

A complexity based diagnostic tool for tackling wicked problems

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Abstract

Many of societies' most pressing social policy problems are wicked problems. While complex adaptive systems theory has been recognised as an appropriate way to address this type of problem, complexity-accepting strategies are difficult for public administrations because they are at odds with their current dominant logic. This paper describes the development and implementation of a diagnostic tool for tackling wicked problems that is underpinned by complex systems leadership theories and takes into account the current needs of government. The diagnostic tool was reasoned during a research project that investigated how best to increase the social impact of an active citizenship education program in the City of Onkaparinga, South Australia. The research project identified that while the program developed the active citizenship characteristics desired by the three levels of government in Australia, graduates from the program encountered systemic blocking factors when they attempted to put what they had learned during the program into practice. To increase the program's impact, the diagnostic tool addresses these systemic blocking factors by focusing on nine leverage areas that enable systemic innovation and change to occur in communities.

Introduction

Complex problems are commonly known as "wicked problems" in the social purpose sector¹. The term wicked problems was first coined by Rittel and Webber² to describe the complex social policy problems that societies face which cannot be definitively described and that do not have definitive and objective solutions.

Many of societies' most pressing problems are wicked problems³. Examples of wicked problems include: terrorism, environmental degradation, poverty³, ageing populations, energy security, affordable healthcare⁴, river catchment management⁵, climate change, obesity, indigenous disadvantage⁶, place-based disadvantage⁷ and active citizenship⁸. While these examples seem quite diverse, they all share the following characteristics of wicked problems: they have no clear solution; they have many interdependencies; they are often multi-causal and have conflicting goals; they are difficult to define with different stakeholders having a different understanding of what the problem is; attempts to address them often leads to unforeseen consequences due to their multi-causality and interdependency; they are often not stable as the problem and the context of the problem evolves as attempts are made to address them; and they are socially complex, often changing their behaviors which requires stakeholders to coordinate their approaches⁶.

Given these characteristics, it is widely accepted that wicked problems need to be addressed through a collaborative, holistic⁶ and adaptive⁹ problem solving approach. Diverse stakeholders, including citizens, need to be engaged to ensure the complexity and interconnectedness of a wicked problem is understood, possible solutions can collectively be identified, and any required behaviour change is understood, discussed and owned by the people whose behavior needs to change⁶.

Communities are complex adaptive systems¹⁰ and consequently complex adaptive systems theory has been recognized as a suitable approach for addressing the wicked problems that occur in communities^{11·6·12}. Despite this recognition, governments are reluctant to treat communities as complex adaptive systems^{13·14} because embracing complexity is at odds with the dominant logic of public administrations¹³ and with government needs which are more easily achieved when there are clear relationships between cause and effect¹⁴. These needs include time pressures for making government policy; the requirement of governments for simplicity, repetition, clarity and accountability¹⁴; and the need to limit risk and uncertainty¹³.

This paper describes the development of a complexity-accepting¹⁵ model that is underpinned by complex systems leadership theories and addresses the reluctance of governments to treat communities as complex adaptive systems. Given that this model has these characteristics, it is posited that the model can be used as a diagnostic tool for addressing wicked problems.

The research project

The model was developed during a longitudinal research project with the City of Onkaparinga Council in South Australia¹⁶. This research project had three aims: to determine the influence of an active citizenship education program on the community leadership practice of its graduates, to find out if these graduates were able to use what they had learned during the program to influence the organizations and communities they interact with, and to reason a hypothesis to increase the social impact of the

program.

A customized methodology was used for the research project which involved embedding into Dewey's¹⁷ pragmatic process of inquiry, principles and processes from the Corbin and Strauss¹⁸ version of grounded theory and first, second and third person action research¹⁹. Between August 2008 and August 2010, biannual face-to-face semi-structured interviews were undertaken with nineteen graduates from the active citizenship education program. NVivo 8 software was used to transcribe the interviews and undertake line-by-line open coding. Theoretical reflection was then applied to the summarized data using a diverse range of theories relevant to community problem-solving. This determined the influence of the program on the active citizenship practice of graduates and on the ability of graduates to influence the organizations and communities they interact with.

The research findings showed that the graduates of the program had developed the active citizenship characteristics desired by the three levels of government in Australia¹⁶. At a national level, the Australian Government's education for sustainability strategy recognizes that if Australia is to address unsustainability and promote sustainable development, education and learning needs to focus on developing *'informed and involved citizens who are able to engage with complex issues and understand the need to balance competing interests'*²⁰. To achieve this aim the Australian Government's education for sustainability action plan focuses on developing the capability of citizens to: understand connections between environmental, economic, social and political systems; undertake collaborative visioning processes; think critically and reflect on personal experiences and world views; challenge established ways of interpreting and connecting with the world; effectively participate in decision making processes; and effectively work in partnerships²¹.

