014). I will extrapolate systems thinking

theories and practices from those areas of knowledge, as well as from public policymakers and stakeholders, to understand the concurrent challenges of process, structural, and technical complexity. Early work connecting the study of policy with concepts related to systems and complexity theory can be traced to Kickert et al. (1997), Kiel (1989), Klijn (1996), Overman (1996), Morçöl (1997), and Meek (2010). A misguided commitment to cause-and-effect thinking has led to fundamental doctrines that have permeated our thought for almost 400 years. Accordingly, I realize breakthroughs in this conceptual area could have implications for policy in education, energy, heath, human security, and transportation. Likewise, I realize research in this area is more an amalgam of the areas that I described previously; they are a present and ongoing scholarly inquiry, thus prompting the need for further research.

The applicable literature in the area of policy and systems concepts, buttressed by research on critical systems thinking, describes a combination of methodologies (possibly from different paradigms) and methods used together in a single intervention, and offers a better problem-solving method for public policy dilemmas. Given that a core inquiry in this research is whether the analytical lens of critical systems thinking and its corresponding multimethodology incorporates key elements of the dialogue for decision makers and policymakers, I am interested in the utility of systems thinking concepts for resolving wicked problems. Further, I am inquiring as to their present-day use and the knowledge and experiences extracted from that use. Because my intent is to learn from my participants' experiences, I am also seeking the strengths and weaknesses of theories they rely on, and an enumeration of critical systems thinking skills and competencies that are uniquely important to policymakers working amid complexity. Considering this focus, I aim to answer the following research questions and sub-questions:

1. With critical systems thinking as one of the core analytical lenses, what are the key elements of how policymakers can practically use systems thinking to model the impact of and ways to resolve wicked problems in public ecosystems?
2. What are the strengths and limitations of the core theories or approaches being discussed among the systems community, represented in this research by the Operations Research (OR) Society and the International Society for the System Sciences (ISSS)?
3. What critical systems thinking skills and competencies can policymakers and researchers use and promote to propel the acceptance of systems thinking methods and produce organizational change? What should the initial direction and recommendations for research be?

Systems thinking, its use in public policy, specific methods of systems thinking (namely, critical systems thinking), and associated strengths and limitations are paramount to understanding the evolution and synthesis of public policy development and answering the research questions. To that end, my literature review defines and extrapolates these topics as they relate to public policy.

Existing Scholarship and Literature

Applicable theories, systems models, decision-making processes, problem identification strategies, and case studies can be found in the existing literature. A misguided commitment to cause-and-effect thinking has led to fundamental doctrines that have permeated thought for a long time. New systems research in this area could have implications for policy in education, energy, heath, human security, and transportation. As stated in Chapter 1, new research also has import for policymakers at every level of hierarchy. It can inform policymakers' willingness to see a situation more fully (i.e., noticing), recognize that we are interrelated, acknowledge there

are often multiple interventions that can address a problem (i.e., a critical systems view), and champion interventions that may not be popular (Goodman, 1995).

Scholars have concluded that practitioners faced with the complex, multidimensional, and dynamic nature of policymaking in a complex environment have access to tools for realizing an improvement. The literature describes interventions that use systems thinking and complexity paradigms and methodologies in health systems (Cavana et al., 1999), business (Sweeney & Sterman, 2000), ecological economic systems (Rosser, 2001), and commodity systems (Swain et al., 2003) to inform decision making and consensus building (Maani, 2002; Maani & Maharaj, 2004). These specific areas of research provide a context for the study of systems and policy. OECD (2019) similarly surveyed government officials as part of a study of systems approaches in the public sector and identified the following key takeaways across all levels of government:

- Systems approaches are reemerging as tools especially appropriate for complex problems;
- Systems approaches work for the public sector precisely because of the class of complex, multidimensional, multi-stakeholder problems administrations are responsible for, and because piecemeal reforms produced with traditional analytical tools and problem-solving methods are no longer producing results in many areas;
- Systems approaches have achieved success across a range of problems, from education to aging and from healthcare to mobility, but are not systematically applied in the public sector;
- Because of the nature of today's problems, full diagnosis of "what went (or what is going) wrong" may not be possible. Systems approaches provide a way to make progress in spite of ambiguity and uncertainty and build more resilient governance systems;
- Systems change in the public sector is difficult, in part because the system itself cannot be turned off, redesigned, and restarted. Rather, systems must be continuously available. Systems approaches can help navigate the difficult challenge of "changing the tires while the car is driving;"
- Systems practices are on the rise (both inside and outside government) around the world, providing ever-deepening evidence of what works in the public sector;
- Many of the problems governments face today are wicked, which means that, to some extent, they are unknowable. Systems approaches provide the tools for governments to work with relative precision (i.e., making productive decisions before all the facts are known);

- A set of principles and practices exist that can be deployed by government agencies either unilaterally or with partners to work toward systems change; and
- To effect systems change, administrations must develop a vision for a desired future outcome, a definition of the principles by which future system will operate, and a portfolio of interventions that can begin to transition the existing system toward a future system (OECD, 2019, p. 67).

As noted previously, systems thinking approaches and policy are tied through existing literature. While it is beneficial to have a tie between systems thinking and problem solving in concept, there is a concern among researchers and policymakers about the impact of these findings on addressing real-world policy dilemmas.

Core Themes of the Literature

The core themes of the research as related to policymaking include a general systems orientation, the application of systems thinking to public policy, and the utility of multimethodology and critical systems thinking as a solution to public policy dilemmas.

Theme 1

The foundational theme of the literature is the transformative power of systems thinking to modulate the way that we see the world. Banathy (1996), in exploring how to design social systems, found, "A realization that we should change the existing systems as a whole or that we want to create a new system is the genesis of design" (p. 62). Individuals and organizations have the power to change the way they see events, structures, and paradigms by embracing what Meadows (2008) called a systems lens. According to Laszlo (2012), "The systems view provides us with a rigorous way of looking at reality from a different perspective, an expanded viewpoint that enables us to see how nothing exists in isolation" (p. 98). One of the key points in this literature is that systems thinking is a gateway to seeing interconnections between elements, and once we see the new reality, we cannot ignore it. The literature applies this perspective to the practice of social systems design, which has the potential for massive societal changes and

transformations that "touch the lives of every person, family, community, and nation and define the future of humanity (Banathy, 1996, p. 1). By extension, the systems perspective includes decision makers and policymakers aand provides an avenue for transformative societal change?

Foundational Principles

This review outlines a thought world where the idea of holistic thinking can be integrated into policymakers' decisional processes. Whether it be the concern of a newly created organization, or advancing a special project, the explicit use of the concept of *systems* (and today it is *systems thinking* in its various forms) would be considered the very paradigm of thinking holistically (Checkland, 2000). These systems thinking tools help policymakers

> scale systems thinking to harness its potential as an instrument of policymaking and democratization, which in turn allows the development of a perspective on how to design better human and organizational structures of thought. Through these methods, we can develop not only highly intelligent systems but also "emotionally intelligent ones with an ethical compass." (Cabrera & Cabrera, 2015, pp. 187–189)

We augment this acumen with mindfulness and the discipline of noticing, "The attempt to be systematic and methodical without being mechanical" (Mason, 2002, p. 59), and we have in literature the fundamental mindset for those attempting to move a policy initiative, augment an existing program, or alter a region's economic path.

According to Sweeney (2012), systems awareness requires the development of higher-order skills such as critical and divergent thinking, analysis, synthesis, and problem solving. These are all traits we have in abundance as humans, but they must be nourished. Sweeney (2012) wrote, "How do you nurture a child's natural intelligence about systems and help him or her to become systems literate?" (p. 4). In the parlance of this inquiry, and elevating Sweeney's (2012) questions to include advanced thinking in complex systems theory, system dynamics, and agent-based modeling, it is important to ask: How can policymakers nurture a natural capacity to connect the dots through everyday conversations and activities? How can coaches and

consultants build an environment that leads policymakers to see the patterns that make a difference? The answer for policymakers and for Sweeney's clients—children—are similar. She draws these key concepts from research:

- Children possess an innate understanding of complex systems;
- This understanding is crucial to solving the interlinked social, environmental, and economic problems of today's world;
- Education for children of all ages can and should be designed to nurture this systems-based intuition.

I provide Sweeney's (2012) work as an example of the present discourse on systems and policy in the systems community. As the literature suggests, systems literacy is paramount for the community as a whole, and a high level of learning is necessary to become systems literate. Theorists assert that a minimal level of systems literacy is integral to human education.

> To be literate means to have a well-educated understanding of a particular subject, like a foreign language or mathematics. In many fields, the knowledge must be both comprehensive and abundant enough that you are capable of putting it to use.
>
> Systems literacy represents that level of knowledge about complex interrelationships. It combines conceptual knowledge (knowledge of system principles and behaviors) and reasoning skills (for example, the ability to see situations in wider contexts, see multiple levels of perspective within a system, trace complex interrelationships, look for endogenous or "within system" influences, have awareness of changing behavior over time, and recognize recurring patterns that exist within a wide variety of systems). (Sweeney, 2012, p. 4)

After a thorough review of systems approaches, I determined Sweeney's (2012) conception of the teaching, advising, and coaching was the most conducive for the current study. Richmond's (2011) urgency mandate was also influential:

> It is (because of) the premise of systems thinking that it is possible to evolve our thinking, learning, and communicating capabilities, and as we do, we will be able to make progress in addressing the compelling slate of issues that challenge our viability.

Richmond (2011) went on to state:

> But in order to achieve this evolution, we must overcome some formidable obstacles. Primary among these are the entrenched paradigms governing what and how students are taught. We do have the power to evolve these paradigms. It is now time to exercise this power! (p. 1)

Empowering the subjects and targets of this research through the paradigms, frames, and methods of systems thinking has transformative effects; here it is described out of Richmond's (2011) own research experience. Viewed from a wider context, the ability to see interdependencies and connections is a trait of a systems thinker. These interdependencies are vital to reaching an individual or organization's objectives and goals. According to systems research, systems literacy not only empowers individuals; it can also connect people to communities of practice, where their sensibility can be expressed as a responsible and effective capability. Systemic capability is then enacted when systems literate people apply systems knowledge in various roles.

Yet another approach, the capability approach (Nussbaum, 2011), is concerned with entrenched social injustices and inequality, especially capability failures that are the result of discrimination or marginalization. It ascribes an urgent task to government and public policy leaders, namely, to improve the quality of life for all people as defined by their capabilities. Nussbaum (2011) remarked this is the essential aspect of the approach because it connotes empathy and concern for other people, keeping in line with the public service ethos. This is particularly relevant when combined with the practice and attitude of noticing as an added component to the policymakers' toolkit.

The skill of noticing, combined with a systems orientation, allows for increased understanding of a system by examining linkages, interactions and delays between the elements that compose an entire system. Taking the overall system and its parts into account offers fresh insights that are not accessible through a more traditional reductionist approach. I define a

paradigm as a framework containing all the basic assumptions, ways of thinking, and methodologies that are commonly accepted by members of a particular learning community, work team, or scientific community of interest. Accordingly, the systems paradigm is defined as a coherent set of basic concepts and axioms that form the worldview or perspective underlying systems theory and thinking. Similarly, I define a conceptual framework as a network or a plan of interrelated concepts that together provide a comprehensive understanding to some phenomena or domain of interest. Therefore, as I lay out in this research, the paradigm is one of systems thinking in a policy world, and the conceptual framework, composed of systems science techniques and public policy as defined in Chapters 1 and 2 of this dissertation.

Policymakers know all too well the need for a specified language. *Engine driving the train*, *floor jockey*, *goo goos*, *horseshoe*, *juice*, *low ball*, *soft kill*, *take a walk, WORF*, *work the floor* (Michael & Walters, 2002)—these are just some of the terms used in the proprietary world of policy in California's state capitol where I formerly consulted. By using and having knowledge of what these terms mean, a policymaker joins the cadre of successful lobbyists and policymakers. Likewise, the use of systems terms to describe problem sets adds meaning clarity and could lead to success in policy development. The literature underscored the importance of common language with which to problematize. "Every systemic act of development in the material and social worlds demands the development of particular ways of 'seeing' the world from a systems perspective along with a set of practical skills that reflect this particular systemic view of the world," noted Burns (2007, p. 34). That systems perspective is reflected in the language used to describe issues and problems and is particularly important in the policy world. It is important because tackling problems from a systems perspective requires a common language to describe them.

Common language comes from the use of systems concepts and methods; it arises from the very practice of "creatively mixing methods from a variety of sources, yielding a more flexible and responsible approach than might be possible with a more limited set of tools" (Midgley, 2000, p. 5). Language and skills are needed to communicate how we see the world now, through our new and constant shifts in perception. The literature seems to suggest that tools of awareness, language, noticing, insight and observation, capability, and a helping posture position policymakers and decision makers to thrive in a policymaking environment.

Foundational Issues

This theme is demarcated as general systems awareness through thought, worldview, and language, but Johnson and Cochran (2016), who have edited a text on policy and complexity science that is part of an evolving body of literature on the subject, offered an important caveat:

> The policy area of complexity science applied to policy is still evolving and enticing great minds to rethink the nature of policy problems and how a complexity context can add to understanding problems. (p. 3)

The literature in this field is emerging and there is room for further investigation. These theorists argue that systems thinking principles are not known about or incorporated in management practices and it is presently underrepresented in management practices. In an article, Ackoff (2006) mused:

> Very few managers have any knowledge or understanding of systems thinking, and for good reason. Very little of our literature and lectures are addressed to potential users. I very seldom come across an organizational decision maker who has had any previous exposure to systems thinking. (p. 705)

The relative lack of understanding and knowledge about systems thinking practices appears often in the literature. Theorists are at a loss for how to encourage engagement and adoption of these principles. Jackson (2019) provided: "To govern effectively we need a common language, a systems and complexity thinking framework, that elucidates and clarifies the problems we face

allowing for feedback and adjustment while maintaining relevance as a modelling technique to the real world" (p. 587). Not only do we need systems thinking because it offers a common language, but also because it provides a framework that helps clarify problems. Indeed, the "complexity of many of the issues that researchers engage with have numerous interacting variables (that) need to be accounted for and multiple agencies and groups (that) bring values and concerns to bear" (Ison, 2010, p. 156). Any tool that helps enumerate a group's values and concerns is vital to policymakers and decision makers. The literature reveals general systems awareness and the attributes listed herein are foundational to systems practices by policymakers and decision makers.

Current Situation

Since I believe systems approaches are designed to assist policymakers and decision makers, the next question is: what does the literature say about the conceptual tools available? Snowden and Boone (2007), when writing about a leader's framework for decision making, asserted that leadership across contexts requires openness to change:

> Good leadership requires openness to change on an individual level. Truly adept leaders will know not only how to identify the context they are working in at any given time but also how to change their behavior and their decisions to match that context. They also prepare their organization to understand the different contexts and the conditions for transition between them. Many leaders lead effectively—though usually in only one or two domains (not in all of them) and few, if any, prepare their organizations for diverse contexts. (p. 9)

The willingness to change and adopt a new way of thinking is the precursor to the application of systems thinking in policy. As policymakers turn to the elementary aspects of systems thinking in their thoughts and actions and become more interconnected with the system around them, they can be more effective and adaptive to the changing environment in which they exist.

Systems Thinking as Tool

Ison (2008) wrote, "Within systems practice, a tool is usually something abstract, such as a diagram, used in carrying out a pursuit, effecting a purpose, or facilitating an activity" (p. 21), highlighting the practice as a primarily cognitive one. From a cognitive perspective, systems thinking integrates analysis and synthesis, using both to create knowledge and understanding while integrating an ethical perspective. That systems thinking perspective is vital in the promulgation of public policy. Analysis answers the "what" and "how" questions, while synthesis answers the "why" and "what for" questions. Laszlo's (2012) description of a systems feeling translates into noticing and awareness needed for policymakers to incorporate systems thinking processes into policymaking. This nuance is articulated by noted theorist Alexander Laszlo (2012):

> The connection between systems thinking and systems feeling happens through life experiences and reflection. Systems feeling involves lifelong learning and a commitment to integrate cognition and emotion, linking head with heart. As Gandhi put it, the means are the ends: we need to find ways to engage our whole selves in processes that incorporate the same values and aspirations we are trying to create. We need to move from teaching systems to creating the conditions for experiencing and living systems. (p. 97)

To heed Laszlo's (2012) advice, it is necessary to move away from independent reductionist thinking and begin to think holistically. In turn, holistic thoughts will inform policymaking and decision-making abilities, making systems thinking a functioning tool for policymakers and decision makers alike. Systems thinking is advancing and system awareness is increasing, and practitioners are finding innovative ways of imparting systems approaches to different audiences.

