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Lean & Agile Governing System Design

Reconstruct Systematic Pathway in Governing System in Public Emergency

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Abstract

In the context of public emergency crisis, how to quickly improve the efficiency of problem-solving with minimal system cost has become an increasingly important governance system issue. This paper is a system design research project for the novel coronavirus outbreak in 2020, focusing on how to find problem entry points and propose effective design solutions for rapid response to public emergency crisis events from an interdisciplinary perspective of design and management disciplines. This paper presents that applying Lean & Agile thinking to the rapid iteration and testing of practical knowledge can improve the quality of decisions and save more resources. This study attempts to combine Lean and Agile thinking to propose a series of systematic principles that help grassroots organisations to produce systematic principles of governance knowledge and iteration rapidly and the Lean & Agile Governing System framework. And the system mechanisms are further clarified through problem-specific prototyping solutions by providing reference solutions that can be applied. The study uses a non-standardised Gigamapping analysis and visualisation method to sort out and analyse the elements and relationships in the system, trying to propose some system problems based on the whole governance cycle, and then construct a new system model. At present, this study still lacks enough validation, but it is expected to provide a constructive idea and basis for the modernisation and systematisation of governance tools design to deal with public emergency crisis.

Introduction

Public emergency crises can be divided into different categories, such as public health events, natural disasters, catastrophic accidents, social security emergencies, and economic problems (Xue & Zhong, 2005). A public emergency crisis implies that the state, society and the population suffer from a crisis (Fink & American Management Association, 1986), and has the attributes of a general social crisis. In terms of nature, public emergencies generally have several essential characteristics, such as suddenness, urgency, uncertainty, social, non-procedural decision-making, comprehensive, etc. (Xue & Zhong, 2005; Zhou, 2018), as shown below.

- Suddenness and urgency: The situation is sudden, and governors need to make quick decisions under high pressure, but often lack the necessary trained personnel, materials and time.
- Uncertainty: The beginning of a public emergency often cannot be judged by conventional

rules, information is seriously inadequate, untimely, and incomplete, and there is insufficient empirical knowledge to guide the subsequent derivation and possible impacts involved.

- Social: Public emergencies can often pose a severe threat to a social system.
- Non-Procedural Decision Making: Governors must seek "satisfactory" solutions with limited information, resources, and time, shift from the conventional thinking process instantly and make some necessary decisions on the spot.
- Comprehensiveness: It requires an integrated response from many social systems to solve the problem effectively.

Stoker (1998) makes five claims for the theory of governance, which can be interpreted as that governance compared to management, the term emphasises more but is not limited to the role of the government, but also includes the network of actors in governance, and also believes that government needs some tools and techniques to complete the process of governance. Governance systems are a vital force in responding to public emergency crises (Lerbinger, 1997), which are complex system practices. They also place high demands on the governors in the system to make the right and quickest governance decisions with effective information. There are indeed numerous systemic problems in the governance of public emergency crises, as evidenced by several real-life examples of actual occurrences. For instance, in the case of the Novel coronavirus pneumonia outbreak in late 2019, in China, for example, there were still some relatively bad decisions made in the early stages that led to some more considerable hazards from a God's perspective, but the good news is those adequate mechanisms were used to respond quickly and extensively to achieve excellent governance results compared to some other countries. In the Chinese context, despite good governance results, some problems have emerged. For instance, overworked grassroots personnel, the improper implementation by implementers (Wang, P., 2020), formalised governance decisions, decision-makers' mistakes (Shangguan, Wang & Sun, 2020), and residents' lack of understanding (Shangguan, Wang & Sun, 2020), etc., not only led to specific harmful effects but also caused a waste of human and material resources. Suppose the purpose of design is to achieve a better situation, then for these problems. In that case, our study intends to find a way to improve the correctness of governance decisions quickly and efficiently and needs to be based on the principle of smaller system costs and resource losses.

How to accomplish public emergency governance? A key direction in existing research is cross-sectoral synergy, such as studying synergistic governance mechanisms (Wang, L. Z., & Yang, 2020), Disaster resilience and complex adaptive systems (Coetzee, Van Niekerk & Raju, 2016). In the study of cross-sectoral synergy, the flow of information and knowledge is an essential consideration in public crisis management, and among the relevant studies at this level, Longstaff & Yang (2008) discuss the issue of trust in information dissemination in crisis management, Kapucu (2006) has proposed the use of ICT technologies to enhance inter-organisational communication, and information sharing, Simões-Marques and Figueira's (2018) study focused on the use of artificial intelligence technologies to assist in emergency decision-making. At the community level, Li et al. (2014) studied community-based collaborative databases to help various stakeholders within a community share collaborative information; Kapucu's (2006, 2008 & 2009) study specifically focused on crisis governance in the community level, Carafano; Marshall & Hammond's (2007) study discussed the importance of grassroots governors in crisis governance in the community.

This paper tries to provide a conceptual framework and design solution to knowledge sharing in public emergency governance systems through the perspective and approach of system design. In the second section, I will discuss the Gigamapping-based design research

approach adopted in the research process, followed by the Chinese governance system and mechanism and the system problems identified through the research in the third section. Finally, the Lean and Agile Governing System's conceptual framework proposed in this paper is introduced, which helps to design a tangible solution in the context of specific system problems in the fourth section.