At a state level, the Premier of South Australia recognizes that while developing the civic leadership capabilities of citizens is a challenge²², doing so is required if true partnership working between citizens and governments is to be achieved²³. A civic leadership capability considered particularly important by the South Australian Premier is the capability of citizens to make considered judgement rather than just providing their own opinions: citizens need to consider all the relevant information, understand differing points of view, and consider the needs of the community above their own self-interests²³.

At a local government level, the Local Government Association of South Australia²⁴ states that the success of local government community engagement processes *'rests on the need for a community well educated about civics and well informed on key issues affecting the community'*. Local Government in South Australia requires citizens to know what Local Government does and how they can be involved in the strategic planning and agenda setting for their local area²⁵.

While it was shown that the active citizenship education program developed these desired active citizenship characteristics, the research findings also uncovered that when graduates attempted to put what they had learned during the program into practice they encountered significant systemic blocking factors that were related to power relations¹⁶. In December 2010, a focus group of key stakeholders was facilitated to generate embryonic ideas for initiatives that would address the enabling and blocking factors identified during the graduate interviews. The most appropriate hypothesis/model for increasing the social impact of the active citizenship education program was then generated using the pragmatic process of inquiry approach of converting the elements of the original situation into the unified model¹⁷ most likely to achieve the inquiry's aim²⁶ of increasing the program's social impact. In addition to the findings from the graduate interviews and the focus group, elements of the original situation included government policies, insights from the development of the active citizenship education program, and theoretical literature relevant to addressing complex social policy problems.

The main analytical idea which converted elements of the inquiry's original situation into the unified model most likely to increase the program's social impact was the need to improve the nature of both the interactions and the working relationships between graduates and governments, graduates and street-level workers, and graduates and other community members¹⁶. Street-level workers are public sector and non-profit workers who interact directly with citizens in the course of their jobs and have significant influence on citizens through their substantial discretion in implementing public policy²⁷.

The literature explored during the research project uncovered the potential to enhance the interactions and working relationships between these community stakeholders by taking a complex adaptive systems approach when working with communities. According to complex adaptive systems theory, under certain conditions, interactions between interdependent "agents" produce system level order²⁸ as agents interact and learn from each other, change their behavior, and adapt and evolve to increase their robustness²⁹. In this context, the term agent means anything that acts within a system such as a characteristic, a process, an individual, an organization, or a decision making uni³⁰.

The model

To increase the program's impact, the model reasoned during the research project took as its starting point the need to take a complex adaptive systems approach to improve the interactions and working relationships between graduates, governments, street-level workers and other community members, and the need to address the reluctance of governments to treat communities as complex adaptive systems. Duit and Galaz³¹ and Moobela³² suggest that in order for governments to be able to take a complex adaptive systems approach to community problem-solving, government systems need to have the ability to balance unplanned exploration and planned exploitation. This insight is supported by Uhl-Bien *et al.*³³ who argue there is a need to manage the entanglement between the administrative leadership of bureaucracies and the adaptive leadership of

complex adaptive systems at the administrative-adaptive interface and at the innovation-to-organization interface. Given this insight, the model developed during the research project focused on: treating communities as complex adaptive systems; balancing government's unplanned exploration of solutions with communities, and their planned exploitation of community knowledge, ideas and innovations; and creating the enabling conditions required for systemic innovation and systemic change.

From a combined analysis of the research project's findings, background information, and the theoretical literature, the reasoned model identifies: nine leverage/focus areas that need to be targeted to create the enabling conditions for systemic innovation and systemic change, and characteristics of initiatives that will support the desired enabling condition at each of these focus areas¹⁶. Five of these focus areas center on building the adaptive capacity of communities to enable the emergence of new ways of working that have improved system functioning and performance. The remaining four focus areas concentrate on assisting government systems to balance the unplanned exploration of solutions with communities and the planned exploitation of the knowledge, ideas and innovations that emerge from community-led activities.

Focus areas for building the adaptive capacity of communities

Four complex systems leadership theories inform the model's five focus areas for building the adaptive capacity of communities. These are: Lichtenstein and Plowman's²⁸ leadership of emergence, Snowden and Boone's³⁴ tools for managing in a complex context, Surie and Hazy's³⁵ and Goldstein *et al.*'s³⁶ generative leadership, and Uhl-Bien *et al.*'s³³ complexity leadership theory.