Key Points

- The transformative power of systems thinking has the ability to modulate how we see and experience the world;
- An understanding of complex systems is crucial to solving interdependent social, environmental, and economic problems., such as the global coronavirus pandemic which provides a real world contemporary universal example of the need for interdependent thinking that provides sound thinking in the midst of unexpected global events with local/state impact.
- As children, we all have that innate understanding, but it must be nurtured to be fully actuated;
- Individuals and organizations have the ability to evolve paradigms and overcome obstacles through systems thinking practices;
- With the tools of systems language, awareness, capability, noticing, insights and observation, research, and a helping posture, policymakers and decision makers are better positioned to excel in a VUCA environment.

Theme 2

The second theme of the literature is the application of systems thinking to public policy. Systems thinking has been suggested as a way to gain a better understanding of situations in the policy world (Morçöl, 2010) as well as in a variety of business operations (Brown & Eisenhardt, 1998), management activities (Wheatley, 1992), and individual ways of thinking and interacting (Senge, 1990; Senge et al., 2014).

Foundational Principles and Contexts

This theme is comprised of aspects of organizational and leadership research, systems literature, and project management theory. It is characterized by texts on the practical application of systems thinking in policy (Ghaffarzadegan et al., 2011; Trochim et al., 2006; Wallis, 2013). For practitioners, this area of systems research outlines contemporary methods for addressing problems that may arise in the course of their duties. The literature provides that systems thinking is primarily a way of approaching problems and designing solutions (Cabrera et al., 2008; Checkland, 1985). With these sources, the body of literature begins to illustrate the connection between the early work connecting the study of policy with concepts related to systems and complexity theory, which can be traced to the work of Kiel (1989), Klijn (1996), Overman (1996), Kickert et al. (1997), Morçöl (1997), and Morçöl and Dennard (2000). Practices and models found in this literature can be especially useful for practitioners addressing real problems in context. In recent years, there has been growing interest in applying systems thinking principles to improve public policy outcomes; policymakers, public policy practitioners, and other policy professionals have taken notice.

Banathy (2013) provided a perspective related to design thinking and social systems design in discussing Ackoff's view of problems:

> Ackoff (1981) suggests that a set of interdependent problem constitutes a system, which he labels a "mess." Like any systems, the mess has properties that none of its parts have. These properties are lost when the system is taken apart. In addition, each part of a system has properties that are lost when it is considered separately. the solution to a mess depends on how the solution to the part interact. A design problem situation should always be seen as a system of problems and not as independently obtained part of a mess. (p. 29)

The "mess" is also suggested as an impetus to change the manner in which public administration itself is practiced. Probst and Bassi (2017) wrote:

> We must reform public administration and corporate administration. In this context, we must de-bureaucratize, de-rigidify, and decompartmentalize. We must offer initiative and opportunities to civil servants and corporate employees to become more agile. We have to make sure that kindness, patience, and attention are given to all those who interact with public offices, beginning with the elderly and those who face challenges with language. . . The reform of the state does not depend on increasing or decreasing the number of jobs, but rather results from no longer considering human beings as objects that can be quantified but taken as living being s endowed with autonomy, intelligence and emotions. (p. 47)

With this humanistic view of systems, policymakers can engage with all levels of stakeholders and ensure that whatever policy they develop has considerations for all aspects of policy delivery.

Systems thinking is primarily a way of approaching complex problems and designing solutions (Cabrera et al., 2008; Checkland, 1985). The use of systems thinking practices has included three major fields: (a) policy, or the political distribution of services and allocation of resources; (b) practice, or the implementation of policies to achieve the goals and objectives of decision makers or the subject organization; and (c) research, or the investigation of the effects of interventions to influence subsequent policy development. Probst and Bassi (2017) offered guidance for policymakers attempting to gain direction. They wrote:

> Complexity is relevant for public policy makers because most countries face several concurrent challenges that simultaneously affect (and are affected by) social, economic and environmental dimensions. To reach any stated goal and to shift closer to a sustainable development pathway, we need decisive policy interventions that will simultaneously support socioeconomic development and environmental conservation. (Probst & Bassi, 2017, p. 26)

In areas of public health, governance, policy administration, economics, and healthcare, systems thinking has been used to model and describe wicked policy problems, in an effort to address a perplexing societal concern. To fully engage with the literature that spans organizational and leadership research, systems literature, and project management theory, practitioners are required to have a little bit of expertise in all areas, which they can gain through

the universal language of systems. When system thinking processes are used as a management tool, middle managers, project managers, and organizational leaders have a proven method to accomplish meaningful change. Community leaders and activists who seek effective problem-solving approaches use contemporary methods to address problems that arise in the course of their duties (Holman et al., 2007, p. xv). For example, it is used by the United Nations Development program, the World Bank, and the World Resources Institute, proving that systems thinking has universal applicability as a mechanism for solving large-scale problems that confront policymakers.

When discussing Theme 1, I developed a basis for the use of systems thinking by most anyone and, by extension, the use of systems thinking approaches by everyone. When reviewing the literature in light of public policy concerns, the same holds true but becomes more pronounced in the literature specifically related to policy concerns. Probst and Bassi (2017) and Maani (2016) specifically laid out the use of systems thinking approaches among multiple stakeholders to resolve complex problems and outline and model a specific language of systems. It is a language that is useful to policymakers and it outlines the specific tools of causal loop mapping, rich pictures, and feedback loop diagramming that can assist policymakers in viewing a system in its entirety.

The literature contains a specific prescription for how to structure policy problems. Elias and Cavana (2000) provided for problem structuring in the following way: Problem structuring is defined by a phase in which the situation or issue at hand is defined and the scope and boundaries of the study are identified. This is the common first step in problem-solving approaches. The problem structuring, in turn, consists of the following steps:

- Identifying the problem area or policy issues of concern to management. This step requires that objectives are clearly established, taking into account multiple stakeholders and perspectives.
- Collecting preliminary information and data including media reports, historical and statistical records, policy documents, previous studies, and stakeholder interviews. "As we extend our systems practice to policymaking, we will gain the ability to address more intricate, more complex interventions" (Cavana & Maani, 2000, pp. 17–18).

Maani (2016) wrote, "Typically, leaders, policymakers, scientists, NGOs, activists and others deal with these issues separately and in isolation" (p. 18), but practice has shown that systems processes and systems tools such as causal loop mapping and diagrams, rich pictures and modeling, provide explanatory power to policymakers when addressing societal problems. As with most disciplines, practitioners of systems thinking and practice use a common nomenclature that can be applied to multiple disciples and various problem formulations, regardless of the specific problem. If policymakers can reconceptualize the problems they confront in systems language, it will lend itself to a systems solution. Policymakers are addressing complex, systemic problems in their daily lives, as a result, these systems thinking approaches should be tied through research to the decision-making process of policymakers. Senge wrote:

> Like many systems, the mess has properties that none of its parts have. These properties are lost when the system is taken apart. In addition, each part of a system has properties that are lost when it is considered separately. The solution to a mess depends on how the solution to the parts interact. A design problem situation should always be seen as a system of problems and not as an independent part of a mess. (1980, as cited in Banathy, 2013, p. 29)

By adopting a systems orientation to solve problems, policymakers invoke a unifying frame that allows them to universalize issues and commit all stakeholders to an approach that "includes the willingness to see a situation more fully, to recognize that we are interrelated, to

acknowledge that there are often multiple interventions to a problem, and to champion interventions that may not be popular" (Goodman, n.d., para. 5).

Wicked Problems

Wicked problems are defined as those that seem incomprehensible and resistant to solution (Churchman, 1967; Rittel & Webber, 1973). Head and Alford (2015) noted, "While conclusive 'solutions' are very rare, it is possible to frame partial, provisional courses of actions against wicked problems" (p. 25). When combined with the organizational and cognitive actions of a policy space, we can begin to envision the optimal space on which policy decisions are made. These policy dimensions fracture our view, distorting problems in the mind of the policymaker. In describing why social and economic problems cannot be understood and addressed in isolation, Ackoff (1974) offered:

> Every problem interacts with other problems and is therefore part of a system of interrelated problems . . . a system of problems . . . I choose to call such a system a mess . . . The solution to a mess can seldom be obtained by independently solving each of the problems of which it is composed . . . Efforts to deal separately with such aspects of urban life as transportation, health, crime and education seem to aggravate the total situation. (p. 46)

The policy and systems literature demarcate problems that are highly interconnected and deserving of special attention as wicked problems. According to Rittel and Weber (1973), these situations have 10 characteristics:

1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no "stopping rule" (i.e., no definitive solution).
3. Solutions to wicked problems are not true or false, but good or bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every (attempted) solution to a wicked problem is a "one-shot operation;" the results cannot be readily undone, and there is no opportunity to learn by trial and error.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.

9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways.
10. The planner has no "right to be wrong" (i.e., there is no public tolerance of experiments that fail). (p. 6)

These 10 characteristics help policymakers quickly determine if the situation they are attempting to resolve can be defined as a wicked problem and therefore open to a systems-based solution set. If problems can be identified and formulated "to reach a stated goal and to shift closer to a sustainable development pathway, we need decisive policy interventions that will simultaneously support socioeconomic development and environmental conservation" (Probst and Bassi, 2017, p. 4). These researchers make the case for the sue of systems thinking in policy, systems leadership, critical systems thinking, the management of complexity, and other specified systems thinking approaches applicable to policymakers. The intended audience for this review and the corresponding dissertation includes business leaders and their strategic foresight professionals, governmental officials involved in strategic policymaking and their advisory staffs, professionals working with international organizations, and students and academics interested in systems analysis (Head, 2008).

Adopting a systems thinking mindset is critical to the problem defining and shaping process as well as assisting in leadership and organizational system sustainability. This strand of literature highlights the ability to reconceptualize problems as a critical aspect of systems thinking, along with the ability to think about a system as a whole, rather than only considering the parts individually. This skill allows policymakers to perceive the world as a complex system and understand its interconnectedness. Within this strand lie the foundational principles for implementing systems thinking practices among policymakers and it creates a number of pertinent issues. In addition to highlighting certain skills that are needed to implement systems thinking, the literature also reveals some challenges to implementation.

Foundational Issues

One of the foundational issues is how policy problems are structured. The literature provides guidance on resolving wicked problems. Challenges in public policy, climate change, and the issue the author writes about, global health, are now recognized as complex problems where simple blueprint approaches have limited success. There are unique issues involved facing systems thinking implementation in a policy space:

> The challenges presented appear in the context in which they operate keeps changing, because the manner in which things change do not conform to linear or simple patterns, or because elements within the system are able to learn new things, sometimes creating new patterns as they interact over time. (Peters, 2014, p. 14)

Current Situation

As we extend our systems practice policymaking, we will gain the ability to develop more intricate, more complex interventions. Maani (2016) wrote, "Typically, leaders, policymakers, scientists, NGOs, activists and others deal with these issues separately in isolation" (p. 18) and traditional systems scholars offer the systems tools of Causal Loop Mapping, diagrams, and strategic planning. If policymakers are able to shift the way they conceive of messes and their potential solutions, and embrace a systems-thinking paradigm, then all of the systems thinking approaches can be applied to those problems. These systems thinking approaches are tied through research on policymakers' the decision-making processes. Senge et al. (2014) wrote:

> Like any systems, the mess has properties that none of its parts have. These properties are lost when the system is taken apart. In addition, each part of a system has properties that are lost when it is considered separately. the solution to a mess depends on how the solution to the part interact. A design problem situation should always be seen as a system of problems and not as independently obtained part of a mess. (Banathy, 2013, p. 29)

By adopting a systems orientation to solve problems, policymakers invoke an organizing frame that allows them to universalize issues and commit all stakeholders in an approach that

"includes the willingness to see a situation more fully, to recognize that we are interrelated, to acknowledge that there are often multiple interventions to problems, and to champion interventions that may not be popular" (Goodman, n.d., para. 5). It locks stakeholders in a proactive stance, enabling genesis of new and novel approaches to problem solving and implementation.

Currently, there is increased interest in using systems thinking to tackle wicked problems in various public policy settings, but that can be challenging for policymakers because novice systems practitioners may find the literature amorphous and highly theoretical. Theorists offer foresight and systems thinking as a practice to solve contemporary problems. Canty-Waldron (2014) cited:

> Governments need new approaches which offer a level of comfort and direction in the face of the uncertainty of the many inter-related wicked problems they are tasked to address. If evidence -based policy is not the talisman it is advertised to be, any alternative approaches must be just as rigorous and systematic enough to be credible to gain traction and influenced change. It is proposed that foresight in general, and systems thinking in particular, meet these criteria. (p. 62)

Decision makers tackling complex policy dilemmas can use the tools of management science, public policy, systems science, and mindfulness to create a systems-based platform where the tools of causal loop mapping and other systems techniques can be employed. This systems orientation is innate and can be used to great effect to address stakeholders' need to be included, and to gain insights and perspectives from multiple stakeholders. This awareness and adoption of a systems orientation lays the groundwork for Theme 3, which incorporates multiple perspectives, including a social action or ethical perspective.

Importance of This Theme

I have combined the fields of management science, public policy, systems science, and mindfulness in an effort to craft a paradigm, a way of thinking that may serve policymakers in

executing their duties and responsibilities. Policymakers spend their days, not unlike engineers, fixing problems. When you ask an engineer, “How are you doing?” she answers, “All systems are functioning properly,” the idea of an emotional state being described mechanically. To be in a state of perpetual wonderment and curiosity about the way the world works is the heart and soul of an engineer, whereas a policymaker seeks to develop policies and platforms to make things work in conjunction with one another. This theme of the literature speaks to the bridge between the two.

Key Points

- Systems thinking offers new ways to conceptualize policy problems, which opens the door to innovative ways of working with communities and tackling wicked policy problems;
- Systems thinking allow policymakers to be more agile and de-bureaucratize, de-rigidify, and decompartmentalize the organizations they inhabit;
- Policymakers can use practical systems thinking tools through meaningful options to create positive impacts on policy processes.

Theme 3

Foundational Principles and Concepts

The third theme of the literature is the concept of multimethodology. For policymakers and decisionmakers, we define multimethodology as theoretical awareness and social awareness in the application of systems approaches to problems (Jackson, 2019). Both Mingers (1980, 1984) and Jackson (1982) stressed the importance of looking at the social theory underpinning all applied systems approaches. They also asking specific questions about the assumptions embedded in soft systems thinking and how these impacted upon its effectiveness (Jackson,

2019). That research developed into the multimethodology approach and informed a new rubric for solving wicked problems.

Policymakers and decision makers use various approaches to account for multiple points of view and incorporate as much knowledge as possible into their analysis. When engaging in a "thinking space," policymakers could use root definitions, conceptual models, the Viable Systems Model (VSM), system dynamics or any other systems tools to conceptualize a system. The fundamental tenet of multimethodology is "the importance of combining methods in dealing with real-world situations, whether the purpose is pure research or a practical intervention" (Jackson, 2019, p. 529). I had this thought in concept prior to attending the ISSS conference in Corvallis, Oregon. While attending the ISSS 2019 conference, I was listening to the speakers and reviewing the materials for the conference and wondered: Why not be able to use more than one method/approach for policy dilemmas? We know that not all solutions work for all problems, but what about a combination of techniques I wonder whether the soft systems methodologies of rich pictures and causal loop modeling are not enough? These soft systems approaches were inadequate in some instances. Then came a finding: The critical systems thinking approach is based on critical systems heuristics (CSH) which is developed by Ulrich (1983) and is a framework to support reflective practice. Like Soft Systems Methodology it contains a precise protocol set of questions, designed to make explicit the everyday judgement on which decisions are made. With this paradigm, we can assess complex policy situation with the four dimensions of problems or problem situations namely sources of motivation, control, knowledge, and legitimacy. In sum, the 12 questions espoused by the authors to determine complex systems prompt an understanding of the bigger picture (Ulrich & Reynolds, 2010). Critical systems heuristics offer a framework that addresses specific concerns of stakeholders, measure

improvement and address the need of decision makers. It is designed to be employed in decision environment (Jackson, 2019).