Methodology

System-Oriented Design (SDO) combines system practice and design practice, integrating systems thinking and design thinking (Sevaldson, 2013), which is an important research method for systems approach combined with design approach (Jones & Kijima, 2018), where Gigamapping, helps designer analyse system elements and architecture, shifts the focus of design research from objects to relationships, explaining systems while helping to create them (Sevaldson, 2015) as a visual thinking method. This paper also focuses on the Gigamapping approach.

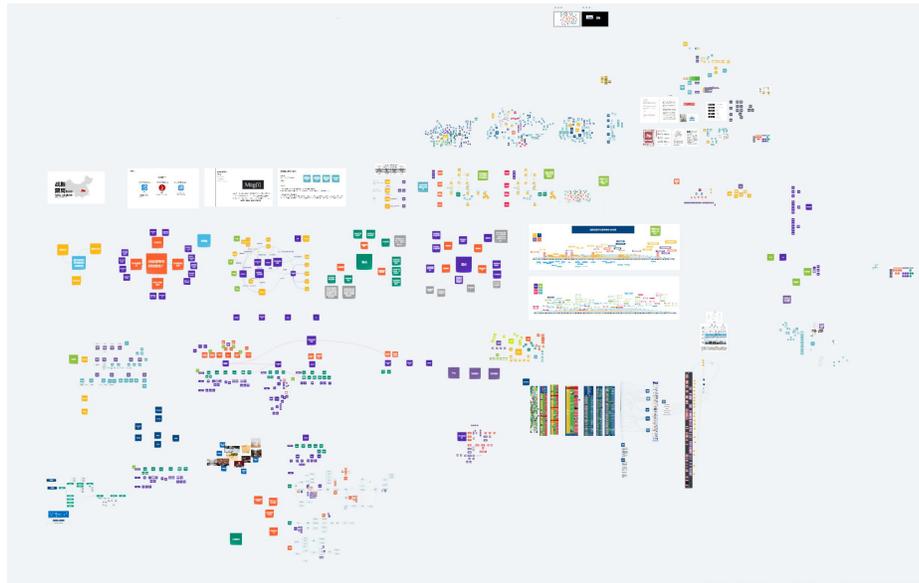


Figure 1. Gigamapping of governing system in a collaboration software(elaborated by authors), including a series of tools as Key Stakeholder Journey, Sympathy on Beliefs and Behaviour of Stakeholders, System map, Timeline, as well as take much documentation, papers as input.

Through a combination of interviews with governors and related materials and literature, we profiled the key actors of this governor system (e.g., initial responders, governance decision-makers, measure developers, grassroots implementers, governance audiences, governance participants, etc.). We explored to uncover key behaviours and processes (e.g., governance implementation, collaboration, decision making, information access, knowledge sharing, etc.) to understand the antecedents behind the actions, find levers for system design (key design directions), and use a range of tools (see Fig. 1) in a design interrogation approach (Nelson & Stolterman, 2014) to create future systems while developing a deeper understanding of the existing system.

The research in this paper has some unique advantages in that the researcher was in the epidemic governance system in China himself, and was the first to conduct micro and macro research observations of the entire governance system as both a governance audience (in the system) and a researcher (outside the system) in an effective system. On the other hand, because the original study period coincided with the epidemic, the actual research methodology still had many limitations. The primary research process was largely collaborative and remote (during the epidemic), most of the research was done in that way, including remote interviews with community governors, community grassroots implementers, and relevant professionals, as well as group-based systematic research analysis with tangible design concept outputs. We next describe some of the findings and results.

Hierarchical Public Emergency System

Taking China's crisis governance system during the COVID-19 pandemic as an example, China's public crisis governance system is a joint prevention and control mechanism with a multi-level command as the core and the collaborative participation of multiple organisations (Wang, L. Z. & Yang, 2020), a Collaborative Emergency Management Network (CEM) (Kapucu et al., 2010). The core governance place in China is the community. Therefore the discussion of the study has mainly focused on community-centred public emergency crisis management, avoiding other specialised fields such as hospitals, transportation, logistics, economics, and so on.