Complex systems leadership theories are based on complexity sciences³⁰ and consider leadership not to be held in a particular person or role but to be a process embedded in all of the interactions amongst agents in a system³⁷. As a problem solving approach, they do not focus on finding the one way to solve a complex problem, instead their focus is on providing a framework within which stakeholders can learn, interact and adapt to maximize their effectiveness in solving complex problems³⁸.

Complex systems leadership theories consider that new ways of working can emerge from the interactions amongst agents in a system. These theories often represent this emergence as the emergence of a new "attractor" through adaptive processes of change^{36·28·34·33}. An attractor represents the stable patterns of a complex system³⁹ showing the range of possible actions in the system. These possible actions are set by their circular, nonlinear structure of beliefs, actions and results that strengthen each other and act as an attractor and non-permeable barrier⁴⁰.

The five focus areas that build the adaptive capacity of communities are: create a disequilibrium state, amplify action, encourage self-organization, stabilize feedback and enable information flows.

Create a disequilibrium state

Creating a disequilibrium state can be thought of as the first stage a community goes through in its transition to a more collaborative, holistic and adaptive way of working. A disequilibrium state occurs when existing patterns are disrupted through events such as the pursuit of a new opportunity, a threat or crisis, or fluctuations that alter the system²⁸. The need to create a disequilibrium state cannot be overemphasized, as it is only when a system is in this state can the interactions between interdependent agents produce a new system level order²⁸.

Initiatives with the following characteristics can create the required disequilibrium state: they highlight the need to organize communities differently and cultivate a passion for action^{36·28}; they manage initial starting conditions³⁴; they specify goals in advance³⁵; they establish appropriate boundaries^{34·40}; and they embrace uncertainty, surface conflict and create controversy²⁸.

Amplify action

After the community system is disrupted and is in a sensitized state, small changes to the system through actions or events can amplify quickly through the system via the increased interdependent interconnections between system members and positive feedback dynamics²⁸. This amplification enables systems to overcome the equilibrium seeking tendencies of dominant attractors and move towards new attractor regimes that have different system behaviors and functioning⁴⁰. In the case of building the adaptive capacity of communities, the dominant attractor's equilibrium seeking tendencies would be the beliefs, actions and results associated with the current way of working. The new attractor regime would be the beliefs, actions and results of the new way of working that harnesses adaptive community dynamics.

Characteristics of initiatives that encourage the amplification of action include: enable safe fail experimentation⁴¹, enable rich interactions in relational spaces²⁸, support collective action²⁸, partition the system³⁵, establish network linkages³³, and frame issues to match diverse perspectives³³.

Encourage self-organization

Once substantive change is created, the influence of the dominant attractor (the current way of working) will be overcome and the system will move towards a new attractor regime (the new way of working). When this occurs, initiatives can be used to assist elements of the community system to self-organize around the new attractor. Self-organization involves system members and system resources recombining in new patterns of interaction and working arrangements that improve the functioning and the performance of the community system²⁸.

Initiatives that enable community system elements to self-organize include those that: create correlation through language and symbols^{28,35}, encourage individuals to accept positions as role models for the change effort²⁸, enable periodic information exchanges between partitioned subsystems³⁵, and enable resources and capabilities to recombine²⁸.

Stabilize feedback

After a significant number of system elements have recombined around the new attractor (the new way of working), the emergent change needs to be institutionalized throughout the community system by dampening feedback in order to slow down the amplification²⁸. Initiative characteristics which stabilize systems include: initiatives that integrate local constraints²⁸; initiatives which provide a multiple perspective context and system structure; initiatives that enable problem representations to anchor in the community; and initiatives that enable emergent outcomes to be monitored³⁵.

Enable information flows

Information flows are required throughout the community system during the transition from the old to the new way of working. Increasing the flow of information throughout community systems enables communities to use information for organized solutions³⁶. Characteristics of initiatives that enable and encourage such information flows include: initiatives that assist system members to keep informed and knowledgeable of forces influencing their community system³³; initiatives that assist in the connection, dissemination and processing of information^{33,35}; initiatives that enable connectivity between people who have different perspectives on community issues; and initiatives that retain and reuse knowledge and ideas that have been generated through interactions³⁵.