This reflective practice framework contains specific steps to assist policymakers in resolving wicked problems. Designed with policymakers in mind, it addresses all elements of a complex problem situation. If implemented properly, this superseding framework could be useful for stakeholder management, solving complex problems, and developing public policy. Further, when added to similar problem-based approaches like those offered by Flood and Jackson (1991) and Jackson (1991), policymakers can add a new perspective and see seven principles as underpinning the meta-methodology by determining:

- Problem situations are too complicated to understand from one perspective and the issues they create are too complex to tackle with quick fixes;
- Problem situations, and the concerns and issues they embody, should be investigated from a variety of perspectives;
- Once the major issues and problems have been highlighted, it is necessary to make a suitable choice of systems methodology or methodologies to guide intervention;
- It is necessary to appreciate the relative strengths and weaknesses of different systems methodologies and to use this knowledge, together with an understanding of the main issues and concerns, to guide choice of appropriate methodologies;
- Different systems methodologies should be used in a complementary way to highlight and address different aspects of problem situations (Jackson, 2019, p. 735).

By using this new critical systems approach, or lens, policymakers have an additional tool with which to solve problems. Notice this tool is an aspect of the wicked problem definitions provided previously yet adds a layer of complexity when classifying a problem as one for which

a multimethodology approach can be used. Such an approach leads to stakeholders delivering new systems perspectives and other creative approaches designed to ensure that different viewpoints receive attention in the problem-solving environment.

Foundational Issues

When I think of training leaders, I have a vision of what a leader is based on my experience. Leaders have compassion, intelligence, bravado, patience, and style. When I began this research, it was in an effort to help citizen legislators be better policymakers. Through the study of systems, I have development a path for them to deepen their skill sets and become the kind of leader I imagined.

It is a well-established principle of systems theory to focus on what is called the system paradigm; that is, the basic overarching principles that are common to all areas of systems thinking and theory. Systems thinking has been defined as an approach that attempts to balance holistic and analytical reasoning. At the stage of mastery, the practitioner can use systems thinking frameworks and interventions in a transdisciplinary way, incorporating a vast body of theory, methodology, and practice. That versatility to adapt to situations and messes makes a practitioner useful to their organization. Jackson (2019) argued:

> We have argued that an "ideal-type" for of multimethodology, one that can bring the greatest benefit to systems thinking in managing complexity, requires that we operate in a multiparadigm, multimethodological, and multimethod manner at each stage of an intervention. This allows us to consider and rule out certain "candidate" multimethodologies from further consideration. (p. 537)

Choosing the right combination of methods is crucial to a successful intervention. This practical finding was buttressed by research "when a growing critical awareness of the strengths and weaknesses of individual systems approaches, and an appreciation of the need for pluralism in systems thinking" (Jackson, 2010, p. 342). The author's adoption of method combination, as

well as a true advocacy of systems thinking will be essential underpinning for understanding the use of systems thinking in policy.

Current Situation

It is an embrace of that pluralism spurred by practical findings and supported by present day research on critical systems thinking that is of import to policymakers and decision makers. Based on Jackson's (2019) research and that of other contemporary thinkers, concepts of noticing, systems awareness, and other concepts and theories can be incorporated into the critical systems thinking framework and used in practice. Critical systems thinking provides an excellent container for these concepts and adds an added perspective of awareness and action. As critical systems thinking rubrics and processes proliferate, its applicability proceeds across disciplines. By setting out how the variety of available systems approaches can be used together in a coherent manner to promote successful intervention in complex societal problems, policymakers can use the tools of systems thinking to bring about desired policy results.

Ackoff (1995) believed effective research is not disciplinary, interdisciplinary, or multidisciplinary; it is transdisciplinary. Systems thinking is holistic; it derives understanding of parts from the behavior and properties of wholes, rather than deriving behavior and properties of wholes from those of their parts. Disciplines such as chemistry and physics are aspects by science to represent different parts of the reality we experience. In effect, "Science assumes that reality is structured and organized in the same way universities are" (Ackoff, 1999, p. 32). As these aspects of science are applied to fields of study, they can also be applied to public policy. The literature suggests that critical systems thinking, and practices are important in the management toolbox, especially for those serving in the public sector. Systems thinking practices seek to draw on the respective strengths of social theory and system thinking. These approaches

work well in practice with methods of social science, social theory, and other humanistic value-driven processes. Jackson (2019) wrote:

> By employing critical systems thinking and practice, policymakers can utilize the steps therein to address to employ or combat the 'coercive system' within their organization. One of Churchman's principles of systems thinking was "The systems approach begins when first you see the world through the eyes of another." The combination of methodologies (possible from different paradigms) and methods together in a single intervention is a new concept but one that should be considered by policymakers who face complex problems in a changing decision environment. Multimethodology is based on the concept that the world we confront and seek to intervene in is "multidimensional." and that the world is a "complex interactions of substantively different element." (p. 532)

Through this newest iteration of systems thinking and practice, theorists are exhorting policymakers to use critical systems thinking to combat both the policymaking environment and the problem itself. This research will seek to augment that view by asking policymakers whether this hypothesis has merit and why or why not. Additionally, as referenced in Theme 2, contemporary theorists are embracing the use of systems thinking for policymakers and they emphasize the value of using systems thinking in policy development and problem formulation in their research (Carty-Waldron, 2014; Haynes et al., 2020; OECD, 2019).

Importance of This Theme

This theme is fundamental to the present research. As I have described, this is an ongoing inquiry. Scholars are still exploring the nexus of systems thinking and policy development and are continuing to inquire how systems research can assist in expanding this field. Systems thinking offers new ways of conceptualizing and contextualizing problems, which open up ways of working with stakeholders and tacking wicked problems (Haynes et al., 2020). These research findings highlight the ongoing importance of integrating systems thinking into the practices of public policy stakeholders, policymakers, and decision makers.

Spurred by an interest in the rampant level of reductionism prevalent in the policymaking environment, I developed this study to ask questions about paradigms and how they affect mental models and ways of thinking. This led me to a study of systems science, organizational development, leadership development, and, most importantly, the application of systems thinking in public policy. Through my investigation of extant research, I discovered critical systems thinking and multimethodology; I found contemporary authors struggling to answer the same questions I was posing and practitioners facing the headwinds of the world's perplexing problems. We know that critical systems thinking involves operationalizing ideas from other methodologies that are specific to the problem presented. In turn, systems thinking can address a more diverse and wider range of problem situations, and greater emphasis can be placed on the inherent human aspects and where the concept of optimization largely lost it meaning (Daellenbach, 2001). It is my hope that this research will continue that trend and give policymakers tools that increase their effectiveness in problem solving. These approaches provide alternatives to decision making and problem solving for policymakers who are systems practitioners.

Key Points

- Multimethodology connotes a social awareness of the application of systems approaches to policy and problems solving approaches;
- The fundamental tenet of multimethodology is the combining of approaches, methods, and methodologies to address real-world situations or problems;
- The critical systems thinking framework makes explicit the judgement on which decisions are made;

- The critical systems thinking framework addresses stakeholder concerns, measures improvement, and addresses decision makers' needs;
- The critical systems thinking framework is designed to be employed in a coercive environment in which many policymaking decisions are made.

Conclusion

This chapter integrates, synthesizes, and critiques relevant research on systems thinking and public policy. Existing research provides that systems thinking offers new ways of working with communities to conceptualize, contextualize, and tackle wicked policy problems. It also highlights that an innate understanding of complex systems is crucial to solving the interlinked social, environmental, and economic problems of today's world and a systems-based intuition should be nurtured in all. Systems-based solutions are useful for elected and appointed officials because they allow them to be more agile and de-bureaucratize, de-rigidify, and decompartmentalize their organizations. By introducing systems methods and language in policy deliberations, new ways of working with stakeholders and tackling wicked problems can reverse policy resistance.

Finally, the research exhorts policymakers to (a) use practical tools of systems thinking and its conceptual framework to create positive impacts on policy processes, and (b) use multimethodology to promote "social awareness" in the application of systems approaches to problem solving in policy. Through an understanding of the literature, policymakers can use the fundamental tenet of multimethodology, which is to combine approaches, methods, and methodologies to address real-world situations or problems, as a go-to solution in policymaking. This review guides them to specifically consider critical systems thinking approaches and frameworks to unearth and make explicit the underlying mental models and judgements that

affect policy decisions and processes. The review describes the critical systems thinking framework as the primary method to address stakeholder needs, measure improvements, and address the needs of decision makers involved in the policymaking process. The literature points to the critical systems thinking framework as being specifically designed to address externalities policymakers create when operating in a coercive decision-making environment. In the following chapter, I will describe how research will be conducted by collecting data from participants involved in real-world, systems-based policy development.

CHAPTER 3: METHODOLOGY

This chapter presents the study research design and specific procedures that will be used. With the literature review in Chapter 2, I proposed that a basic understanding of complex systems is inherent in all of us from an early age; in fact, we begin connecting the dots and establishing a systems literacy from an early age, grasping the concept of resource depletion and diminishing benefit before we can walk. Of interest to policymakers and researchers is having that awareness pervade the policymaking establishment and eventually seeing advanced systems methods used to address wicked problems in the policymaking environment.

If policymakers are using systems thinking practices to resolve wicked problems, this research will capture that experience to answer my research questions. If those practices lead to improved policymaking, implementation, and evaluation, it is an argument for integrating disparate knowledge, perspectives, and values for collective decision making. Maani (2016) wrote:

> The prevailing approaches to decision making are reductionist, isolated, and linear. Global challenges such as climate change, poverty, public health, and sustainability defy isolated solutions from a single science, discipline, expertise, or agency. Rather, these challenges require a confluence of diverse domains and disciplines including social, cultural, political, financial, and spiritual considerations to achieve acceptable and sustainable outcomes. (p. 79)

To achieve sustainable outcomes, it becomes incumbent on leaders and policymakers to understand systems approaches. Through this research, I intend to determine areas in which systems thinking will be useful in the public sector while gaining insight into how systems approaches have been used in the public sector or other contexts. I expect to be able to outline the contextual differences in applying systems thinking in practical, contemporary situations, and I hope to identify and enumerate the challenges and possibilities for systems thinking in the public sector. If successful, this research will generate awareness about the potential of systems

thinking in the public sector and have a blueprint for future research in other sectors of the economy.

Rationale for Methodological Approach

This study is situated in the methodological tradition of case study research (Aberdeen, 2013; Bloomberg & Volpe, 2008; Burns, 2007). According to Schramm (1971), "the essence of a case study is the illumination of a decision or set of decisions: why they were taken, how they were implemented, and with what result" (as cited in Yin, 2003, p. 12). This is precisely why the case study methodology was chosen for the present study. Explanatory case studies on how public sector organizations and leaders have applied systems approaches can provide public sector leaders with evidence for the use of systems approaches to resolve wicked problems. To capture this evidence, I will use the case study methodology as described by Yin (2004), using experiences of the systems community of practice as individual case studies.

A critical aspect of this research design was determining the type, manner, and conduct of the research. I asked questions like: What type of population will be assessed? Will my research questions be answered best by a qualitative or quantitative approach? Will the research design elicit data that allow me to draw conclusions or avenues for further study? These are the types of questions the researcher must ask before data are obtained. Therefore, the choices made in this research are designed specifically to address a population of policymakers and decision makers.

For the current study, I will develop two to three case studies to better understand the use of systems thinking in the public sector. Applying the case study method appeals to me as a holistic way to see organizational problems; additionally, it highlights how systems tools can be applied to the leadership and organizational structure of public sector organizations.

Yin (2009), along with other advocates of case study research, explained, “The more that your (research) questions seek to explain some present circumstance (e.g., ‘how’ or ‘who’ some social phenomenon works), the more that case study research will be relevant” (p. 4). Case study research has been proven valuable in political science and sociology because of its unique ability to tell stories about data and circumstances better than other methods of research (Yin, 2009). Case study involves a detailed description of a setting and its participants, accompanied by an analysis of the data for themes, patterns, and issues (Merriam, 1998; Stake, 1995; Wolcott, 1994).

Ethnography was considered for this study, but the research questions do not call for a detailed explanation of the social or cultural attributes of the population under study. Phenomenology was also considered, but the research questions do not call for an investigation of the experience of people to identify the essence of the human experience. There was no call to discover a new theory or process, so grounded theory was dispensed of as a potential method. There was no need to examine the changing experiences over time, nor describe the dimensions of the experiences, so hermeneutics and action research were likewise not chosen.

When selecting cases, I will apply several criteria. First, a case has to deal with a public policy problem. Second, the public policy problem being studied needs to be complex and systematic in nature: it must have multiple interconnected dimensions, no optimum solution, multiple stakeholders, high levels of uncertainty, etc. Third, there has to be potential for transformative effects at the system level (e.g., because current solutions are failing or are limited in impact). Finally, systems approaches must have been used to analyze the problem.

The case study analysis will use existing data and scholarship and, to an extent, limited interviews with stakeholders. Through triangulation of data, I aim to: (a) identify which systems

approaches were chosen to solve the policy problem and why; (b) determine how systems analysis was carried out (i.e., what the process entailed, who the stakeholders were, which resources were used, how much time it took); and (c) if results of the systems analysis were implemented in public service delivery, explore what (endogenous and exogenous) challenges were encountered at different stages of the process as well as the perceived or measured effects of implementation.

As systems approaches have different kinds of impacts on governments and governance processes, I will seek to produce variety in our case studies. For instance, some systems approaches result in governments forming long-term working relationships with external partners, while others lead to use of methodologies or even project teams internally to establish permanent capacity. It will be useful for public sector managers interested in systems approaches to see the variety of responses possible given the variety of the challenges and opportunities they face. Case studies will be selected based on existing research on leadership and organizational theory, systems theory, complexity theory, decision making, and the approach of systems thinking in multi-stakeholder decision making for complex problems. Cases will be selected in different policy areas, including active and healthy aging, resource efficient production and eco-innovation, and transportation and public infrastructure.

Research Assumptions

The study research questions will procure answers and demographic information about participants. I expect the manner of data collection to be nonintrusive and relatively easy to complete. Open-ended questions are uniquely designed to elicit the experiences of participants, tap into their personal experiences, and shed light on their perceptions. These questions have a

distinct place in the study's methodological design and serve as a useful complement or adjunct to other data collection methods.

The challenge in research is the ability to capture a comparable amount and range of information across cases to examine concepts of interest. I expect the evidence will be descriptively rich and will draw on a variety of sources, including published interviews, articles, answers to study questions, and field notes from observations. I will also ensure rich data by using two purposeful sampling strategies, namely criterion and intensity sampling. Criterion sampling holds that all participants must meet one or more criteria as predetermined by the researcher, and intensity sampling requires the researcher to seek information-rich cases that meet the standards for the study. This research is being conducted in the environ of the ISSS which includes member only website and discussion in international annual conferences.

Participant Selection

To identify study participants who could illuminate current systems thinking approaches in policymaking, I initially turned to the faculty of Saybrook University. What organizations would have active systems-thinking practitioners? Which of those organizations would have policymakers in their ranks? Which ones had a multidisciplinary population of academicians, published theorists, and management professionals? I asked for a recommendation of an organization that might contain systems scholars who engaged in policy deliberations and was referred to the International Society of Systems Sciences (ISSS).

The ISSS describes itself as the first and oldest organization devoted to interdisciplinary inquiry into the nature of complex systems. I was able to develop a list of participants (with help from Saybrook University faculty and faculty from other institutions) after becoming active in the organization as a scholar-practitioner and doctoral student in Leadership of Sustainable

Systems. These potential participants are members of ISSS, the Operations Research Society, and other groups with a scholarly interest in policy development science. I expect to invite this group of scholars to contribute to the present research. As a result, this research is designed to identify those researchers, practitioners, leaders, and managers who use systems thinking practices in the development of a public policy objective.