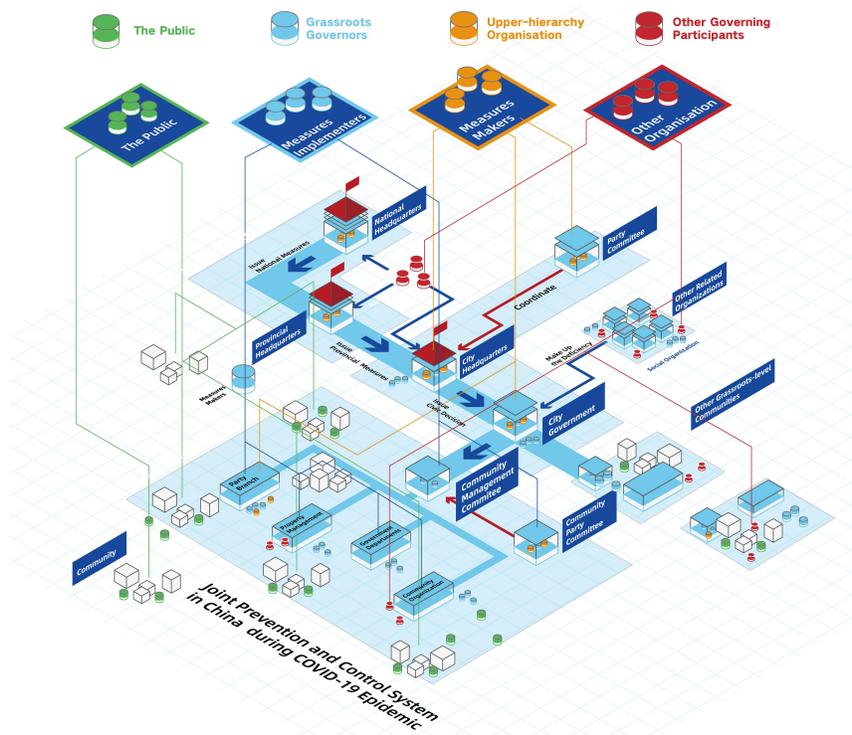


Figure 2. Joint Prevention and Control System in China during COVID-19 Epidemic(elaborated by authors).

The actors in this crisis governance system can be divided into four categories of

stakeholders (see Fig. 2). The command serves as the decision-maker, while the grassroots governors mostly serve as the executor of the decision. Other organisations will implement the decisions and supports in cooperation with the mainline of governance, and residents cooperate with the governance as the audience of governance.

The command, from top to bottom, is divided into the national, provincial, city, district and county level layers, with the community as the core governance place. The decisions of governance circulate from the high-level command to the low level, until it reaches the mass level. In the process, various experts (CDC experts) will make decisions as to the core members of the command. The government is responsible for the release of decisions and coordination of resources. The command of the community deepens the decision making according to the rules passed from the upper level. It implements it through the neighbourhood committee, party organisation, property, government public sector and community organisations in the community, and other organisations tend to cooperate more at this level in various ways.

In this governance system, decisions are increasingly specific and implementable from top to bottom. At the macro-level, decisions are mainly made and published. At the middle-level, they are mostly coordinated and integrated management of human and material resources under the decisions. At the micro-level, they are mainly implemented and iterated and the participation of the people and other organisations. This system has played a vital role, but some problems remain.

System Problems origin from the system mechanism

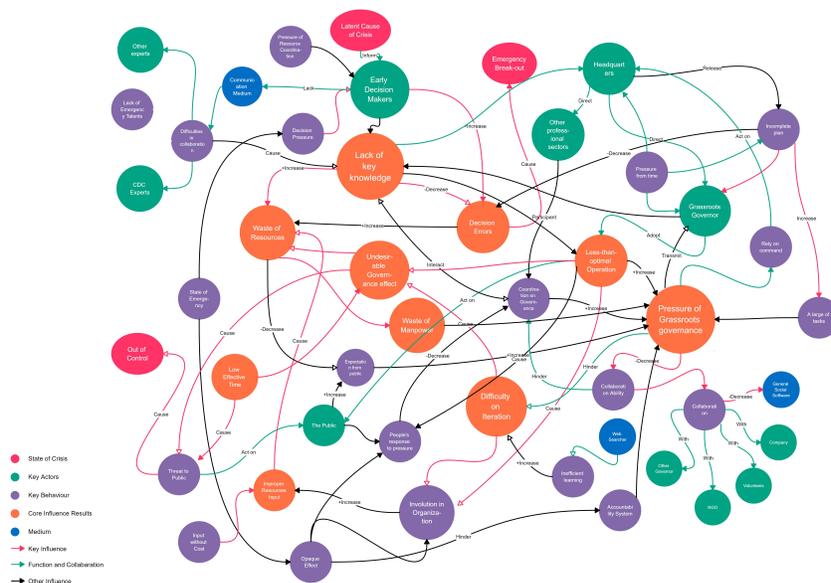


Figure 3. Systematic analysis of public crisis governance (elaborated by authors), complex but helpful for researchers to understand the problem and find solutions.

Instead of using some hard system methods such as standard system models, this paper uses some soft analysis methods (example see Fig. 3) to conduct a qualitative study by analysing human behaviour, organisational relationships, and system relationships in dynamic

systems (Jones, 2014), which, although not very accurate, helps us understand the mechanisms behind the problem to help propose solutions. Governance knowledge mainly refers to the validated and practical knowledge generated by applying and iterating the governance measures in practice.