Focus areas for unplanned exploration and planned exploitation

The remaining four focus areas concentrate on enabling government systems to balance unplanned exploration and planned exploitation. Public administration and elected government systems are both recognized in the model due to: the strict doctrine of separation between policy makers and administrators no longer holding⁴², and the need to protect representative democracy by enabling politicians to play a key role in metagoverning⁴³.

Metagovernance is defined as *'the organization of self-organization'*; it is not a new mode of governance but the unification of existing forms of governance⁴⁴. Public authorities, or networks of public and private actors that have been authorized by public authorities, usually undertake the metagoverning role⁴⁵.

Sørensen⁴³ distinguishes between public administrators and politicians taking metagovernance roles and highlights that because metagovernance is predominantly performed by public administrators it runs the risk of undermining representative democracy. To overcome this threat, Sørensen⁴³ argues that politicians need to play a key role in the networks which produce metagovernance.

Given this insight, the model supports both public administrations and elected members to participate in metagovernance. The model contains two focus areas that center on where initiatives can be applied to assist government systems to undertake unplanned exploration of solutions with communities. These occur at the interface between elected governments and adaptive communities, and at the interface between public administrations and adaptive communities. The two remaining focus areas center on where initiatives can be applied to assist government systems to undertake the planned exploitation of knowledge, ideas and innovations that emerge from community-led activities. These occur at the interface of adaptive communities and elected governments and at the interface of adaptive communities and public administrations.

Theoretical concepts informing characteristics at these four focus areas include: seeds of emergence^{33:209} and creating ecologies of innovation³⁵ from complex systems leadership theories, soft power from international relations theory⁴⁶, and street-level bureaucracy⁴⁷ and metagovernance⁴⁴ from public administration theory¹⁶.

Public administration-adaptive community interface

At the interface between public administrations and adaptive communities, initiatives are required that enable people working in the public sector or who have been contracted to deliver public services to undertake unplanned exploration in communities. Characteristics of these initiatives include: initiatives that assist public administrators to frame policies in a manner that enables

community adaptation of policies; initiatives that remove information differences to enable the ideas and views of citizens to align to the challenges being addressed by governments; and initiatives that encourage and assist street-level workers to take into account the ideas and views of citizens.

Public administrators can frame policies in a manner that enables communities to adapt policies to their local context by using the complexity theory concept of seeds of emergence and the international relations concept of soft power. The proposed seeds of emergence³³ would take the form of a broad challenge focused policy framework that sets strategic aims and objectives and is packaged to engender cooperation through the use of soft power sources such as a visionary policy narrative⁴⁶. The policy framework can be firmed up by incorporating the following characteristics of Chapman's⁴⁸ ideal policy statements from a systems perspective: clearly establish the direction of desired change; set boundaries for implementation; allocate resources for implementation that specifying how resources should be used; grant permission for innovation; and specify broad evaluation requirements that are based on system end users experiences and outcomes.

At least sixteen nations are removing information differences between citizens and governments by making public sector information publicly available⁴⁹. In Australia, the Australian Government has adopted principles of open public sector information that recognize: public sector information as a national resource; public access to information stimulates innovation and enables citizens to contribute to policy formulation; and the value of public sector information can be enhanced by making the information easily discoverable and easily useable⁵⁰.

Performance management systems can be used to encourage street-level workers to take the ideas and views of citizens into account. The need for such a system was recognized by Bourgon⁴² who identified the need for a doctrine of accountability to provide guidance on incorporating citizen participation and citizen choices into policy implementation, and Lipsky⁴⁷ who identified the need to measure and evaluate the work performance of street-level workers⁴⁷.

Toolkits can be developed to assist street-level workers to undertake unplanned exploration in communities. This suggestion aligns to Lipsky's⁴⁷ argument that while the performance of street-level workers needs to be managed, scrutinizing worker performance without providing support in carrying out their role can be detrimental. The tools in the proposed toolkits would be designed to: prevent street-level workers from stifling and suppressing the beneficial interactive dynamics in communities; enhance the creativity, learning and adaptability of communities; and enable street-level workers to nurture adaptive dynamics that are consistent with the missions and strategies of governments³³. Tools for unplanned exploration could include: tools for Sørensen's⁴³ four metagoverning roles of hands-off framing, hands-off storytelling, hands-on support and facilitation, and hands-on participation; tools for metagoverning through exploration and experimentation collaborative platforms⁵¹; and tools based on the following practical steps for supporting local level adaption of national policies: open up the space for opportunities through a stimulus for action, facilitate awareness that there is no universal best practice solution, develop opportunities for organizational play and the generation of creative ideas, create a pool of ideas by reviewing past successes and failures, and use complex systems leadership theory to create effective emergent structures⁵².