The universe of potential participants will be past and present members of the ISSS and the OR Society. This organization serves as a proxy for practitioners who are interested in the opportunity to exchange successful systems practices, educate others in systems thinking practices, and interface with other organizations such as the Operations Research Society, the Association of Cybernetics, and other systems-related organizations. As such a rich and connected organization, ISSS offers an ideal avenue for learning about the latest in systems thinking approaches being used by decision makers in public policy. Access to the membership of the ISSS can be obtained by anyone who signs up to be a member; by joining, I was granted access to the members-only portal. Invited participants from ISSS will be screened according to the following criteria: they use systems thinking in public policy or for a public purpose interest/objective; they are a systems practitioner or educator; and they have knowledge of systems principles and practices.

Discussion

The research questions guiding this study call for qualitative inquiry and a research design that takes the systemic nature of public-sector decision-making environments into account. The study questions are open ended and therefore do not limit a respondent's choice of answers (Gubrium & Holstein, 2002). In this way, the study may draw from participants' valuable insights into the use of systems thinking in practice of public policy development.

Additionally, this study is intended to mine the intellectual capital of the systems community to identify factors that shape when and in what fashion systems practitioners use systems methods to diagram dynamic processes. I hope to directly or indirectly glean insights that policymakers and decision makers can use to improve how they identify complex problems, approach them as situational messes, and promote sustainable, regenerative governance systems.

This research invites participants to recall instances when they used systems thinking to address a wicked problem in a policy context. I plan to secure qualitative data that supports investigation of this phenomenon in depth in a real-world context. Qualitative data is usually in the form of text (e.g., interview transcription or organizational documents), but may also include non-textual artifacts such as tables, pictures, and audio and video recordings (Patton, 2002; Strauss & Corbin, 1998). This study will use multiple data collection methods, including surveys, archival documents, etc. to elicit in-depth descriptions of circumstances, interactions, observed behaviors, events, attitudes, thoughts, and beliefs from people who have experienced systems thinking in public policy practice (Patton, 2002). Data collected for the study may also include excerpts or entire passages from personal or organizational documents such as correspondence, records/diaries, and case histories (Patton, 2002). This research will capture high-level discussions of the use of systems thinking, systems literacy, and systems methodologies used to solve the world's most challenging problems.

By employing a number of data collection techniques, I expect to obtain an in-depth understanding of systems thinking in wicked problem dissolution. Data will be triangulated to obtain an in-depth understanding of the phenomenon under study. This robust data collection strategy will provide rigor, breadth, and depth to the study, as well as correlative evidence of the data obtained (Creswell, 1998; Denzin & Lincoln, 2011).

The various methods of data collection available to investigators have advantages and disadvantages. After contemplating various possible methods, including interviews and focus groups (Robson, 2002), I decided to develop a questionnaire. This method was chosen due to the dispersed nature of prospective study participants and the limited timeframe of this research. The questionnaire allows for a free, untimed response of respondents and will ensure that all participant input is collected.

The sole data collection issue foreseen at this junction involves the lack of participant response. The research opportunity has been widely disseminated to stakeholders in the systems community; I also enlisted past and present officers of the ISSS. These steps, along with the minimal administrative burden of the study, should ensure strong participation among eligible study participants.

Ethical Considerations

In any research study, ethical issues related to protection of the participants are of vital concern (Berg, 2004; Marshall & Rossman, 2015; Pring, 2000; Schram, 2003). It is incumbent upon researchers to adhere to the highest ethical standards and ensure safeguards are embedded in the research process. Social science research is responsible for both informing and protecting respondents. The research process involves enlisting voluntary cooperation and it is a basic premise that participants are informed about the study's purpose. Informed consent will remain a priority throughout this study and, to ensure conformity with informed consent procedures, written consent will be obtained from each participant. In addition, proper informed consent forms will be requested and signed ensuing that confidentiality of responses is assured. Finally, cautionary measures will be taken to ensure the storage of research-related records and data. As the principal researcher, I will have sole access to this material.

Research Limitations and Delimitations

Given the study parameters of two to three cases solicited for analysis, the results from this study should be interpreted with the understanding that policymakers were solicited to participate. Findings may be especially applicable to policymakers and decision makers who are ISSS members, particularly those members with experience in policy matters. I acknowledge this as a delimitation of the study, and plan to address it with subsequent research that includes a larger pool of policymakers (e.g., local elected and appointed officials). The only other delimitation to note involves using past and present members of the ISSS as participants and conducting the study virtually. To my knowledge, I have not placed any other delimitations on this research and expect this study will be conducted according to the plan set forth.

With respect to limitations, this study will be conducted under the extreme time strictures of an academic year. As such, only limited information will be available at the time of analysis and synthesis of data. This is a potential weakness of the study but should not hinder the scope of investigation. The study may also be limited by researcher subjectivity. Because analysis ultimately rests with me as the researcher, there is an overriding concern about researcher bias in the form of assumptions, interests, perceptions, and needs. Being fully aware of this limitation, as researcher I will try to control for those biases.

Chapter Summary and Conclusion

In summary, this chapter provides a detailed description of the dissertation study research methodology. Qualitative case study will be employed to illustrate the phenomenon of whether and how policymakers and decision makers use systems thinking in their decisional processes and procedures. The participant sample will be made up of a number of purposefully selected individuals. Two data collection methods will be employed, including a questionnaire and

follow-up questions. The data will be reviewed against themes from the literature and other emergent themes. Credibility and dependability will be accounted for through various strategies including source and method triangulation.

A review of the literature was conducted to devise a conceptual framework for the design and analysis of the study. A process analysis will enable the key themes from the findings to be identified. Through a comparison with the literature, interpretation and conclusions will be drawn and recommendations will be offered for education, practice, and further research. The intent will be to improve the efficacy of policymakers and decision makers. Additionally, it is expected this study will be of value to systems practitioners who are responsible for preserving and promulgating systems thinking and its practices overall.

CHAPTER 4: STUDY ANALYSIS AND FINDINGS

This chapter contains findings of this study of systems science use in public policy, particularly in the resolution of wicked policy problems, which expands the use and application of systems-based approaches, methodologies, methods, and strategies to include the field of public policy and administration. By identifying and articulating these approaches, we fill in a knowledge gap in the literature and practical application of systems use in policy and affirm the existence of a systems-policy interface, which serves as the basis for additional research and applications, prospective new theories and collaboration and an emerging field of study. New theories of systems thinking in policy through systems and systemic leadership focus on interpersonal and interorganizational collaboration to promulgate policy among people and organizations in a public sector system. This new practical and theoretical focus includes a renewed emphasis on cross-sector collaboration and collaboratively communicated facilitation and problem formulation. These findings proscribe the tenets and approaches, charges elements, components, and definitions of systems and systemic leadership to be used in the application of systems thinking to wicked policy problems in a complex operating environment. Upon the foundation of the systems-policy interface, policymakers, practitioners, and decisionmakers can now use previously applied techniques and tactics innovatively in addressing wicked policy problems.

Originally interviews of systems experts from the International Society of Systems Science (ISSS) and Operations Research (OR) Society were planned. Due to various reasons, including the COVID-19 pandemic of 2020 and scheduling issues, interviews were delayed. During this period, experts published their ideas on systems thinking as applied to policy making

in the public sector. Because of this, interviews were dropped and replaced by a critical review and analysis of their written journal articles and books. This is explained in more detail below.

This chapter illuminates new definitions of systems thinking in policy including new definitions of systems and systemic leadership, which includes revised calls for the inclusion of the use of systemic leadership to combat reductionism evident in public sector organizations and systems leadership that outlined a set of skills which, when applied at individual, community, and systemic levels, are ways in which leaders can affect systemic change through policy management while addressing complexity and uncertainty, addressing multiple interest and considering the politics of a public sector systems. Through the element of systemic leadership, policymakers and leaders could employ systems leadership and systems thinking to affect the science-policy interface. By doing so, policymakers can apply tenets of systems leadership employing high level thinking, approach combinations (including the methods of boundary critique, critical systems heuristics, viable systems model, soft systems methodology, community operation research and strategic choice approaches.).

As this research encompassed a variety of approaches drawn from complexity, systems thinking and operations research, a majority of the findings are drawn from systems thinking practices. As will be seen, within the practice there was evidence of an emerging notion of a systems-policy interface, and new definitions of leadership for decisionmakers and policymakers. I found systems thinking in policy encompasses a multidisciplinary body of policy and administration policies and procedures typified by a willingness to consider integration, interdependence and connectivity in time and space, both individually and collectively. Components of a public sector organizational and leadership systems have both systems and systemic properties, and also possess characteristics that provide a leadership and organizational

framework for policymakers addressing intractable wicked policy problems that manifest in multifaceted policy environments. Further, these innovative approaches, and the existence of a science-policy interface should aid in the design, diagnosis, operation, and evaluation of policies that allow their organizations and leaders to survive and thrive in complex operating environments.

Context for Understanding and Discussing Findings: The Science-Policy Interface

Wicked policy problems call for high levels of systems thinking, resource coordination and collaboration due to their interrelated and integrated beliefs, psychology, norms, and culture. Traditional problem-solving methods have emphasized intervening in systems at multiple entry points without taking the residual policy effects into consideration. Previous models have reinforced the need for multilevel and multiple strategy interventions (e.g., education, policy, analysis), as existing practices have been less effective in solving wicked problems. They neglect the interrelationships within and across levels of a public sector system, and how interventions need to take these relationships into account in their design and implementation. This study's findings indicate that authors and theorists believed that by integrating systems thinking paradigms, models and methods, policymakers and decisionmakers could and have begun that integration into the policymaking process. Affirmation of the interface encourages decisionmakers to apply systems science techniques to policy, making intergovernmental, interpersonal, and individual collaboration not only possible, but a preferred way to solve wicked policy problems. Through systems and systemic leadership and analytical and methodological ties between systems and policy, policymakers can confidently adopt and apply lessons, cases, methods, methodologies, and approaches of systems science to the policymaking process. These approaches, and their corresponding methodology, have the potential to deliver missing praxis

elements of systemic and adaptive governance. That praxis will produce transformation, but only if it is built on fundamental shifts in thinking about how to address wicked policy problems. As systems change and transformation is the goal, recognition of the emerging systems-policy interface hastens transformation as policymakers apply systems techniques to emerging problems to modulate issues and problems in a public system to an equilibrium state.

This study's findings indicate applying systems thinking techniques to wicked policy problems allows the large body of information that composes the academic fields of complexity science, operation research, and systems science to be mined for causal links. Once policy practitioners and systems scientists begin to work in conjunction, the many relevant scientific disciplines, paradigms, research communities, theories and methodologies can begin to act in accordance. Their collaboration, spurred by the science-policy interface, allow stakeholders the tools to diagram common problems and identify areas of disagreement, upon which they can compromise. Both practitioners and researchers have noted that, in systems they both inhabit, systems interworking become clearer and research questions formulation easier, assisting in the evolution of policy from all stakeholders.

Although research in the science-policy interface is still in the research pipeline, initial findings, which are provided in this and subsequent chapters, are encouraging, providing initial areas of discovery and research for other systems-policy, cross-sector research collaborations. As Boulding pointed out, general systems theory (and systems science in general) "aims to provide a framework or structure on which to hang the flesh and blood of particular disciplines and particular subject matters in an orderly and coherent corpus of knowledge" (Laszlo & Krippner, 1998, p. 12). Providing a uniform framework for the complexity of a wicked problems gives order and process to a multicausal occurrence, aiding in its resolution and suggesting next steps.

As real-world phenomena are experienced and analyzed, systems thinking practices provide uniformity of problem-solving approaches, and identification of causal factors, core concepts, and vital causal relationships.

As will be seen in the findings set out in this chapter on systemic leadership, wicked policy problems diagrammed, conceptualized and reconceptualized through a systems lens can be better understood by stakeholders, especially if they, collaboratively, are creating these diagrams and concepts together. Stakeholders are empowered individually and collectively in the problem-solving process, either interpersonally or interorganizationally, simply as a result of generative human interaction and interplay. Policymakers utilizing the framework advanced by this dissertation, have new tools in addressing complexity in their operating environment. These findings outline said framework for leaders and policymakers to use in the advancement of public policy strategies and objectives. Indeed, the science-policy interface framework allows previously unallocated techniques and tactics not previously applied to policy processes to address the complexity in public sector systems and to be used innovatively in addressing wicked problems.

> Systems thinking and arising analyses can reveal how ideology, politics and diplomacy connect to policy decision making, and, ultimately, to the well-being of stakeholders…It can help demonstrate why a different kind of framework (one that addresses the big societal questions of equitable, sustainable global progress) must become the guiding light for new approaches. (Berry et al., 2018, p. 287)

In their article on the nexus between climate change and mental health, Berry et al. (2018) articulated the guiding light of the systems-policy interface that can lead both policy and systems science communities in the collective and individual objectives in advancing research into the uses and practices of systems thinking in policy. The genesis of this nexus and its implications can be found in early deliberations of the International Federation of Systems

Researchers (IFSR), a body of the systems community that convenes and facilitates academic traditions of system sciences, cybernetics and complexity theory in the applications, management, and leadership of organizations. Initial publications of the IFSR Conversation in 2014 recommended support and facilitation of systems-based projects that (a) establish a consistent lexicon for systems philosophy, (b) refine and publish a model for articulating system-philosophical perspectives, (c) develop a "map" of the scope of Systems Science, (d) develop and establish a general systems theory, and (e) apply general systems theory toward fulfilling the founding ambitions of the systems movement.

Today, as evident in the present research, the lexicon, philosophy, publications, map, and application of new iterations of general systems theory constitute the backbone of systems thinking in policy. Recently, the vision outlined in 2014 by the IFSR was realized in a recent U.K. study of 'Better Policy Delivery and Design" prepared by the Cabinet Office's Performance and Innovation. There, it is argued systems design should be iterative. Both academicians and practitioners, across decades have reinforced the systems-policy interface. It is best understood not as a linear process—leading from policy ideas through implementation to change, but rather as a more circular process involving continuous learning, adaptation, and improvement.

In examining the need for the systems-policy interface, we can note systems thinking is important for societal public policy decision making. Understanding a system helps policymakers and decisionmakers navigate complexity, allowing for adjustments, more counsel, and innovative approaches to solve problems. Individuals, stakeholders and even society itself are human systems embedded in, reflective of and shaped by societal norms and priorities. These norms impact the way we as societies and individuals interact and they determine individuals' circumstances within societal frameworks. It is an essential aspect of problematization, to denote

our lexicon of concepts. The interface allows us to describe wicked problems with a common language, the language of systems, and to develop policy that can be shared and discussed among disparate stakeholders and decisionmakers. For instance, the aforementioned description of interplay between mental health and climate change is described this way:

> For example, in an effort to measure the health effects of climate change, the relationship between mental health and climate change (which) has received little attention in research or policy. Using a systems approach, complemented by a new style of research thinking and leadership, these two phenomena are aligned to address the needs of this emerging field with existing and research policy agendas. (Berry et al., 2018, p. 42)

This recent example of the causal nexus between environment and health effects helps to solidify the concept in the minds of stakeholders, bridges research communities, and suggests new collaboration in research and practice to produce new research collaborations. According to Berry et al. (2018), the climate-change-mental-health system relationship, assists stakeholders with aligning effects on mental health with real-world effects of climate change. Like all systems, they assert, the climate-change mental-health system has power, resilience, and momentum, producing mental health outcomes which are unavoidable. Berry et al. (2018) through combining concepts of mental health and climate change in a systems-based framework imbue those two fields with a systems platform and solidify the causal relationship in the minds of stakeholders.

> The case of climate change and mental health is a good example of the use of systems thinking practice in a real-world context. It is essential to acknowledge the social-level contexts and constraints and the many feedback loops and reciprocities characterizing dynamic systems and real lives. The study of climate change and mental health benefits from systems thinking by incorporating insights m a wide range of disciplines that are endemic to systems thinking: Systems thinking is “a set of ‘synergistic analytic skills used to help describe a complex set of interacting factors that produce outcomes, to predict their behaviours and to formulate interventions to achieve desires (and avoid pernicious) results. (Berry et al., 2018, p. 283)

Scientists and mental health professionals, in an effort to bring attention to the correlation of these two phenomena, linked them in the nomenclature, similarly to how the science-policy

interface was introduced. By attaching scientific process to policy deliberation and implementation, stakeholders can guide how budgetary and policy narratives are framed and how wicked policy proposals are examined, optimizing public acceptance of unpopular decisions. The science-policy interface, like the climate change and mental health demarcation, highlights the important role systems thinking can play in public policy ecosystems. This correlation can synchronize the emerging field of system thinking in policy with existing local, state, national and international research, policy, and agendas.

