Agility amid uncertainties: evidence from 2009 A/H1N1 pandemics in Singapore and Taiwan

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ABSTRACT
Despite the emphasis placed on agility in uncertain situations such as extreme events, no comparative data exist to look into the determinants that drive agility. For crisis response managers, the failure to develop agility threatens organizations’ survival amid uncertainties. This paper investigates the development of agility and explains the emergence of agility against the fight of influenza A/H1N1 pandemics in Singapore and Taiwan in 2009. This paper further provides empirically grounded evidence to identify prerequisites for agility development in response to public health crises in East Asia.

KEYWORDS
Agility; uncertainties; pandemics; H1N1; Singapore; Taiwan

Introduction
Agility has been mostly studied in sports science and medicine and is defined as simply the ability to change direction both rapidly (Bloomfield, Ackland, & Elliot, 1994) and accurately (Barrow & McGee, 1971). In the organization literature, organizational agility is mainly defined as, and sometimes exchangeable with, adaptability within the context of the competitive market advantage (Brown & Eisenhardt, 1998). At the collective level in extreme events, an organization has to adapt strategically to address its insufficient (or ineffective) response (Birkland, 2006; Moynihan, 2008, 2009; Stern, 1997; Vera & Crossan, 2005). The rationale is quite straightforward as designing an agile organization matters to its survival (Amabile, 1988).

However, the current studies on organizational agility are mostly limited to private domains. We find little empirical research and evidence in exploring the role of agility in public organizations amid uncertainties such as extreme events. Regardless of the nature of organizations, unexpected and threatening emerging conditions weaken the administrative capacity to make sense of new contexts and develop adaptive solutions in chaotic situations (Lai, 2011; Weick, 2001).

During the crisis period, in particular given the limited time, dynamic conditions and intense pressure, lead response organizations must be capable of making swift decisions (Boin, T Hart, Stern, & Sundelius, 2005) and effectively evaluate and re-evaluate the nature and scope of the uncertainties and search for an appropriate response. This iterative, successive process of adjustment and routine-breaking actions is what we call agility.
Agility is closely related to the quality of response processes. To achieve this end, response organizations must be agile and capable of adapting to changing pandemic scenarios adequately, timely and flexibly. For public organizations in the context of health crisis, the goal of organizational agility can be pragmatic as to bring the pandemics into control and containment stage whereby the state of emergency is lifted and business activities resume as usual.

However, agility in real-world practices does not necessarily generate positive results during extreme events (Lai & Tan, 2012). The ignorance of capacity development and failure to assess it, by and large, points to highly ambiguous and flawed methodological approaches (Lai & Tan, 2012). Apparently, organizational agility is assumed to vary but this finding is clouded by definitional confusion about the term ‘agility’ itself. Hence, for research purpose, agility amid uncertainties at the organization level in this paper is defined as ‘to cope or ingeniously adapt to a set of circumstances’ (Preston, 1991, p. 88) or as ‘devising resourceful solutions to intractable problems’ (Meyer, 1998, p. 572).

In the existing literature of public management and organization studies, I find little empirical research on the development of agility at the organization level. While the literature of crisis management has produced numerous case studies, approaches to the study of agility during crisis periods and lessons drawn for effective response are scattered across various disciplines. Little is known about how to develop organizational agility, and how a taskforce can learn this skill and successfully apply it in organizations, especially in extreme events. Limited theoretical work is available on what it takes to develop this adaptive skill, and there is a lack of empirical evidence supporting the development of agility (Vera & Crossan, 2005).

This capacity capture, as assumed, is more profound in public entities due to their bureaucratic nature and rigidity. As such, public organizations fall short in response capacity when attempting to adapt to uncertain, extreme situations (Bardach, 1998, 2001). Hence, it is imperative to explore organizational agility from a capacity approach. This capacity approach is essential to depict how organizations survive through both external and internal crises and find subsequent solutions to pressing issues (Agranoff, 2006, p. 63).

Therefore, this paper focuses on organizational agility occurring in lead public health sectors and illustrates the ability for organizations to be equipped with the skill for being agile. To achieve this end, this paper conducts a qualitative interview into the development of agility and explains the emergence of organizational agility against the fight of influenza A H1N1 pandemics in Singapore and Taiwan in 2009. Subsequently, I further provide empirically grounded evidence to lay out in detail the various prerequisites for agility development in response to public health crises in East Asia.