This paper creates a Normal Governance System (N-GS) framework (see Fig. 4) to describe the present situation. In a public emergency crisis like COVID-19, there are three main core contexts for grassroots governors: organisation, governance, and collaboration, through which they accomplish community-based governance behaviours. (1) In the organisational context, grassroots governors complete the knowledge exchange process more with the upper-level organisational members (e.g., measure makers). The upper-level organisations perform training and management of grassroots governors with essential sources of planned governance knowledge and take resource synergy with other participants. (2) In the governance context, they interact with the public and implement governance measures. They also need to complete tasks such as demand communication and listening to feedback, which is proven channels for governance knowledge generation. (3) In a collaborative context, collaborative governance with other organisations and completing tasks such as collaboration are mostly coordination-based governance knowledge. Each community can be considered a micro-governance system, and the knowledge communication between different micro-governance systems is mainly done between the upper levels of the organisation, with the help of communication tools and media tools.

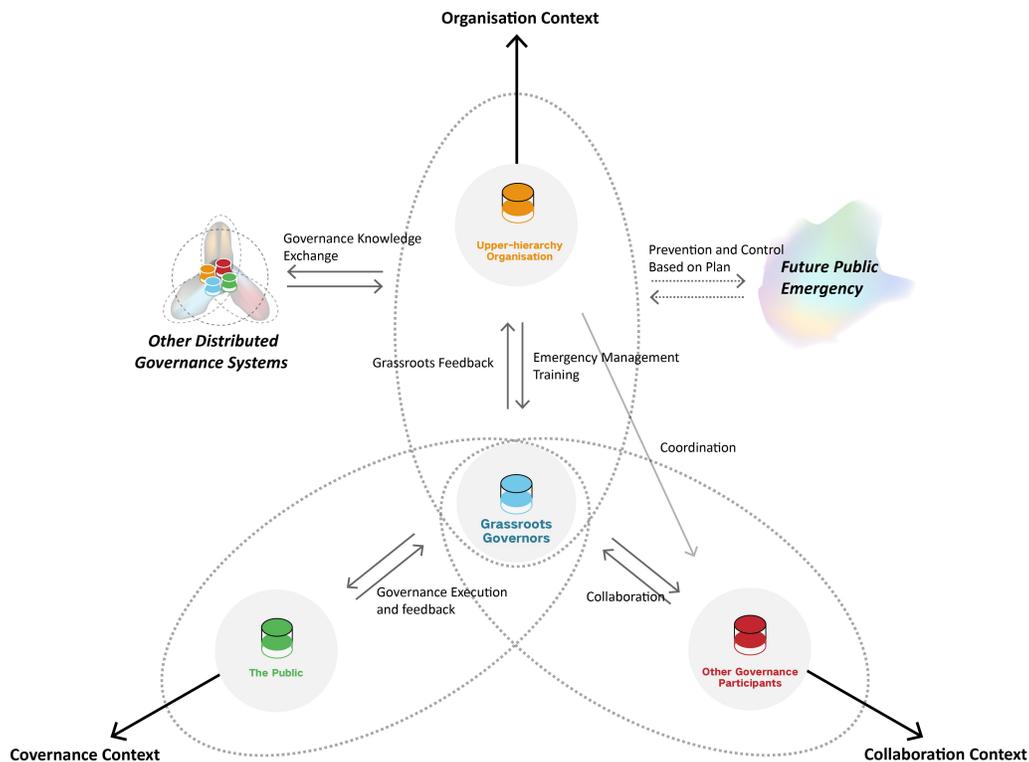


Figure 4. Normal Governing System Framework (elaborated by authors)

This paper will also elaborate on the systemic issues found in the context of the four-stage crisis governance life cycle of Response, Recovery, Mitigation, and Preparedness proposed by Lindell & Perry (2006) (see Fig. 5).

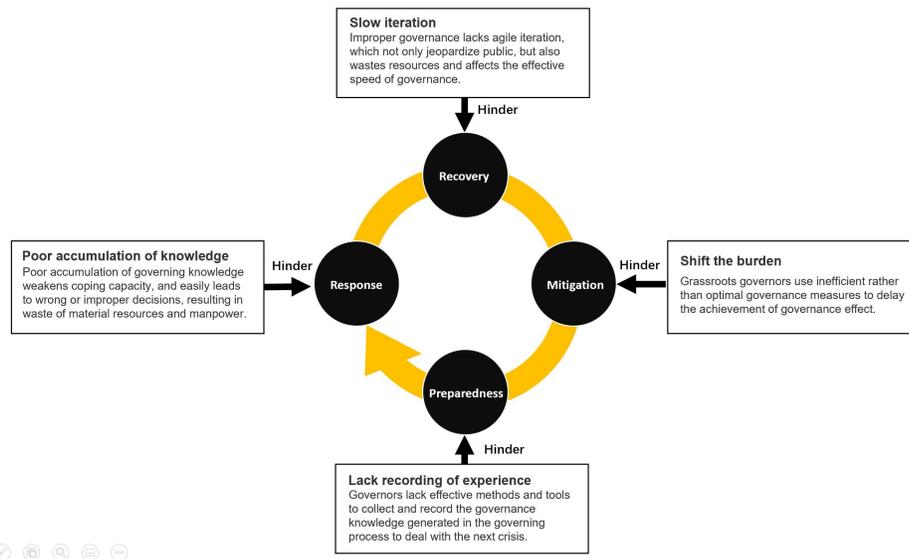


Figure 5. The vicious circle of public emergency crisis governance (elaborated by authors).