How Study Findings Were Derived

This qualitative, IRB approved research study of systems thinking practices in policy was designed to explore systems community use and practice of systems thinking in policy with a sample of ISSS and OR Society members, the present use and application of systems thinking principles, methods, methodologies, tools, and techniques used in developing public policy and in public administration practice. I expected to identify techniques and skills associated with systems thinking as they applied to the resolution of wicked problems. A survey of relevant literature in operations research, complexity, public policy, management decision making, and project management yielded a conceptual base of literature, but a limited amount addressing systems science or problem solving using systems techniques were published and available for inclusion in my analysis the actual number of sources addressing these issues is scarce, due to the paucity of practitioners who have published recently on this topic. Adhering to the population of ISSS and OR Society members I proposed in the IRB application, I sought those ISSS and OR Society member who were active in the field of systems thinking in policy and sought their expertise and scholarship. My analysis, therefore, contains the most recent relevant data on systems thinking use in public policy given that constraint, and draws upon them for analysis,

conclusions, and recommendations. That analysis and synthesis used published research as the subjects to be analyzed. This chapter presents emergent literature authored by study participants about systems thinking use in public policy as findings of this research. As published literature encapsulates study participants' responses to my research questions, it provided a robust data set for the presentation and analysis of the most recent findings in the field. The data set includes published articles, interviews, and web postings with scholars. Study respondents designated current uses of systems approaches in policy arenas, multi-stream policymaking and identifiable impacts on their work. All study participants were members of the systems community and affiliated with one or more of the following organizations: ISSS, UK Systems Society, International Council on Systems Engineering, or the systems thinking strand of the OR Society. Archival data and related contemporary research were also mined for answers to my research questions. All respondents described engagement with systems thinking, which, in some way, was evidenced by their association with and participation in the aforementioned organizations.

After an initial query of both society's memberships, I sought to validate my hypothesis presented in my IRB application, that use of critical systems thinking approaches exceeded other methods in solving wicked problems and was preferred by the systems community. Through this research, I discovered critical systems thinking was not the predominant schema proffered for policymakers and decisionmakers; rather, it was the exercise of systems and systemic leadership and the science-policy interface. This research found, from examples of systems thinking in health policy, that systems approaches in preventative health identified areas of impact such as systems structure, culture, and people (Bigland et al., 2020). When researchers and policymakers apply these principles, and the research that follows from their application it could use core leadership lessons applicable to policy decision. Wicked policy problems often require the

interplay and coordination of multiple organizations. Systems leadership views these systems as interdependent parts and require focus on organizational collaboration of these parts and an emphasis on interorganizational coordination to achieve a greater purpose. That coordination has the tendency to supplant existing boundaries, relationships, and perspectives, necessitating a system approach obvious. To operate in this complex environment, policymakers and decisionmakers have the benefit of a research-based approach to solving wicked problems: systems and systemic leadership, which is explored more fully later in this chapter. Both approaches incorporate systems thinking techniques into the practice of leadership for public sector organizational systems.

Although this study's research findings lead us to a greater understanding of the role of systems and systemic leadership in the management of public sector organizations, it does not validate the original study hypothesis that critical systems thinking was used predominantly. However, I did find some aspects of critical systems thinking, including its orientation to include real world impacts on decision making, fit well with public policy dilemmas. Additionally, not only is discovery of systemic and systems thinking leadership among the core analytical lenses that can be applied to policy, enumeration of the components of systems and systemic leadership has the potential to greatly enhance policymakers use and practices in the future. Leaders and decisionmakers charged with managing complex multistakeholder problems in VUCA environments and complicated governance systems can use systems and systemic leadership in resolving challenges they face. This study found instances of both systems thinking methods and methodology among the study population but found limited use of systems and systemic leadership in the study population. For those approaches in use, I found method variants were borrowed from one or more traditional approaches used in management and were selectively and

creatively combined to address policy. For instance, in preventive health, systems thinking offered new ways of conceptualizing health problems and contexts (Haynes et al., 2020), which opens innovative ways of working with communities and of tackling wicked problems. These combinations of approaches were a new way of addressing wicked policy problems, and results could be shared and applied to other problem situations as they emerged. These approaches were used to tailor solutions for problem-specific and industry-specific policy dilemmas, and made available to policymakers and decisionmakers as exemplars to address similar issues across organizations and networks addressing issues with policy.

Innovative Leadership Approaches

To counter the pervasive ethos of reductionism embedded in public-sector organizations and processes, leaders and policymakers could adopt systems and systemic leadership approaches as a way of mastering the interconnected organizational, leadership, and policy infrastructure within a policy environment. These approaches were outlined last year in a report by the Harvard Kennedy School (Dreier et al., 2019) and in a previously mentioned research article on public health and systems leadership (Bigland et al., 2020) as well as in an article of systems leadership from Hobbs (n.d.). All sources describe systems leadership in public sector organizations as an emerging phenomenon, which employ systems thinking and whole systems approaches that require collective action (although Hobbs would argue the term whole systems approach is a misnomer). These scholars argue no single organization can control the outcome and so they are dependent on collective action to address the joint problem. All propose the employment of systems leadership techniques in the resolution of wicked problems that occur in complex systems such as climate and the environment, public health, food scarcity and the administration of towns, cities, and provinces with myriad stakeholders.

> Achieving progress on this agenda requires a departure from traditional top-down, hierarchical and linear approaches to implementing change. Instead, it requires innovative and adaptive approaches that engage broad networks of diverse stakeholders to advance progress toward a shared vision for systemic changes. This approached is called systems leadership. (Dreier et al., 2019. p. 3)

Below I describe Dreier et al.'s presentation of particular features of both systems and systemic leadership designed to catalyze, enable, and support the process of systems-level change in public sector organizations.

Systemic Leadership Approach

While there is scant literature on systemic leadership, existing sources are based on previous works by such noted systems scholars as Werner Ulrich, Derek Cabrera and Laura Cabrera, Michal Jackson, and prior writings by one of its authors, Gerald Midgley. Composed of design-led approaches, the systemic leadership approach has the potential to assist stakeholders in thinking and acting more systemically. It promotes the generation of previously undiscovered, problem specific problem insights by cultivating collective intelligence. "If informed by these kinds of systems thinking approaches, the public sector of the future could be more exploratory, design led, participative, facilitative, and adaptive addressing complex priorities, rather than focusing only on leading organizational delivery within narrow 'silos'" (Hobbs & Midgley, 2020, p. 3). If policymakers and leaders were to adopt problem-based approaches to systems thinking and design by synthesizing different approaches, as called for in the systemic leadership rubric, these approaches could be embedded in public service design and service delivery to enhance systems leadership of public sector organizations. OR Society colleagues and researchers Hobbs and Midgley (2020, pp. 2–3) suggest the systemic leadership approach's "true power" comes from exploring the unique context at hand and designing "a bespoke programme that draws upon the best of many approaches" (Hobbs & Midgley, 2020, p. 1). Midgley (2000)

offers here, as he does in Systemic Intervention, that "principles and methods may be borrowed from one or more of the available approaches and creatively combined" (p. 3).

Hobbs and Midgely's (2020) theory of systemic leadership is prefaced by work by Ulrich (1994) on critical heuristics of social planning, Midgley's (2017) published work on critical back-casting, and Beer and Beer's (1985) work on diagnosing systems organizations. It is also based on standard processes of boundary critique, the viable systems model, and soft systems methodology, to name a few (Jackson, 2019). Systems leadership is grounded in systems theory and can generate deeper insights, guard against unintended consequences and coordinate action more effectively" (Hobbs & Midgley, 2020, p. 1). By questioning assumptions, exploring context, and engaging people, Hobbs and Midgley (2020) assert embedding systems thinking approaches in everyday government routines will enhance problem-based approaches to systems thinking and design. Storied in systems traditions this approach uses systems thinking techniques to deliver policy priorities, enhancing the leadership potential of policymakers and leaders in public sector organizational systems.

General systems theory holds that organizations are composed of interrelated parts. Hobbs and Midgley's (2020) systems leadership focuses on coordination of these disparate parts of a system and considers it as a whole to facilitate achievement of its given purpose:

> When the issue being addressed is too complex for a single organization to deal with alone, multiple organizations can become involved. Nevertheless, the idea is the same: constituent parts of an existing system must be 'joined up' into a greater whole. (p. 1)

Multiorganizational, multidimensional, and complex issues that exceed organizational boundaries require the advanced thinking of systems thinking practices and techniques. They necessitate mental processes that are capable of grasping the big picture, according to the Australian Public Service Commission (2012), a body that uses these techniques. These

mental models should include “the interrelationships among the full range of causal factors underlying them” (p. 6). Higher level systems thinking challenges stakeholders to expand their view of the wicked problem before them.

Policymakers and decisionmakers are required to engage all stakeholders in boundary critique and are also obligated to engage with diverse stakeholders. Additionally, they are exhorted to work across organizations, and employ traditional analytical, conceptual, and project management tools used by public servants involved in policy making and planning policy implementation. To effectively use this approach, practitioners need to be able to step back from the systems in which they reside. Policymakers and decisionmakers need to be able to think about what they are trying to achieve in relation to the bigger picture and collaborate with a broad range of stakeholders. As policymakers come to the study of systems thinking with varying levels of expertise in the methods and methodologies of systems thinking, this charge would require a multiple entry point learning plan. This is a plan which would require them to begin a practice the skills of a systems thinker. Through systems thinking, policymakers and leaders can generate deeper insights, guard against unintended consequences and coordinate action more effectively.

Systemic Leadership and Change Management in Public Sector Organizational Systems

As a researcher, my objective was to find, if possible, those transferable techniques or strategies that could assist policymakers address wicked policy problems. I had those practitioners in mind, as I wanted to find traditional techniques that were orchestrated in a new way. My desire was to develop a training for policymakers and decisionmakers based on those methods. With the discovery of systemic leadership, I found specific guidelines that can be used to mentor and coach policymakers and decisionmakers to help them build capacity. As one of

two approaches I found among my respondents' submissions, the systemic leadership approach has a distinct application to change management in the public sector. From its simple formulation to its incorporation of traditional systems methods, systemic leadership has the potential to illuminate substantial change in public sector organizational management systems. As described, systemic leadership views organizations as composed of interrelated parts, as opposed to individual and separate entities. Facilitating a public sector systemic leadership context has the effect of focusing coordination of component parts of the system toward a common purpose. The literature provides the following two guidelines for use of this approach:

Use of Systems Leadership in Addressing Wicked Policy Problems

- Policymakers are guided to use systems thinking in their approach to public policy. The authors believe leaders need to be able to retreat from the systems in which they reside. They need to be able to think about what they are trying to achieve in relation to the bigger picture and collaborate with a broad range of stakeholders.
- When training policymakers in the use of systems thinking practices, care should be taken to account for different levels of systems knowledge among them.

Both of those guidelines provide tangible guardrails for policymakers in delivering systems thinking principles in a policy environment. Previously, when discussing Sweeney's approach to systems education, I noted an elemental approach should be taken to account for different levels of systems knowledge among children. Similarly, when providing systems knowledge to policymakers and decisionmakers, the same care should be taken. As policymakers come to the study of systems thinking with varying levels of expertise in the methods and methodologies of systems thinking, providing them the tools of systems thinking in policy to solve wicked problems requires a multiple entry point learning plan. This plan would require them to begin to practice the

skills of a systems thinker. Through systems thinking, policymakers and leaders can generate deeper insights, guard against unintended consequences, and coordinate action more effectively.

Composition and Components of Systemic Leadership Approach

Systemic leadership is composed of various process components: the strategic choice approach, the viable systems model, soft systems methodology, and community operational research. According to the authors, the strategic choice approach is used mostly for multistakeholder decision making and handling uncertainty. There are four phases of strategic choice: shape people's understandings of the multidimensional problem; design several packages of possible policy responses; compare these packages; and choose between them. This helps people think about uncertainties and contingencies. It also offers a tool to visualise multiple interacting areas of policy, the options available, and how compatible they are with one another. These components should be familiar to practitioners; the discovery is their direct and specific application to public sector leadership and the public sector's organizations and processes. Below is a description of these components.

Soft Systems Methodology. Strategic leadership offers as a process of systemic change the component of Soft Systems Methodology or SSM (Checkland, 2000; Checkland & Scholes, 1990; Jackson, 1982). SSM is one of the traditions of systems thinking along with hard and critical systems thinking. Jackson (2019) called it an approach for people complexity in that it is seen as "emerging from human self-consciousness and free will" (p. 342). He wrote, "Soft systems approaches seek to improve organizational improvements by exploring different perspectives and ensuring that enough agreement is obtained among stakeholders about the purpose they wish to pursue to enable them to take action" (Jackson, 2019, p. 341).

SSM as a component of systems leadership is thought to be ideal for communities and other stakeholders attempting to address a wicked policy problem. It is designed to allow them to review mutual and shared objectives and goals, promote understanding and propel cohesion until an agreement is reached. The significant loose ends of systemic leadership? A personal story of complexity, systems thinking, OR, innovation, and the scope for public policy learning.

SSM offers visual techniques for exploring differing stakeholder perspectives. This involves four main activities: rich picture building, to get a visual map of people's perceptions of a complex problem; identifying possible transformations to pursue from different stakeholder perspectives and visualising required actions; reflecting on the options and asking what kind of transformational approach is best; and finding accommodations between stakeholders to agree the most desirable and feasible way forward. Most importantly, SSM helps stakeholders learn collaboratively about complex situations and generate better mutual understanding of their different viewpoints on desirable and feasible change.

Although originally conceived as a problem-solving tool, SSM has developed over the years to be oriented toward learning and insight because the methodology is exploring a situation from different perspectives.

Community Operations Research. This attribute of aspect of system literature was not familiar to me. A quick survey of the literature tells me it is a novel approach, and only provided in the context of the systemic leadership approach. It is a community centred, open aspect that appears to be suited for decisionmakers and policymakers. This systemic leadership component aspect is people oriented and is the most participatory of the systemic leadership components.

According to Hobbs and Midgley (2020), this component is positioned for citizen-engaged transformations. It calls for policymakers and decisionmakers to work participatively

with local communities, drawing on several systems thinking approaches to bring disparate stakeholders and community members together and reach consensus. The focus of this component of the approach is on meaningful community engagement in setting agendas for transformation and *acting* on those agendas. This component resists the top-down design and implementation of policy in favour of codesign and coproduction with multiple stakeholders, communities, and citizens.

Creative Combination of Approaches. In study responses, Hobbs and Midgley (2020) suggest policymakers should creatively combine approaches of systemic leadership to assess, enumerate, and modify highly complex policy issues involving multiple causal factors and the intricacy of people complexity. Rittel and Webber (1973), in their wicked problem defining piece, *Dilemmas in a General Theory of Planning,* state, "The information needed to understand the problem depends upon one's idea for solving it" (p. 2). In other words, to describe a wicked problem in sufficient detail, one has to develop an exhaustive inventory of all conceivable solutions ahead of time. I would argue a policymaker attempting to solve a wicked policy problem needs to master the skills of boundary critique, critical systems heuristics, the strategic choice approach, the viable systems model, soft systems methodology (including the use of rich pictures), and what Midgley (2020) calls community operations research (described as working participatively with local communities). These approaches are integral components of the systemic leadership approach, and when used alone or in combination, aid us in thinking and acting more systemically. First advanced in Midgley's (2020) article on systemic intervention this practice of using approaches in combination with existing processes, produced the most uses and methods, which led to equally inventive policy results.

As Rittel and Webber (1973) presciently predicted, these approaches feature prominently in problem identification. Problem understanding and problem resolution are concomitant to each other, making it important in applying systemic leadership to place a special emphasis on problem identification, problem scoping and reconceptualization. In the words of Rittel and Webber (1973), formulation of a wicked policy problem is the problem.