**H1N1 pandemics in Taiwan and Singapore**

In April 2009, H1N1 first broke out in Mexico and the USA. On 27 April, the WHO raised its pandemic alert level\(^1\) from Phase 3 to Phase 4, a phase ‘characterized by

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\(^1\)The WHO has set up the global pandemic-alert level from Phase 1 to 6. Phase 1 means ‘no viruses circulating among animals have been reported to cause infections in humans’, Phase 2 refers to ‘an animal influenza virus is known to have caused infection in humans’, Phase 3 denotes ‘an animal or human–animal influenza virus has caused sporadic cases or small clusters of disease in people, but there have not been community level outbreaks’, Phase 4 means ‘a reassortant virus is causing community-level outbreaks’, Phase 5 describes ‘human-to-human spread of the virus into at least two countries in one WHO region’ and Phase 6 refers to a global pandemic, which means there are community-level outbreaks in at least one other country in a different WHO region.
verified human-to-human transmission of an animal or human–animal influenza virus able to cause community-level outbreaks. Two days later, the pandemic alert level was further raised to Phase 5, indicating that at least two countries in one WHO region had found cases of human-to-human transmission of the virus. Meanwhile, the WHO suggested all countries to ‘immediately activate their pandemic preparedness plans’ and ‘remain on high alert for unusual outbreaks of influenza-like illness and severe pneumonia’. Within weeks, on 11 June 2009, the pandemic alert level was raised to Phase 6, denoting a worldwide pandemic, when sustained local transmission had occurred in general population across multiple WHO regions.

At the beginning stage of H1N1 outbreaks in Taiwan, the Centers for Disease Control (CDC) implemented border control in an effort to prevent or delay the spread of the virus from abroad. On 20 May 2009, Taiwan’s Central Epidemic Command Center (CECC) confirmed the first (imported) case of H1N1 influenza in Taiwan. The CDC immediately reported to the WHO and contact points in other countries through International Health Regulations (IHRs) Focal Points. Four days later, on 24 May, the first indigenous case was confirmed. The precautionary measures in public health control triggered a great deal of policy responses at different fronts in Taiwan. When the WHO announced in mid-June 2009 that the entire world was in the pandemic period of moderate severity, Taiwan swiftly transited to mitigation strategies. As many H1N1 patients could recover fully without medical treatment, the CDC soon modified the strategy of case management. In the pandemic development in Taiwan from 19 June 2009 to 8 May 2010, a total of 923 complicated cases were reported and confirmed, including 39 deaths (CDC, 2010). Taiwan successfully controlled the H1N1 pandemic in many ways. The mortality rate of H1N1 in Taiwan was 1.8 per million, one-third of the average among Organisation for Economic Cooperation and Development (OECD) members and one-fifth of America’s average. Taiwan ranks among the top five countries globally for her island-wide vaccine coverage. Admittedly 25% of the population in Taiwan, a cumulative total of 5.6 million people, received a shot against H1N1.

In Singapore, the Ministry of Health (MOH) elevated the country’s Disease Outbreak Response System from green to yellow on 28 April, soon after the WHO raised the pandemic alert level. One month later, the first case of H1N1 was detected at a local clinic on 27 May 2009. The case was subsequently sent to a local hospital designated to treat H1N1 cases. About 3 weeks after the first imported case, community transmissions (with no links to the first case) broke out at an alarming rate. Health authorities in Singapore immediately introduced rigorous containment measures, which eventually brought down the rate of community transmission. Most notably, at the peak of the H1N1 pandemic (from 26 July to 1 August 2009), community outpatient clinics attended to nearly 24,477 cases for acute respiratory illness. In the week between 2 August and 8 August 2009, 65.5% of influenza-like cases were confirmed to be H1N1. By September 2009, there were 1348 confirmed cases of H1N1 in Singapore. Singapore practiced in-hospital quarantine measures for the first wave of infected cases. In early November 2009, effective vaccines against the H1N1 pandemic began to be available to the local community. Although the WHO later categorised the H1N1 pandemic as one of moderate severity, the public health control

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2Singapore’s health authority uses five colours for different levels of disease outbreak. Green is equivalent to Phase 1 in WHO’s alert levels, yellow is Phase 2, orange is Phase 3, red is Phase 4 and black denotes Phase 5.
measures introduced to mitigate the severity of this pandemic undoubtedly contributed in no small part to contain this highly contagious pandemic. Table 1 provides a comparison of H1N1 pandemics situation in both countries.

**Methodology and data sources**

For this paper, I undertook a mixed-method research design, including comparative case studies, a qualitative analysis of interview statements and documents (media reports, official documents and evaluation notes) within the 2009 H1N1 pandemics in Singapore and Taiwan.

A group of leading national public health organizations in each country (i.e. the CDC in Taiwan’s case and Communicable Disease Division in Singapore’s Ministry of Health) was enlisted, each recommending the major players within the broader network of disease control and prevention. Primary data were collected through 30 research-administered, face-to-face interviews from 20 organizations: 20 informants from 12 organizations in Taiwan’s communicable disease network and 10 from 8 organizations in Singapore (see Table 2). All the organizations selected in this study were responsible for managing the 2009 H1N1 pandemics. The interviewees’ statements were used as evidence to support or contest the argument. Descriptions of informants are provided alongside illustrative quotes in the findings section.