In the early stages (corresponding to the Response phase), the main problem is the accumulation of poor governance knowledge, which weakens response capabilities and can easily lead to wrong or inappropriate decisions, resulting in a series of wasted human, material, and other resources. Because of the inherent characteristics of urgency and uniqueness of public emergencies, the responders in this stage are under more system pressure and lack sufficient response knowledge, often resulting in inadequate and intentionally vague plans, missing details and not applicable to the community context. When decisions reach the grassroots, grassroots governors lack sufficient knowledge to refine them, which leads to inappropriate, faulty, and flawed decisions being implemented.

In the middle stage (corresponding to the Recovery stage), the main problem is the lack of rapid iteration of improper governance measures, which not only causes harm but also wastes resources and affects the speed at which governance takes effect. The inappropriate decision making leads to more implementation pressure on the grassroots governors, who are overworked in the endless implementation process and thus find it difficult to create better generative governance knowledge on their own. On the other hand, they also lack learning opportunities because the current learning relies more on mutual collaboration at the upper levels of the organisation (e.g., the release of iterated and more detailed measures at the upper level) and self-learning (e.g., checking the news media, peer-to-peer communication, and audience feedback), and they lack a network system to support them in achieving self-iterative decision-making. Constrained by the current multi-level governance system (see Fig. 3), governors are unable to quickly transfer the more effective governance knowledge back to the entire governance network, hindering the overall learning process in the governance network. On the side of the governance audience, people and other organisations are busy implementing some low-value and formalistic measures that are not conducive to collaborative governance, resulting in a significant loss of human and physical resources and possible governance failure.

In the middle and late stages (corresponding to the Mitigation stage), the central phenomenon is that governors use inefficient rather than optimal governance measures,

delaying governance effects. The widespread adoption of seemingly good governance measures relieves the governance pressure on decision-makers and governance practitioners to a certain extent. However, there are still some more good measures, but due to the sunk costs incurred after adopting the measures, decision-makers can only use those "seemingly faultless" measures to take into account these costs. However, that creates a lot of costly waste in the long run due to inefficiency in the overall governance system (because it is more for carrying out orders from the upper level rather than for the actual effectiveness of the governance) and is a manifestation of "Shifting the Burden" model (Senge, 2006). The unlimited use of human and physical resources will have a negative impact on the whole system.

In the late stage (corresponding to the Preparedness stage), the main problem is that the governors lack effective methods and tools to collect and record the governance knowledge generated during the governance process, forming a vicious governance cycle. Since the whole process relies almost purely on the manual iteration of the measures, some governance decisions on a plan, useful but not granular enough, are difficult to return to plan even if they are changed in practical application. Thus all the knowledge is internalised into the tacit knowledge of those involved in governance. In the next crisis outbreak, it is still impossible to tap the tacit knowledge in large quantities despite the early warning rehearsal. After a long period, when a crisis is likely to break out again, the new governors who lack the knowledge and the governors who cannot quickly tap the old tacit knowledge cannot respond quickly to the crisis, causing another outbreak of the crisis.

These problems distributed throughout the governance cycle system seem to be relatively hidden and not easy to be detected one by one. Still, through analysis, it can be found that most of them are behavioural problems in the system. These problems are not conducive to the communication and iteration of governance knowledge in the entire process, delaying the widespread achievement of governance effects, inadvertently cause harm, as well as cause waste of resources in the process. Senge (2006) points out the structure of the system influences the system's behaviours, and this article attempts to reconstruct some of the system elements, hoping to push the system into an ideal future.

Lean and Agile Governing System for Emergency Governance

Through qualitative research analysis, this paper finds that governance knowledge has a significant influence with governance quality and resource use over the life cycle of a governance system and that the circulation of practical governance knowledge is one of the key factors in solving public emergency crises. This paper argues that the important role of Lean and Agile thinking is to facilitate the rapid generation and testing of practice-based knowledge to improve decision-making without wasting more resources. This paper combines the concepts of lean and agile in public crisis governance, which will be further targeted to governance knowledge networks centred on grassroots governors.

Leverage Lean and Agile Thinking

Lean thinking (Womack & Jones, 1997; Womack, Jones & Roos, 2007) originated from Lean Production, and Poppendieck (2011) pointed out that the basic principles of eliminating waste, empowering front-line employees, responding immediately to customer requirements, and optimising the entire value chain are the foundation of lean thinking (see Fig. 6). This way of thinking about organisation and management empowers implementers effectively to

participate in system improvements at the grassroots level, which can significantly reduce the time from problem identification to problem resolution, and the reduced feedback time will help the entire organisation reduce overall input.

The concept of Agile (Fowler & Highsmith, 2001) was developed from Lean Thinking. It was first applied to the process of software development, called agile software development, in which the distinctive approach also represents the degree to which an organisation can respond quickly to needs and can improve the quality of results (Mergel, Ganapati & Whitford, 2020). Agile obtains the customer's real needs through direct collaboration with the customer and responds quickly to test whether the solution to the demand is a solution to the problem. Agile Thinking recognises the importance of programmatic factors such as processes and tools, but providing a solution that can face the end-user is more likely to facilitate the generation of valuable knowledge. The importance of group reflection is emphasised.