Collaboration. According to theorists, collaboration, both cross-sector and systems-policy, and interpersonal and interorganizational, essential for successful passage of policy initiatives. I have indicated this research found creative combinations of approaches to address wicked policy problems are a key factor. Additionally, approach combination is more apt to be successful if there is an interpersonal and interorganizational collaboration aspect of collaboration. This study's findings suggest collaboration should have several attributes, which are outlined below.

Collaboration As a Key Attribute of Systems Leadership. Hobbs and Midgley (2020) place a great emphasis on collaboration, even specifying types of collaboration that should occur as a result of employing the systemic leadership approach, as described below. The specificity and type of collaboration provides a clue to its importance among theorists.

Curiously, authors did not focus on the mechanics of collaboration, but instead chose to focus on the lack of case examples of collaboration in their research of public policy stakeholders. Much like the silos in a reductionist public organization, the paucity of publicly available peer reviewed research in the area of collaborative research projects, and the combined organizational use or funding of research collaborations in this area, indicate an absence of research and practitioner collaborations in this area. While there have clearly been limited uses of systems thinking approaches in practice, publication of those uses and applications in public

policy is currently in the research pipeline. Although examples cited in this chapter represent a small sample of such research, a scholarly acknowledgement of the science-policy interface in academic and practitioner research signals expected cross-sector collaborations and continued interest in this area not only among public policy researchers, but practitioners and scientists as well. There is a wide diversity of fields in which research is occurring, and the diversity of fields in which articles appear signals growth in this area of research. Also, there are many applications of methods that do not acknowledge their origins in systems science. anecdotally five such applications for every one that does acknowledge its origins.

Cross-Sector Collaboration. Despite limited evidence of peer-reviewed scholarly articles eschewing collaboration as a component of systemic leadership, there is an increasing view that collaboration across and within government, disciplines, sectors, and organizations is best suited to apply systems thinking in policy because it functions both as a means of informing policy and practice with systems science and of working with the systems themselves. This finding is echoed in writings by Haynes et al. (2020), who found the conceptual shift affecting multiple aspects of their work using systems thinking. In their research, they wrote:

> systems thinking was a key contributor to this shift which was not about acquiring knowledge or influencing a discrete policy, but about an evolving systems perspective that is changing how they think and talk about ...problems and contexts, policy goals and practices and approaches to developing solutions. (Haynes et al., 2020, p. 71)

Haynes et al. (2020) indicate this movement toward increased intergovernmental and cross discipline collaboration can only bring renewed innovation, perspectives, and discoveries to policymaking and expansion of the use and instruction of systems thinking in our society.

Systems-Policy Collaboration and Communication. This research uncovered the subcomponent finding that, in a nod to the science-policy interface, both systems and policy practitioners would benefit from increased collaboration, and it would be beneficial to the overall

goals of an organizations efforts toward being more systemic. Theorists argue both policymaking and wicked problem resolution would be advanced through system concept-enhanced communication about the problem between disparate stakeholders. Given this, there is a need to create a shared understanding of the problem, even among interorganizational stakeholders to facilitate collaboration. Systems thinking provides a common basis and language for such an understanding allowing diverse stakeholders the ability to communicate effectively. Creating a shared understanding reduces the complexity of the task leading to increased chances for resolution. In this study, my aim was to explore factors that support policymakers to use systems approaches and to identify and impacts of systems thinking on policy thinking or action, including pathways though which these impacts occur.

Lastly, systems thinking offers new ways of conceptualizing policy problems and contexts which opens innovative ways of working with communities and of tackling wicked policy problems. Policymakers can make practical use of systems thinking, resulting in positive impacts on processes and expected longer-term impacts on societal issues. According to Haynes et al. (2020), some policymakers who took part in a collaboration that used systems thinking reported it changed the research, ideas, tools, and resources they were drawing on, which impacted (a) methods they were using to design, scale up, implement, and evaluate policies, and (b) how they were talking about prevention in their own organizations and with stakeholders. The use of systems thinking as part of the policymaking process had methodological and collaborative effects on the outcome of the policy process. As a tenet of leadership, the injection of systems thinking practices enhances the policymaking process and produces unforeseen benefits to the policy process and the policy itself.

Chapter Conclusion

The systemic leadership approach could signify an opportunity to help build capacity to lead networks of people to learn together systemically in pursuit of designing essential public services collaboratively and tailored to the jurisdiction rather than design of silo-based public policy. As described previously, components of systemic leadership are well known systems-based methods, which can now be applied to policy. Policymakers and decisionmakers may know the viable systems model well from other applications but had no research-based need to apply it in their processes. The value of this approach is the direct guidance to use these scientifically based processes in the policy development cycle. Its value is its ability to allow organizational or multiagency system use as a response to the emergence of a wicked problem amid battering influences of a turbulent, ongoing, and volatile environment (e.g., service provision, coordination, management, intelligence about the future, and strategic oversight).

Systems Leadership

Systems leadership is put forward as an approach best suited for use with issues that require coordinated, collective action to solve and implement, such as obesity and sustainable development. It places emphasis on relationships between parts that form a physical system in addition to is understanding the individual parts and their environment. “Where systems leadership differs most significantly from other leadership concepts is through the focus on leading beyond organizational and professional boundaries to address cross-cutting ‘wicked’ problems.” The authors indicated “systems leaders have clear, shared priorities that are grounded in the needs of their communities and not in the interests of individuals or their organizations” (Bigland et al., 2020, p. 2). This section of the dissertation describes study findings about use of systems leadership and provides an in-depth thematic analysis of various systems approaches to

be used in the policy process. It identifies the systems leadership factors important to policymakers and leaders in getting started with systems leadership and in maintaining system being.

As discussed throughout this dissertation, the paucity of peer reviewed empirical research analyzing how systems leadership is carried out marks the lack of case studies and advanced research of the use of systems thinking in policy through systems leadership. As a result, I am limited to only the range of research, policy and organizational development materials that cover more conceptual what and why of systems leadership as opposed to case studies and exemplars of its use in public sector settings. The Harvard Kennedy School of Government has written on applying systems leadership principles to the sustainable development goals (Dreier et al., 2019) but these are primarily concept papers, with little empirical evidence of their use of public policy domains.

First, according to Dreier et al. (2019), developing a compelling call to action and gathering a 'coalition of the willing' are both important in initiating action. They indicate these concepts translate from wider change management literature but within a systems leadership framework that is both more population and issue focused rather than leader centric, and so transcend the expectation that change is initiated by a single leader.

Second, the systems leadership approach demonstrates relationships are essential and, while they can be built in a number of ways, consciously focusing on nurturing them is important. In terms of how to build relationships, research shows trust and feeling valued and respected are key (Deering et al., 2021) further indicated sharing one's own vulnerabilities, acknowledging colleagues' contributions and needs in a personalized way, and ensuring actions,

behaviors, and words reinforce a supportive and safe working environment could lead to improved systems performance and create public value.

Third, Hobbs and Midgley (2020) authors also offer a key dimension of systems leadership—that of diversity and inclusion. They assert different aspects of systems working will require different forms of knowledge, expertise, experience, and personal characteristics. The overall quality deemed most beneficial to successful systems leadership was capacity for flexibility and adapting behaviors to fit the context.

This study revealed building such practices into their ways of working has potential to strengthen the impact of systems leaders. By building resilience personally and structurally, systems leaders can shift away from charging individuals with responsibility for their own resilience, to a more structured and deliberate approach to building system resilience. This is particularly important given how long term and demanding system working can be. According to this dissertation study, the following are components of systems leadership as defined by Harvard University and contemporary authors in public policy.

Systems Leadership Defined

While there are various definitions of systems leadership in the organizational management and leadership development literature, when a public policy lens is added to the analysis, only a few sources seek to define systems leadership as it applies. Systems leadership, as defined by Dreier et al. (2019) is “a set of skills and capacities that any individual or organization can use to catalyse, enable and support the process of systems level change. We know from existing research that when systems practitioners bring together various systems, ideas, and techniques in an organized way and employ them to try to improve a problem situation, they are said to be using a “systems methodology” (Jackson, 2019, p. 166). This

definition of systems leadership appears to be a systems methodology, given that definition. This definition points to the value of systems leadership as a way of addressing policy challenges that arise in complex policy space. Tying directly to this researcher's aims to develop systems-based strategies in policymaking, Dreier et al. (2019) described systems leadership as being composed of three interconnected elements:

1. *Individual*: skills of collaborative leadership to enable learning, trust building and empowered action among stakeholders who share a common goal;
2. *Community*: tactics of coalition building and advocacy to develop alignment and mobilize action among stakeholders in the system, both within and between organization; and
3. *System*: an understanding of complex systems shaping challenges to be addressed. According to Dreier et al. (2019), the authors, this approach requires collective action, where no single entity is in control. It involves building and mobilizing alliances of diverse stakeholders around a shared vision for systems changes, empowering widespread collaboration innovation and action, and enabling mutual accountability for progress to shift systems toward sustainability.

This form of collaborative leadership is supportive and adept at coordinating action among networks of diverse stakeholders. These three elements of systems leadership can be applied sequentially: individuals can mobilize networks, which in turn can enable systemic change. However, they are highly synergistic and can also be enacted simultaneously. Quite often individuals, coalitions, and systems change strategies will evolve and develop new capacities at the same times as an initiative unfolds (Dreier et al., 2019). That synergistic quality allows for empowerment of the individual leader in a form unique to other forms of leadership and

organizational development. The use of systems leadership can provide a previously undiscovered way of tacking complex wicked problems. Table 1 highlights the application of systems leadership directly to policy and accentuates three spheres of influence where an intervention can be applied. This approach ties roles and responsibilities of an individual leader, the role of policy stakeholders, and the effects of the current political system on the resolution or addressing of wicked policy problems.

Table 1

Policy Management Issues and Interest Groups

Complexity and Uncertainty	Multiple Interests	Politics
Individual	Community	System
Through the practice of collaborative leadership, Systems Leaders both develop their own capabilities and enable individuals within the system to relate to each other and connect in ways that help them work differently. Systems-change initiatives often are driven by sustained effort and commitment of individuals. One individual can shift the direction of an institution, catalyse formation of a powerful network, or provide a crucial intervention to restore trust, focus, or commitment when it is needed. Through connecting to a network, the individual can	Complex systems are populated and driven by diverse stakeholders, both individuals and institutions. Stakeholders relevant to any given system form a community of actors who interact and influence one another within the system. Ideally, relevant stakeholders are well networked and well-coordinated around shared interests and the common good. However more often levels of trust, connectivity, and coordination among stakeholders in a system are highly varied. Yet even if they are fragmented and conflicted, most stakeholders in a system share a common interest in the well-being of the system as a whole – and	System change initiatives must be grounded in knowledge and insight about how the system functions. Most often complex systems are viewed, understood, or experienced differently by their various stakeholders. No single stakeholder has total knowledge of the system; the only way to gain a broader overview is to pool knowledge, insights, and data from many sources. For this reason, diversity is not just desirable but essential to generating a collective understanding of the system, developing effective strategies for action, and perceiving and adapting to

contribute to and influence the evolution of the system.

The potential for individuals to influence systems carries an empowering and inspiring message: anyone can make a difference, regardless of their level of authority or role in a system.

Individual Systems Leaders must exercise their influence with integrity, respect, and a learning mindset. A common theme in discussion of systems change is the importance of the mindset that individual leaders bring to their mission. Otto Scharmer's Theory U encourages leaders to "open the mind, heart and will" so each challenges their own assumptions, truly hears others' perspectives, and explores new approaches. The Academy for Systemic Change cites "development of self" – including awareness, compassion, understanding and wisdom – as one of the key capacities for awareness-based systemic change.

The authors encourage individuals to reflect and engage profoundly with others to expand and deepen their perspective. They emphasize personal

thus are united in a community of interest. Systems Leaders must work to illuminate this community of interest by deepening trust, understanding, and recognition of shared interest among diverse actors in a system.

A key role of Systems Leadership is therefore developing, supporting, and coordinating action among networks of diverse stakeholders. These activities are not new; tactics of building and mobilizing multistakeholder coalitions and alliances have been refined over centuries, particularly through advocacy campaigns, social movements, and community-based development programs. These efforts have been led by civil society, faith-based organizations, and political parties. What differentiates alliance building in the context of systems leadership is the explicit goal of broad and long-range system transformation. Alliances become transformational when their members commit to improving the whole system for everyone's benefit, not just their own.

change as the initiative evolves.

Developing collective understanding of the system involves debating its boundaries, mapping its elements and dynamics, and considering the environment around the system that influences and enables it, from institutional policies and incentives to personal choices and behaviors.

Articulating the role of power dynamics within a system and identifying who benefits or is disadvantaged by those dynamics, is an important aspect of mapping and insight. Exploring potential avenues of action and their implications, based on analysis and stakeholder experience, is key to shaping pathways to action. Systems leaders play a crucial role in guiding this process, facilitating reflective conversation, learning, knowledge sharing and mapping among stakeholders. They require strong skills in process design and facilitation. A Systems Leader's ability to enable collective learning – and to help capture, articulate and share resulting insights – is more important than their

transformation as an essential accompaniment of system change. Systems Leaders can both develop these capabilities within themselves and encourage them in others. In this way, Systems Leaders can engage and mobilize the capacity of numerous individuals to benefit the system as a whole.	individual technical expertise. If a Systems Leader is an expert in their field at the start of the process, maintaining an open mind and learning mindset is key. On a collective level, Systems Leadership requires a shared integrity of vision, participation, and action, based on engaging and benefiting all stakeholders in the system. Participants can apply self-assessment tools … to reflect on and strengthen key aspects of their approach.

Note. This table reflects use of Dreier et al.'s (2019) three elements of systems leadership.

As described earlier, Dreier et al.'s (2019) three elements of public sector leadership include the individual, which is characterized by complexity and uncertainty; the community, which is comprised of multiple, often competing interests; and the system, which is governed by politics. Policymakers trying to advance a policy agenda are faced with the need to collaborate to achieve common goals. We know the backbone of innovation is collaboration: To find innovative solutions, we need to bring people and ideas together, often in unexpected ways. To change systems, we must work with governments, the private sector, and academia. Dreier et al. (2019) offered systemic leadership as a way of accomplishing that objective. Under Denali's systems leadership approach and with these elements, individuals, institutions, networks, and a broader system could all propel change and growth in the course of a systems-change initiative.

Although I will address implications and applications of the science-policy interface in Chapter 5, I introduce the finding here to recognize the nascent promulgation among the systems community and among policy practitioners. Acknowledgement of the science-policy interface could alter the manner and method of global policymaking, having a great impact on wicked problems faced by governments and policymakers worldwide.

Chapter Conclusion

The novelty of consciously applying systems principles to public policymaking cannot be overemphasized. Through systems being and the application of the approaches outlined herein, there will be increased effectiveness of policymaking and policymaking organizations. According to Dreier et al. (2019), through these three elements of systems leadership we have three leverage points, three levels on which transformation and action must take place: individual, community, and systems. The three leverage points can be applied sequentially: individuals can mobilize networks, which in turn can enable systemic change. Quite often, individuals, coalitions, and systems-change strategies will evolve and develop new capacities at the same time as an initiative unfolds. One individual can shift the direction of an institution, catalyze the formation of a powerful network, or commitment when it is needed. Through connect to a network, the individual can contribute to and influence evolution of the systems.

The potential for individuals to influence systems carries an empowering and inspiring message that anyone can make a difference, regardless of their level of authority or role in a system. The relationship between transformational leadership and desirable outcomes if well established. Through practice of collaborative leadership, systems leaders both develop their own capabilities and enable individuals within the systems to relate to each other and connect in ways that help them work differences. Systems change initiatives often are driven by the sustained

effort and commitment of individuals (Dreier et al., 2019). Additionally, other processes can be used as well. Triple loop learning strategy and the Theory U/presencing approach provides some additional frameworks in which these processes of profound change can emerge (Peschl, 2007).