Elected government-adaptive community interface

At the interface between elected governments and adaptive communities, initiatives are required that enable elected officials to undertake unplanned exploration in their electorates and in their areas of portfolio responsibility. Characteristics of these initiatives include initiatives that assist elected members to frame policies in a manner to enable community adaptation of policies and initiatives that assist elected members to take into account the ideas and views of citizens. Similar approaches to those recommended for street-level workers could be developed to assist elected members to frame policies and to take into account the ideas and views of citizens.

Adaptive community-public administration interface

Initiatives are required at the interface between adaptive communities and public administrations that enable people working in the public sector or who have been contracted to deliver public services to exploit community knowledge, ideas, and innovations. Characteristics of these initiatives include: initiatives that encourage and assist street-level workers to exploit the knowledge, ideas and innovations of citizens; initiatives that bridge community-led activities and projects to the strategic plans of governments; and initiatives that enable governments to gather, retain and reuse in other contexts community knowledge, ideas and innovations.

Street-level workers can be encouraged to exploit the knowledge, ideas and innovations of citizens through performance management systems that recognize and support this behavior and by providing street-level workers with tools designed for this purpose. Examples of such tools include: good practice guidelines for bridging the activities and projects of adaptive communities to the work of governments; tools for metagoverning through execution collaborative platforms such as solution templates and implementation standards⁵¹; and tools to assist street-level workers to capture and retain the emergent learnings, processes and products of adaptive communities so that this information can be used in different contexts. While the innovations that emerge from a community's complex adaptive system dynamics will be context specific and therefore not

replicable in their entirety there will be key success principles underpinning these innovations that can be replicated.

Adaptive community-elected government interface

At the interface of adaptive communities and elected governments, initiatives are required that enable elected members to exploit the knowledge, ideas and innovations generated by adaptive communities. Characteristics of these initiatives include: initiatives that encourage and initiatives that assist elected members to exploit the knowledge, ideas and innovations of citizens; and initiatives that collect, analyze, synthesize, reconfigure, manage and represent community information relevant to the electorate or area of portfolio responsibility of elected members. Similar approaches to those recommended for street-level workers could be developed to encourage and assist elected members to undertake planned exploitation roles.

Using the model as a diagnostic tool

At the completion of the research project, the model was used as a diagnostic tool to identify how to increase the social impact of the active citizenship education program. This was achieved by using the model as a lens to identify which of the model's initiative characteristics at the nine focus areas were incorporated into the program and which initiative characteristics were not. To increase the program's social impact, recommendations for amendments to the active citizenship education program and suggestions for new initiatives were made based on this analysis¹⁶.

A two-day workshop on tackling wicked problems and using the model as a diagnostic tool was held with City of Onkaparinga staff and community leaders in September 2013. During this workshop a staff member left the room, returned with a large sheet of paper, and started listing on the paper the current initiatives being undertaken in the City of Onkaparinga to address the wicked problem of food security. It quickly became apparent that using the model as a paper-based diagnostic tool to address wicked problems would be challenging: it would be difficult to record and update on paper the numerous community initiatives that address some part of a targeted wicked problem and to record and continually update on paper how these initiatives align to the model's 9 focus areas and 36 initiative characteristics.

In May 2015, the idea of developing a software application based on the model described in this paper was selected as the winning entry for the Pank Family Trust and University of South Australia Prize for Entrepreneurship. This Prize provided financial support to establish a new enterprise, Wicked Lab, and to support Wicked Lab's development of an online software application for addressing wicked problems.

Conclusion

This paper has highlighted that many of societies' most pressing problems are wicked problems³ and that this type of problem needs to be addressed through a collaborative, holistic⁶ and adaptive⁹ problem solving approach. While approaches informed by complex adaptive systems theory are recognized as appropriate for addressing wicked problems^{11,6,12}, such approaches are difficult for governments. This is due to governments having needs that are more easily satisfied when there are clear relationships between cause and effect¹⁴.

The model described in this paper has the required characteristics for addressing wicked problems: it is underpinned by complex systems leadership theories and it takes into account the current needs of government. This need to focus simultaneously on supporting adaptive communities and government systems is recognized by Isor⁵³ who states that if we are to make advancements in addressing wicked problems a blueprint needs to be invented that will couple the self-organizing and emergent nature of the local to the vertical model underpinning representative democracy. The software application that Wicked Lab is developing is based on such a blueprint.

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