Lean Thinking Principles According to Poppendieck (2011)	Agile Thinking Principles According to Fowler & Highsmith (2001)
<ul style="list-style-type: none"> • Add nothing but value (eliminate waste); • Center on the people who add value (empowering front line workers); • Flow value from demand (responding immediately to customer requests); • Optimize across organizations (optimizing across the value chain). 	<ul style="list-style-type: none"> • Individuals and interactions over processer and tools; • Working software over comprehensive documentation; • Customer collaboration over contract negotiation; • Responding to changes over following a plan.

Figure 6. Lean and Agile Thinking Principles, according to Poppendieck (2011) and Fowler & Highsmith (2001).

Towill & Christopher's (2002) study reflects that there is an overlap of thinking in the Lean and Agile concepts, but each has its characteristics. The lean approach emphasises trial and error on a small scale to reduce inputs on a large scale and is cost-oriented. In contrast, the agile approach is incremental in meeting customer needs and is demand-oriented. Both concepts involve strengthening human and organisational capabilities to maximise resource utilisation to improve quality and efficiency. Some studies have combined these two concepts. Sohi et al. (2016) combine lean and agile concepts to reduce the complexity of project management in the construction industry. Towill & Christopher (2002) examine supply chain strategies that combine lean and agile concepts. The concept of "lean startup" proposed by Eric Ries (2011) can also be regarded as a product of combining lean and agile thinking, emphasising trial and error to quickly test the final customer needs to minimise waste in the startup process.

Lean Thinking originated in the manufacturing industry, and Agile Thinking originated in the software development industry, but some studies have shown that Lean and Agile thinking have moved out of their original domains (manufacturing and software development) into other fields, such as the governance domain (Luna et al., 2014; Janssen & Estevez, 2013). For example, the process of change within the government. Janssen & Estevez (2013) talk about the shift from the electronic government (e-Government) and transformative government (t-Government) to lean government (l-Government). E-Government can effectively reduce organisational size and cut costs through the use of ICTs (Okon'o & Kyobe, 2019). T-Government is the ICT-enabled government operations, internal and external processes and

structures and organisation-led change that meet public sector objectives (Weerakkody, Janssen & Dwivedi, 2011). And I-Government introduces flexibility to the system to do more with less by streamlining organisational structures and processes, reducing the complexity of the public sector, and decentralising authority while achieving greater collaboration with a wide range of stakeholders (Janssen & Estevez, 2013). To respond to the problem of public emergency crisis, the study by Abdelouhab, Idoughi & Kolski (2014) combines agile methods and UCD (user-centred design) methods applied to disaster management.

In the context of public crisis governance, this paper attempts to combine Lean and Agile thinking and proposes a system framework and a set of principles of Lean and Agile Governing System (L&A-GS), in the hope of reconstructing the governance system of public emergency crisis.

Principles and Framework of Lean and Agile Governing System

We propose the following four principles of Lean and Agile Governing System (L&A-GS).

- Empowering the grassroots to be more responsive, rather than sticking to plans;
- More system interaction, consistently addressing points of agreement between system requirements and local requirements, rather than relying exclusively on decision-makers
- Shortening the value stream of feedback, with the governance audience, governors and collaborators evaluating the effectiveness of governance, rather than just superiors doing the evaluating.
- Use digital governance tools to reduce the difficulty of governance learning, rather than constant plan documents;

These principles have led us to propose a framework in the context of public emergency crisis governance (see Fig. 7). Carafano (2007) has mentioned the grassroots as a vital public crisis response force that can provide assistance to adapt to changing needs, help governance systems adjust to the stochastic nature of crises, and respond to emergencies in rapid and innovative ways to reduce harm. Numerous studies related to synergy in crisis governance (Wang, L. Z., & Yang, 2020; Kapucu, 2006) explore more efficient synergistic mechanisms to respond quickly to complex systems, critical in emergency crisis governance. Compared to the governance system under normal circumstances (see Fig. 4), this is a grassroots governor centred mechanism that uses digital tools and platform mediums to collaborate with governance organisations, governance audiences (the public) and governance collaborators (other organisation) to connect the entire micro governance system (community) well. At the same time, through that medium, the communication between each distributed governance system will be easier, especially the knowledge sharing among the front-line grassroots governors. The combination of principles and system mechanisms is shown below.