This research found that policymakers and leaders could reconceive wicked policy problems through a systems lens by using systems processes and methods all within a leadership development framework. I further found that, with the foundation of the systems-policy interface, policymakers, practitioners, and decisionmakers can now use previously applied techniques and tactics innovatively in addressing wicked policy problems. This approach requires a generative and creative orientation to reconceptualize systems thinking, approaches and the practice of systems thinking as applied to leadership and collaboration. This is the new creative framework for the resolution of wicked policy problems using systems thinking in policy along with systems and systemic leadership and collaboration.

Interorganizational Collaboration

System change initiatives must be grounded in knowledge and insight about how systems function. Most often complex systems are viewed, understood or experiences differently by their various stakeholders. No single stakeholder has total knowledge of the system; the only way to gain a broader overview is collaboration. Increased effectiveness of policymaking and policymaking systems can occur through an increase in interorganizational collaboration. There is an increasing view that collaboration across government, disciplines, sectors, and organizations is best suited to apply systems thinking in policy because it functions both as a means of informing policy and practice with systems science, and of working with the systems themselves (Best & Holmes, 2010; Cherney & Head, 2011; Leischow et al., 2008). Collaboration—and coproduction in particular—aims to harness the expertise of diverse

stakeholders and disrupt traditional “linear model of research uptake [that] constructs evidence as an inert, apolitical entity to be implemented universally and unilaterally” (Haynes et al., 2020, p. 73). For cross sector collaboration, research suggests there is a renewed focus globally on “joined up” governance and whole-of-society approaches seeking to improve the design, coordination, and integration of policies for meeting shared goals.

Given systems thinking has a pivotal role to play in tacking many of our most serious policy problems, there is an increasing pressing need to address these knowledge gaps (Johnson et al., 2019; Adam & de Savigny, 2012). As a final step in problem formulation, the literature has suggested collaboratively communicated facilitation. Its purpose is to improve the design, coordination, and integration of policies for meeting shared goals require systems skills if it is to be effective (Kickbusch & Gleicher, 2012; Swinburn et al., 2019).

Potential Application and Its Value for Those Making Public Policy

Systems thinking, which describes the big picture and the details, can be used to help drive ideas toward radical action needed for change. Soft systems approaches, VSM, strategic choice and community operational research are likely to be the most useful addition to public policy and align well with current debate around knowledge transfer and policy. However, the full range of systems methodologies is yet to be engaged by public policy researchers. Networks of policymakers and decisionmakers using these approaches can meet virtually or in person to develop a community of practice. A community of practice is a social learning perspective in which communities generate expertise or innovation on the basis of negotiating meaning about the practice engaged in by the community stakeholders in a specific domain of action (Wenger, 1998). All aforementioned ideas for CSH, SSM and CoP can support the generation of answers to the boundary questions in Chapter 2. Adoption of these approaches by policymakers and

decisionmakers would bring about whole person, whole community, and whole systems public policy approaches and strategies aimed at achieving sustainable well-being for people and place.

CHAPTER 5: CONCLUSION

Public systems leaders seeking to help build collaborative networks for systemic change are increasingly facing "wicked problems." These wicked problems often have many conflicting stakeholders with entrenched opposing positions, greater complexity, shifting dynamics, and substantial uncertainties (Rittel & Webber, 1973). They often require innovative management over terminal solution. While traditional scientific, policy and management approaches have been used with varied success, this study has found that the interlinked systems of a policy environment require a greater understanding to address the wicked problems under scrutiny. A key conclusion of this study is the application of systems and systemic leadership and collaborative approaches to improve public management and policy and lead to organizational resilience and improved policy outcomes. Through adoption of this framework, policymakers and leaders can propel collaborative work on policy. Public policy leaders and practitioners regularly addressing the prospect of simultaneous wicked policy problems in a complex environment now have enhanced tools of systems thinking in policy through systems leadership and collaboration to affect system change our global public sector systems. A key conclusion of this study is the novel application of systems and systemic leadership and collaboration approaches to improve public management and policy and lead to organizational resilience and improved policy effectiveness. Through adoption of this framework, policymakers and leaders can propel collaborative work on policy, organizational and network sustainability, and a gradual public network movement from a reductionist paradigm to one of holism and sustainability when viewing organizational and policy dilemmas.

Systems thinking is a container conceptual framework to be used by policymakers to make full patterns of systems behavior clear by seeing the whole structures that underlie

questions. We have seen how systems concepts can be introduced to early learners and instructions can be provided to practitioners regardless of their initial disciplines or level of systems knowledge. At its core, system thinking in policy answers basic questions (when, what, where, how, who, and when) while finding a solution to the problem at hand. Policy systems are interrelated rather than existing of linear cause and effect chains, where we might see the entire change process instead of only snapshots. Systems thinking in policy through leadership and collaboration recognizes the dynamic interdependent nature of policy systems and their inherent wicked policy problems and being cognizant of the citizen stakeholder systems being role in which we are functioning. These renewed definitions remind us of the care and influence we have the power to exert, even as we are being influenced by these systems we inhabit. Every citizen-stakeholder in a governmental system has a stake in the operation and development of that system and the ability to influence and change the system. Through noticing this role and responsibility, awareness of our systems being, and through employment of the approaches I outlined herein, there could be increased effectiveness policymaking and sustainable public sector organizations.

This research is an initial analysis of current research, studies, and practices in the last year with new material constantly being published. I conclude that new theories of systems thinking in policy through systems and systemic leadership focusing on interpersonal and interorganizational collaboration to reconceptualize policy among people and organizations will emerge. I was ultimately able to discern a holistic leadership and organizational framework that provides a blueprint for action in the model and problem formulation of wicked policy problems. In this paradigm, there is a description of novel approaches in the field and innovative skills and competencies that could bring about systemic change in individuals, organizations, and society

as a whole. As with most research applications and their eventual data collection, the results were not as expected. My original hypothesis was based on critical systems thinking, not systems leadership. Even as proposed, this research was able to uncover different, more practicable, applicable approaches.

This new practical and theoretical focus cross-sector collaboration and collaboratively communicated facilitation and problem formulation, all fruits of the systems-policy interface, allows policymakers and decisionmakers to use previously applied techniques and tactics innovatively in addressing wicked policy problems. This practice is relatively new to the systems community and, to my knowledge, has not been identified as the systems-science public policy interface (systems-policy interface). My initial ideas and research origination was to see the possibility and applicability of systems theories to the development of public policy. As these concepts are being articulated by systems scholars in recently published research, they require additional proof of feasibility and application and further refinement of ideas in practitioner and research fields. At issue are questions of what core characteristics and dynamics of systems-science public policy interface are. How have policymakers experienced the tie between policy and systems science in their experience? What specific elements of the framework were useful in addressing what types of policy? Does it work better in addressing health related wicked problems, or transportation issues?

In this study, I sought to unearth current thinking in systems practice among policymakers, but further research is needed. This research adds a new level of perception in addressing multistakeholder wicked problems, the focus on individual, organizational, and societal leadership approaches. What if we studied leadership styles other than transformational in relation to this new framework? I have found through this research that, not only have

theorists begun to apply the rich methodological history of systems science to policy and public administration, but they have begun to develop approaches to leadership that incorporates systems thinking into the leadership and management of public sector issues and organizations. What is needed now is illustrations, case studies of specific uses and practices of these frameworks and practices in different fields of endeavor.

As I described in Chapter 4, better policy can be accomplished by embracing the science-policy interface concept through the leadership styles described below. Upon the foundation of the systems-policy interface, policymakers, practitioners, and decisionmakers can now use previously unanticipated techniques and tactics to address wicked policy problems. As a researcher, I am constantly anticipating practitioner need and attempting to fill them to move organizations from a reductionist view to a systems-based worldview. To counter this knowledge gap, I affirm the science-policy interface in both my scholarship and practice, which highlights the effects of integrating systems science into development of public policy and practice of public administration. Exploration and practice of these techniques will require additional research and practice, as we move from a reductionist worldview. Overall, emerging thinking about systems change and public policy, combined with existing scholarly research and documented practical experience have formed a solid base for understanding how systems thinking may affect future public policy.

The effects of wicked policy problems such as the mental health crisis, climate change, water management, and personal and public health concerns are issues of societal concern that can be addressed holistically with the systems and systemic leadership of public sector issues and organizations. Adoption of systems science practices would aid in producing innovations and collaborative approaches that contain potential benefits for governments and individuals alike.

These tenets and approaches, charges elements, components and definitions of systems and systemic leadership are all developed and presented here to be used in application of systems thinking to wicked policy problems in complex operating environments. As citizen-stakeholders become more aware of their role in policy processes and as they grow in the practice of public and policy engagement, they will require a base of knowledge that informs practices and methodologies.

The need for universal systems education, but especially for policymakers and decisionmakers and within policy communities' individuals and organizations will increase. For those operating in a policymaking environment, knowledge of, and successful practice in, policy-related systems change expands the base of knowledge in the science-policy interface. With this research, and subsequent related research in this area, both I and others may fill in a knowledge gap in the application literature and expand documented cases of the practical application of systems thinking use in policy. Such research would further sustain the systems-policy interface, which serves as the basis for additional research and applications, prospective new theories and collaborations and an emerging field of study. Through the application of the systemic leadership element, policymakers and leaders could employ systems and systemic leadership to inculcate a high-level thinking, and approach combination (including the methods of SSM, boundary critique, critical systems heuristics, the viable systems model, soft systems methodology, community operation research, and the strategic choice approach).

The reconceptualization of systems thinking practices and their application to leadership theory and collaboration in policy development creates a framework for resolving local and global wicked policy problems. This new platform for public sector leadership outlines a set of skills which applied at the individual, community, and system level, has the potential to

transform public organizations, structures, and mental models. As a tenet of leadership, the injection of systems thinking practices enhances the policymaking process and produces unforeseen benefits to both the policy process and the policy itself. The dynamism of this breakthrough is an aspect of the origin of this research and is offered to facilitate public sector leadership and sustainability.

Expanding the Knowledge Base

This research began as a search for a conceptual framework for the use of systems science in public policy. Using existing knowledge about systems thinking in practice, I sought to expand knowledge of its global use to public policy and discovered it is possible through systems and systemic leadership and the continued advancement of the science-policy interface, including specified leadership approaches. This original research sought to collect case examples of systems science use among policymakers, but morphed upon research initiation due to the paucity of researchers and practitioners using these techniques and practices. More specifically, I hypothesized critical systems thinking practices would be the optimal and most used method in the policy continuum, given its ability to incorporate real world occurrences into the model.

Dynamism of Systems Thinking in Policy

With the common language of systems thinking, policymakers can improve their ability to make policy, manage their organizations, and improve the public sector system in which they are engaged. Through novel systems thinking conceptualizations and problematizations, policymakers can innovate and propel desired public stakeholder involvement. Systems thinking offers new ways of conceptualizing policy problems and contexts which opens groundbreaking ways of working with communities and of tackling wicked policy problems. Policymakers can make practical use of systems thinking, resulting in positive impacts on processes and expected

longer-term impacts on societal issues. The use of systems thinking as part of the policymaking process had methodological and collaborative effects on the outcome of the policy process. As a tenet of leadership, the injection of systems thinking practices enhances the policymaking process and produces unforeseen benefits to the policy process and the policy itself.

Connecting Findings to Earlier Scholars

As an early systems scholar, I took note of literature by Kathia Laszlo, a former Saybrook faculty member, on systems thinking and systems being. Systems thinking in policy through systems and systemic leadership has its foundations in the personhood of systems being, including Laszlo's reflection on systems thinking as a way of seeing. She wrote,

> Evolutionary systems thinking is about placing the understanding of a complex system not only in terms of its relations to a larger socio-ecological context but also in terms of the way the system has changed and will continue to change over times. (Laszlo, 2012, p. 3)

Taken to its logical conclusion, the embodiment of systems thinking, or systems being, in policy would be the embodiment of a systems and systemic leader practicing systems thinking in policy and leadership described throughout this dissertation. There are most definitely other approaches, and we will await future research and scholarship to unearth them, but the mapping back of this new approach to original rumination of the personhood of systems being can be called out in our existing knowledge base. This recognition affirms the trajectory of systems thinking and being in practice that began with an understanding of the uniqueness and societal impact of evolutionary systems thinking articulated by Laszlo.

At the core of understanding a citizen stakeholder's role in a systems-based public policy process must be an understanding and inclusion of systems thinking practices on public policy and leadership. New opportunities are possible with the infusion of science, systems science to be exact, to storied regulatory, legislative, and budgetary processes of policy formulation. This

infusion into the policy process will clearly establish and integrate a scientific planning, implantation, and evaluation process into the policy process. More research is needed to develop efficacy research on various tools and combinations of tools used in the process, but initial findings predict an explosion of systems science use in policy. In line with systems community recommendations, the practitioner and scientific communities should now use the lexicon of systems thinking and public policy to practice and provide research and a map of the scope of the systems-policy interface. These recommendations also include the application of these practices toward fulfilling the ambitions of the systems movement and its founders.

In response to the systems community, in Chapter 4, I provided specific findings with specific ways to improve public management in the coming decade. After extensive research I have proposed a specific leadership theory that is system based and attempts to address the needs of all public systems stakeholders. Systems and systemic leadership approaches aim to fill the gap—to become a resource policymakers and decisionmakers (whether they are appointed or elected leaders, staff or advocate managers) can use to understand how policy management is both similar to, and distinct from, other types of management. Study findings should allow stakeholders to learn concrete tips for both building and sustaining their individuals, organizations, and society. It is also aimed at anyone trying to decide whether managing leaders and policymakers might be for them someday.

Leading Individuals, Organizations, and Society to Achieve Policy Goals

Systems thinking in policy literature is replete with specificity around the tie between leadership and systems thinking in public sector organizations. Of particular interest are two articles, one which provides more information on systems leadership and systemic leadership. Both sets of authors offer intriguing perspectives on use of systems thinking in policy through

systemic leadership as it applies to individual collaborative leadership, institutional perspectives, and the role and impact of systems thinking on public systems holistically. While systems scholars Hobbs and Midgley's (2020) view of systemic leadership calls on leaders to synergistically take a whole system, multiorganizational approach to policy and management, Dreier et al. (2019) implore their readers to motivate individual leaders to serve as catalysts of change, endowing them with the individual power and responsibility to make change. They add "The potential for individuals to influence systems carries an empowering and inspiring message: that anyone can make a difference, regardless of their level of authority or role in a system" (Dreier et al., 2019, p. 4). In their writings, Dreier et al. indicated through individual education, awareness, and knowledge, anyone can impact systems to change. When combined with our previous notations of systems being, it provides a solid foundation for individual and organizational leadership coaching that can positively impact public organizational systems. This is like findings of Linda Booth Sweeney's (2012) to systems education of young children advanced earlier in this dissertation which also touts systems science education's value to children. Those young people are like policymakers and decisionmakers, who may have extensive education and experience in their chosen field, but little or no prior experience in systems thinking practices, techniques, or abilities. These two authors provide an accessible, tactile way policymakers can affect systems change through systems leadership that can impact public policy and organizations. They echo theorists like Jackson (2019) who espoused knowledge and use of systems approaches in addressing people, organizational and socio-technical complexity. With these lenses, theorists provide a very rich map for ways in which policymakers and decisionmakers can engage with stakeholders and propel action and change toward societal objectives in varied fields of public policy.

Systems leadership is nonreductionist, participatory, and emancipatory. This research describes how systems leadership combines systems-based leadership and collaboration skills in a new way with the explicit goal of creating change on complex systems issues. A systems leader, therefore, is one who uses a combination of knowledge, skills and mindset applied to create transformation in individuals, organizations, and society. When practiced, systems leadership will allow us to have the benefit of insights derived from the use and application of systems models and methods, such as the viable systems model and soft systems methodology. These are necessarily scientific and mathematical processes, being applied to policymaking based on the work of early theorists. In the governance sphere, if organizations, processes, and mechanisms of governance can be viewed with a systemic lens, the properties of systems, including viewing the systemic actors as entities, is valid and viable.

Allowing that sense of systems being to permeate conceptual boundaries of systems and systemic leadership allows us to evangelize systems thinking principles in governance systems. Universal acceptance of systems ideas is a desired trait among many throughout the global systems community. As institutional memory is lost due to the aging of systems scholars, there is tremendous impetus and resources being put toward legacy and preservation projects. We know from the second finding that a key to effective public policy is knowledge and use of techniques like SSM and VSM, which are not generally understood among the public, not to mention among policymakers and decisionmakers. Systems leadership draws upon familiar skills, such as subject expertise, strategy development, program management, coalitions building, and collaboration of which have been applied by advocacy and community development leaders for decades. These skills, can, however, be taught to policymakers to increase their skill sets and improve regulatory and legislative skills of policymakers at all levels of government. This challenge falls to those

with knowledge of systems, which tend to be practitioners in fields other than policy, such as engineering, and other mathematics related fields, who put education efforts of policymakers at a lower priority than other pursuits. These techniques offer visual tools to assist stakeholder in exploring the wicked problems in their localized environment. These tools allow stakeholders to identify different possible transformations to pursue from different stakeholder perspectives, visualize operations, and ask what kind of transformational approach is best. I expect implementation of these approaches will help stakeholders find accommodation between stakeholders to agree on the most desirable and feasible way forward. The rich picture component of the soft systems methodology helps stakeholders learn collaboratively about complex situations and generate better mutual understanding of their different viewpoints on desires and feasible changes.

Previous research tells us the best reason for engaging in systems thinking is that it correlates to improve performance. Systems thinking competencies, such as the understanding of specific strategies of VSM and SSM and design thinking, have had the highest correlation on organizational performance. Why? Systems thinking approaches have fundamentally different outcomes than reductionist approaches, yet organizations hold on to calcified reductionist approaches despite evidence of its outmoded usefulness. Reductionist thinking breaks down a system to its component pieces and deals with each separately; one of the unfortunate byproducts of reductionist thinking is that what might be good for the subject system might be bad for the larger systems. The most powerful outcome of systems thinking is the sustained improvement of output in both efficacy and effectiveness. Sustained improvements are accomplished by the intentional and planned selection and adjustment of multiple variables across disciplines.

Why do we need systems thinking in policy and leadership? We have determined organizations can benefit from the infusion of systems thinking in policy formulation but now we expand our view to include systems thinking practices in the leadership practices of individuals and organizations as well. Because challenges facing local and global stakeholder communities are increasing complex and interconnected communities and they will come to demand this kind of collaborative and insightful leadership approach. Societies are dealing with problems as vast as the intersection of being unhoused, physical and mental health, and physical and emotional environments or the global challenge of climate change, problems that are complex and require coordination among many stakeholders. Since no single organization can solve these complex challenges, stakeholders must work in conjunction to develop a shared approach. Systems leadership requires coordination, vision, trust building, and innovation.

Systems Leadership and How It Applies to Public Policy

The concept of systems leadership is very formulaic. According to the literature, systems leadership is defined as: (a) systems leadership + systems thinking = systemic leadership, (b) the creative combination of approaches to assess, enumerate and modify complex policy issues involving the intricacy of people complexity, and (c) interpersonal and interorganizational collaboration. Through these tools of systems leadership and systems thinking, policymakers and leaders can generate deeper insights, guard against unintended consequences and coordinate action more effectively. Extensive education is required for practitioners using this form of system thinking practice, and this approach requires a higher-level thinking and someone capable of grasping the big picture. We know policymakers and decisionmakers are required to engage with diverse stakeholders. Additionally, they are exhorted to work across organizations,

and employ their traditional tools of analytical, conceptual and project management required by public servants involved in policy making and planning policy implementation.

Systemic Leadership Approach

As provided in Chapter 4, the systemic leadership approach is simple in form, yet complex in its underlying process, making it adept at collecting intelligence. It is composed of a number of elements. One component of the approach is the creative combination of approaches to assess, enumerate, and modify complex policy issues involving multiple causal factors and the intricacy of people complexity. These approaches allow the description of a wicked problem in sufficient detail; one has to develop an exhaustive inventory of all conceivable solutions ahead of time. I would argue a policymaker attempting to solve a wicked policy problem needs to master skills of boundary critique, critical systems heuristics, the strategic choice approach, the viable systems model, and soft systems methodology (including the use of rich pictures), and what Hobbs and Midgley (2019) called community operations research (described as working participatively with local communities). These approaches are integral components of the systemic leadership approach, and when used alone and in combination, aid us in thinking and acting more systemically. First advanced in Midgley's articles on systemic intervention, this practice of using approaches in combination with existing processes, produced the most uses and methods, which led to equally inventive policy results. Pushed to its natural evolution, systemic leadership development including the design, adaptation, and importing of methods for systemic policymaking and science engagement could lead to enhanced policymaking that could manifest in unknown and beneficial ways.

The literature described the third tenet of systemic leadership as the maxim that systems leadership + systems thinking = systemic leadership. It is also a feature of systemic leadership

that a creative combination of approaches to address wicked policy problems is the interpersonal and interorganizational collaboration is essential for the success of any policy initiatives. Hobbs and Midgley (2020) indicated this movement toward increased intergovernmental and cross discipline collaboration, can only bring renewed innovation, perspectives, and discoveries to policymaking and the expansion of the use and instruction of systems thinking in our society.

Applications of This Research

Application of these leadership approaches are a game changing tool policymakers can use to affect systems change. An excellent example of real-world use of systems thinking in policy is adoption of adaptive management in California's Sacramento-san Joaquin Delta described in an article by Wiens et al. (2017). Adaptive management is a structured, iterative application of science-based knowledge to reduce uncertainties and build flexibility into decision making. As with most systems-based approaches, the adaptive management leadership program is more easily planned than implemented, and it is only beginning to be applied in California's Sacramento–San Joaquin Delta. Although a highly structured adaptive-management process may not always be needed, several elements are essential. Adaptive management should begin by clearly identifying the problem, goals, and objectives; recognizing uncertainties; identifying decision points and alternative approaches; recognizing when adjustments are needed and having flexibility to make them; and considering societal and political constraints. Model complexity should be matched to that of system and management needs; experiments can help unravel causal relationships.

Another example from the Sacramento Delta is their belief that solving wicked problems is not just about managing flows, but also about the complexity of moving water through a hydrologically and hydrodynamically complex Delta. If you add the uncertainty of ecological

responses and the institutional complexity of many actors with many visions and the problem becomes wicked (Dryzek, 2013). When policymakers add the ever-changing water supply and ecological and economic contexts within which decisions must be made, the problem becomes devilishly wicked and in need of system and systemic leadership.

My last example of where systems thinking in policy could be used is around uncertainties about California's future water supply arising from climate change. As more precipitation falls as rain in late winter and less as snow in mid-winter, spring snowmelt occurs earlier because of higher temperatures. Of course, less snow and earlier melting means less water is stored as snowpack and more uncertainty about water availability from reservoirs in late summer and fall. These higher temperatures yield less runoff from the same rainfall amount. Which yields more frequent extremes: prolonged drought, floods from atmospheric rivers. Increasing costs and decreasing availability of that buffer as groundwater is over exploited (Cloern et al., 2011; Dettinger & Cayan, 2014).

Value and Impact of Systems and Systemic Leadership Approaches on Policy

As described previously, policy problems adjudicated with systems thinking in policy and leadership has potential to transform organizations and policy. The question of what systems thinking in general and specific approaches to policy in particular add to the fields of global health, land use, environmental policy, or any number of pressing public policy concerns is just beginning to emerge. Observing that elements of systems thinking approaches are already in use in these areas of research and practice allows us to discuss which of the large body of theories, methods, and tools associated with systems thinking are more useful. This is a rich research area yet to be explored by systems scientists and policymakers alike.

With these tools, policymakers and decisionmaker can develop ideas which, when infused into the policy process, could change the behavior of health systems, governance systems and other bodies of human activity. By circumscribing common principles that can be discovered and expressed, stakeholders employ different types of inquiry and involve both qualitative and quantitative techniques to solve policy problems. By employing systems-based methods, stakeholders can reassess traditional ways of working and solving problems. This can challenge governance structures, their skills base, and the organizational capacity of not only their organizations, but other interconnected organizations as well. By working across organizational boundaries to tackle wicked problems, stakeholders can collaborate and bring new insights to intractable problems. Systems thinking and policy through systemic and systems leadership allows stakeholder and facilitators to focus on engaging stakeholders and citizens in understanding relevant issues and involving them in their eventual solutions, creating buy-in and participation in the policy process. Collaboration is suggested as the most effective manner of solving wicked problems when power is dispersed among many stakeholders. It is particularly relevant where part of the solution to the problem involves sustained behavioral change for many stakeholders.

Recommendations for Future Research

More research is needed on the use of systems and systemic leadership, the use of research-based systems thinking tools, and how they can and are being directly applied to challenges faced today. Systems thinking use in policy is a novel academic and practical concept and has yet to be applied to public policy, administration, and leadership. To meet future challenges, policymakers and leaders should equip themselves with systems thinking tools and

apply them where applicable in the policymaking process at all levels of government and policymaking.

Future research could determine how we can have more effective policymaking at all levels of government. Further analysis and synthesis of the science-policy interface would incorporate skills of qualitative and quantitative methods, simple and complex models, and examples of case studies into the policymaking rubric, increasing the effect of policy and leading to improved outcomes.

Through a directed education effort, these dimensions can be adapted to different audiences and implemented, at different lengths and depths, through a variety of training instruments. These instruments include briefing materials, presentations, exercises, workshops, courses, and curricula, as well as interactive activities such as simulation games, to include local or online opportunities for disseminating knowledge about complex systems and systems thinking to improve decisions and policies in an even more interconnected world.

The education of consciously applying systems principles to mechanisms of public policy should be inclusive of the individual, organizationally, and societally. Bringing this to fruition relies on increased research and data on the public sector's use of tenets of systems leadership (including the methods of SSM, boundary critique, critical systems heuristics, the viable systems model, soft systems methodology, community operation research and the strategic choice approach). Future research should establish a distinct scholar-practitioner alliance for systems thinking in policy, a place where creative scholarship is breaking new ground in research and further evolving this emergent field where the science-policy interface aims to reveal and support rigor in these new forms of research.

Individual policymakers and decisionmakers are but one element of a larger intention which is to cocreate a global platform which aligns and brings together a community of researcher and practitioners who, over the next couple of decades, will advance and amplify the field of systems thinking in policy by codeveloping concepts, methodologies, tools, and frames needed to illuminate and catalyze the evolution of this paradigm. We have narrowed our concept of the field of systems thinking in policy. It is a domain inclusive of its tenets and approaches, charges elements, components, and definitions of systems and systemic leadership to be used in the application of systems thinking to wicked policy problems in a complex operating environment. We need additional research in environmental justice, climate change, public governance, wetland restoration, and so many other fields of endeavour. This is the conceptual basis (the science-policy interface and its affiliated literature) to explore answers to important questions, but the work is not done.

As noted throughout this chapter, there is a need for further research. I can clearly discern practices that will be useful to public sector leaders in pursuit of sustainable policy goals, but a variety of tools used successfully, or better yet a library of case studies of their successful use and pitfalls and lessons in policy settings has yet to materialize. The sought-after research would fill this research gap and add to the knowledge base improving systems literacy and expanding the systems science field. There is great potential in these approaches and their application in policy contexts, and the possibilities generate the call for additional research. What we are left with at the conclusion of this research is an overall theme of developing further application of systems thinking in policy and leadership, which has the following potential applications.

Potential Areas for Application

Policymakers and leaders could possibly reduce reductionism and increase policy outcome success if they adopt systems/systemic leadership principles and apply them to their initiates, endeavours, and personnel. If a policymaker or decisionmaker adopted a systems paradigm, established a practice of using systems thinking in policy through a systems and systemic leadership approach. Here are some ways adoption of a systems paradigm over a reductionistic one could benefit stakeholders:

- Enhance holistic over linear thinking. As systems approaches are applied to real world wicked problems, there will be opportunities for advance research into the use of holistic systems thinking or reductionist linear thinking. Numerous times through this dissertation, I noted areas where there is a vast amount of theory supported by various authors, but little research and case studies on the use and efficacy of the use of systems thinking in policy. This is a vital next step.
- Introducing systems thinking practices in policy propels its properties into the life blood of the organization and its processes. As public managers use systematic processes over traditional reductionistic ones, there should be a corresponding effect on organizations, networks, and environments in which the organizations and its leaders inhabit. An evaluation of the process of management transfer from reductionism to holism could be useful to future academicians and should be pursued.
- Adoption of systems paradigms supplants the need for linear approaches to management and policy formulation in addressing wicked problems. Maintaining the systems perspective helps policymakers see a broader view of wicked problems, which allows for unforeseen solutions and approaches.

- There has and will continue to be some major advances in our understanding of the utility of system science in general and systems thinking in policy in particular. This can possibly lead to greater innovation, collaboration, and coproduction in the delivery of public sector services and public policy.
- Action on wicked problems will require a commitment to systems thinking in policy, and a deconstruction of the silos of governance.
- A wide set of stakeholders should be involved with a systems-based policy process, especially with wicked problems that require integrated research and policy interventions.

The deployment of systems thinking in policy requires extensive education of policymakers and decisionmakers. As they are provided modules in systems education and applications, they will grow in systems knowledge and improve their systems being. These training products have yet to be created and need research to support development of training and evaluation materials that include qualitative and quantitative methods, simple and complex models, and examples of case studies.

- We need to explore the full nature and application of the science-policy interface as evidenced through systems and systemic leadership approaches, which of these approaches should be adopted for changing needs, opportunities, and constraints?
- We need to explore how systems approaches can be used effectively. We need to ask how a variety of systems approaches be embedded in policy mechanisms and processes? At the local level? In state or provincial governments? In the promulgation of national or federal or global policy?

- It is my expectation that a tie between systems science education centers, such as universities, programs, and institutes, will have the ability to pair and collaborate with policymaking institutions such as city councils, stage legislatures, international regulatory bodies, and regional national government organizations, collaborations, and consortiums, such as the National Institutes of Health, Federal Emergency Management Agencies, Centers for Disease Control, the California Natural Resources Agency, or the World Bank.
- Specialized knowledge within these agencies combined with the novel approach of systems thinking could lead to extraordinary opportunities for intellectual advance and new avenues for education and training. Of particular interest is the nexus of systems thinking and public health given increased evidence of airborne viruses now present in our society.
- Wicked policy problems conceptualized and reconceptualized through a systems lens can be modeled intrapersonally, interpersonally, and as an intergroup phenomenon or by its human component. A deeper understanding of this attribute is warranted to understand the unique role of individual leaders in systems change and evolution in policy.
- The science-policy interface framework allows previously unanticipated techniques and tactics to be used innovatively in addressing wicked problems. Indeed, the science-policy interface, extrapolated and refined, could alter the manner and method of global policymaking having a great impact on wicked problems faced by governments and policymakers worldwide.

- Policymakers and decisionmakers should continue with the current focus and activities aimed at improving reductionist organizations, working across other organizational boundaries and engaging with citizens – stakeholders.
- At the organizational level, prioritize skill retention and training to better equip policymakers and decisionmakers with various tools of systems thinking in policy. This may require to hiring of outside contractors, firms, consultants, and researchers to edify existing talent acquisition, onboarding, and training programs at public sector organizations.

Make intergroup and interpersonal collaboration an aspect of public sector organizational culture, including developing a shared understanding of contentious issues among relevant stakeholders and organizations.

Value to Future Policymakers

Systems-policy collaboration and communication will provide value to future policymakers. I have identified collaboration as a key attribute in the deployment of systems thinking in policy through systems and systemic leaderships. It has potential to increase stakeholder commitment, allows for more comprehensive and effective solutions, and uses fewer stakeholder resources. Use of systems thinking techniques provides a common language and conceptual understanding of a problem set that aid stakeholders in developing solutions. As systems practitioners and policy practitioners join together to share resources, insights, and tactics, new possibilities for solutions arise. This cycle of innovation creates the science-policy interface, which I have shown is beneficial to theory and practice of systems thinking in policy through systems and systemic leadership and collaboration.

In this dissertation I have defined systems thinking as synergistic analytic skills tool policymakers can use to help manage a complex problem set of interacting factors that produce outcomes, to predict their behavior and to formulate interventions to achieve desired (and avoid pernicious) results. By using systems thinking techniques, such as systems and systemic leaders, we now have a base of individual, organizational and systemic leadership principles that can serve as a base literature for moving public sector organizations from reductionism to innovation, collaboration, and sustainability.

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