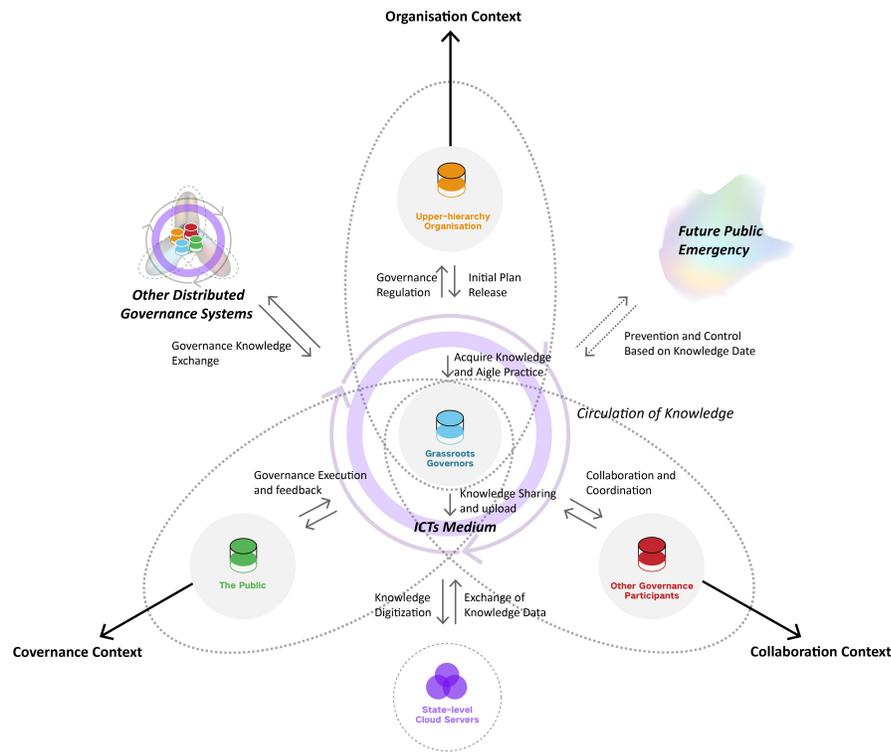


Figure 7. Lean and Agile Governing System Framework (elaborated by authors).

- Empowering the grassroots to be more responsive, rather than sticking to plans. In the early stage, the system focused on the rapid retrieval of governance knowledge. The same effective measure need not be repeatedly developed or ultimately constrained by a plan. This not only means that governors have adequate access to governance decisions from good governors elsewhere to facilitate faster-localised iterations (e.g. GitHub's open-source code helps developers improve development efficiency and get to the actor that solves the need more quickly), and faster deployment, but also have a centralised platform to facilitate communication among governors and explore better early solutions.
- More system interaction, consistently addressing points of agreement between system requirements and local requirements, rather than relying exclusively on decision-makers. Collaborative Network can effectively improve urban resilience (Gimenez, Labaka, & Hernantes, 2016), In the middle stage, a multi-actor, multi-sector, multi-community governance network is built through digital medium to encourage collaborators, governance audiences, and industry experts to provide immediate feedback, evaluation, and suggestions on published governance measures. This continuous value interaction and group intelligence participation weakens the governance pressure on grassroots governors under such a system and helps them be able to revise and improve measures faster, test governance measures more quickly, and iterate governance knowledge to enhance the responsiveness of the system.
- Shortening the value stream of feedback, with the governance audience, governors and collaborators evaluating the effectiveness of governance, rather than just superiors doing the evaluating. Governance audiences, governors, and collaborators evaluate governance directly through digital media in the middle and late stage, not only

the organisation's superiors. That shortens the value stream in governance and cuts down on "formalistic" governance measures, which will facilitate grassroots governors to continuously pursue more streamlined but effective measures to maximise the value of resources.

- Use digital governance tools to reduce the difficulty of governance learning, rather than constant plan documents. At a later stage, through the introduction of digital governance tools throughout the governance process, the development of measures, staff collaboration, resource collaboration and their iterations are recorded on the platform, and proven governance knowledge is stored. Compared to the constant official documentation, that effectively prevents the discontinuity of tacit knowledge. When the next similar crisis breaks out, these proven governance knowledge packages will become a powerful tool for responding to public emergency crises.

This system aims to improve governance efficiency by facilitating the rapid flow of governance knowledge from the front-line in the system and then to enhance the resilience of the governance system by using the immediate storage of governance knowledge and strengthening the synergistic efficiency of the behavioural network of governance while reducing the consumption of worthless resources. Some research has proposed a collaborative governance information platform for emergency management (Zhang, 2008), but calls and conceptual models do not yield the most immediate value and cannot be applied without clarifying the "how" (Luna et al., 2010). As designers, we can translate mechanisms into tangible design solutions that play a critical role in refining system mechanisms to further research.

Tangible Solution: DAYU Think Tank

DAYU Think Tank is a design concept output in this study (see Fig. 8), which is a PaaS system incorporating cloud service technology, and it is hoped that this concept will generate value for further application of governance tools. In this paper, we try to focus on the core features of the design, and briefly describe the design in four aspects: physical resources and human resources coordination (horizontal) and governance span and process (vertical) (see Fig. 9), ignoring the description of other design details.



Figure 8. Design Concept of DAYU Think Tank (elaborated by authors).

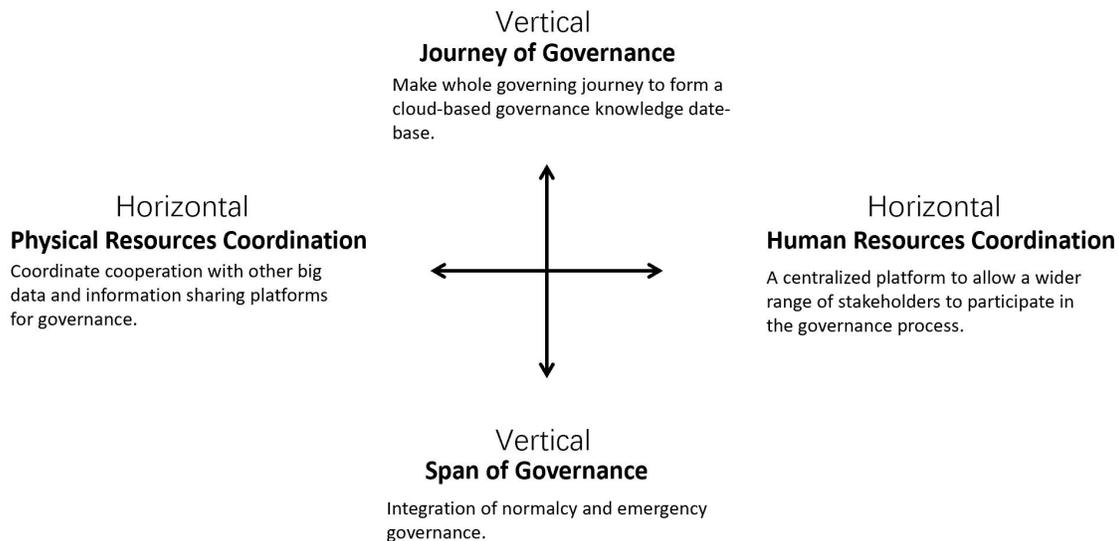


Figure 9. Brief description of the design concept (elaborated by authors).

The Horizontal coordination of physical resources: coordination and cooperation with other governance big data and information platforms; in addition to combining with existing big data governance system to complete coordination on information, it is also necessary to effectively record the inventory and flow of physical resources based on location and department at the same time, so that governance decision-makers and executors can carry out the coordination of resources in the governance process in a more systematic way.

The Horizontal human resource coordination: Using a centralised platform to engage a more multi-level, broad range of people in the governance process. Applied the view of collaborative governance network, this platform takes governance events as the core purpose, and multiple stakeholders (including organisations in the same sector, organisations in different sectors, civic experts, other civic organisations, people, etc.), in addition to the governors, can

participate in the governance process through the same platform by openly evaluating, providing feedback, suggesting and other actions on governance measures from multiple aspects. The effect of centralised governance by one platform is achieved, and the human capacity from both official and private sectors is widely unified.

The Vertical span of governance: integration of normal and emergency governance. Splitting the tools used for emergency governance from those used for normal governance would lead to a formalisation of emergencies, with a large number of governors unable to adapt to the tools quickly when a real emergency crisis arrives. However, the use of conventional communication media and other devices without an adaptive governance system, while easy to use for existing stakeholders, limits the upper limit of governance efficiency. Therefore, we need to achieve an integrated governance system that meets the needs of daily governance and adapts to the emergency.

The vertical governance journey: allowing the decision making, collaboration, publishing, feedback, and iteration processes to be entirely cloud-based, resulting in a governance knowledge base. Unlike most governance tools that focus on strengthening the capacity of upper-level governors (e.g. Gjørseter, et al., 2018; Abdelouhab, 2014), the main users of this system are mainly from the front-line which is built around grassroots governors and other collaborators. Through the full journey study of governors, it was found that the final effective implementation of a governance decision requires many processes such as formulation, collaboration, publication, feedback, and iteration. And all those processes can be completed through a unified instrumentalised system, which is not only expected to reduce the time gap between operations and improve governors' governance efficiency but also to effectively record governance knowledge as a critical reference factor and quick learning material to deal with future situations.

Conclusion

The outbreak of COVID-19 has caused great harm to the whole world, and in this context, the traditional design discipline has started to think more about related issues. In this paper, we investigate and analyse the system mechanisms of public crisis management systems by putting a design perspective on them, and then produce a new system structure by combining Lean and Agile thinking, proposing principles and a conceptual framework (i.e., lean and agile public crisis management systems) that promote the rapid generation and dissemination of governance knowledge and agile response to system needs, with grassroots governors as the core. The process of designing a tangible solution also further refined the concept.

However, there are also many limitations in this paper. It should be clearly pointed out that the research in this paper is qualitative, the proposed conceptual framework and design are yet to be validated, and the research process is limited and non-rigorous. But it is believed that with the gradual improvement of the research environment, there will be opportunities to practice the system design approach further and improve it. Besides, the research in this paper is mainly based on the context of public health emergencies such as COVID-19, so whether it is sufficient to explain and apply to other public emergency crises is still open to discussion.

This paper argues that further research needs to focus on multidisciplinary aspects related to the validation of mechanisms in real system situations, the complexity of comprehensive integration of governance systems, the study of relevant information technology systems, and the design to which mechanisms of L&A Governance System are applied. The authors expect this paper to provide a reference for decision making on the systematisation of governance

tools for public emergency crises and provide insight into the modernisation and development of governance tools with applicability value.

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