**Analysis**

In this section, I analyse and discuss why and how the lead public health organizations in Singapore and Taiwan are agile against A/H1N1 pandemics in 2009 and eventually

### Table 1. Comparison of H1N1 pandemics in Singapore and Taiwan.

|                      | Taiwan                          | Singapore                       |
|----------------------|---------------------------------|---------------------------------|
| Outbreak period      | April 2009–May 2010             | April 2009–September 2009       |
| Preparedness plan    | January 2007                    | July 2009                       |
| First imported case  | 20 May 2009                     | 27 May 2009                     |
| First local case     | 24 May 2009                     | 18 June 2009                    |
| Total cases          | 923                             | 1348                            |
| Death toll           | 39 cases                        | 18 cases                        |
| Case mortality rate  | 1.8 per million                 | 3.4 per million                 |
| First H1N1 death     | 31 July 2009                    | 20 July 2009                    |

Source: Centers for Disease Control (2010) and Tay et al. (2010)

### Table 2. List of organizations in this study.

|                            | Singapore | Taiwan                                      |
|----------------------------|-----------|---------------------------------------------|
| **Government agencies**    | Ministry of Health | Ministry of Health |
| Health Promotion Board     | National Environment Agency | Health Promotion Bureau |
| National Environment Agency| Ministry of Home Affairs | Centers for Disease Control |
| Ministry of Home Affairs   | Ministry of Communication and Information | Mainland Affairs Council |
| Ministry of Communication and Information |                          | Ministry of Foreign Affairs |
|                            | Department of Health Taipei City | Department of Health Tainan City |
|                            | National Institute of Health | National Institute of Health |
| **Hospitals**              | National University Hospital    | National Taiwan University Hospital |
| Tan Tock Seng Hospital     | Taipe Medical University Hospital |                          |
| Communicable Disease Centre | Taipei City Hospital (Hoping branch) | Nation Cheng Kung University Hospital |
brought the public health crisis into control. This paper examines the cases from three dimensions critical in disease control and management: governance structure, prehistory of (similar) crisis and key information channels, which is identified as essential drivers that facilitates the development of organizational agility.

**Governance structure**

The governance structure deals with the process of generating options on what to do about a public problem. The emergence of novel pathogens such as SARS or novel H1N1, though infrequent, reveals that routine disease control methods and their accompanying bureaucratic structures are often inadequate to adapt their actions against unprecedented and multifaceted crisis situations.

In a similar vein, governance structure receives greater attention at the time of a crisis than routine periods. An ad hoc taskforce provides structural flexibility in that appointed leaders are able to handpick the most capable people on the team. According to all respondents, governance structure (i.e. setting up a cross-sector command centre and participatory decision-making) is less significant for routine task in two ways. First, routine disease control services favour stability in the governmental administrative systems that presuppose nonalignment. To improvise on routines runs the risk of bringing in more changes to existing bureaucratic structures. Second, there is no time pressure and decisional urgency to be agile towards a common goal.

In Singapore, the government revamped the Home-front Crisis Management System headed by the Home-front Crisis Ministerial Committee (HCMC) right after SARS whereas Taiwanese government established National Health Command Center in June 2005. During the H1N1-2009 outbreak in Singapore, the HCMC for Influenza (HCMC-FLU) was formed. Various ministries and agencies also formed interagency working groups called Crisis Management Groups (CMGs). Each CMG was in turn headed by a ministry. Then in each CMG, a senior MOH representative was assigned to bring that ministry’s expertise to the group. The main benefit of this abridged command and control structure was that it dramatically shortened response time and facilitated the implementation of health control measures across various healthcare sectors during the 2009 H1N1 pandemic.

"...among all notable moves, one critical step is that Singapore’s MOH established a special taskforce – a joint effort made up of key policy makers, public health practitioners, senior clinicians, and infectious disease specialists – headed by the Permanent Secretary of Health to implement all public health control measures and oversee the provision of medical services." (Senior manager, Ministry of Home Affairs, Singapore)

At the local government level in Taiwan, within 24 h following the establishment of CECC, each regional command centre was established accordingly, while each local government developed a cross-sector coordination mechanism, as a reciprocal contingent task force to its central counterpart. All these regional and local task forces fell under a unified control structure – the CECC. Most of the interviewees applauded and espoused the idea of establishing a leading organization at the central level. One particularly mentioned the role of CECC and its capability in mobilizing resources.

"The CECC played an important coordinating structure as it gave clear orders and mobilized resources within the central government and between the central and local
Prehistory of focus event – SARS

This comparative study shows that having a prehistory of fighting SARS epidemics helps both Taiwan and Singapore to quickly respond to the crisis, respectively, in the following ways.

First, the battle against SARS has facilitated to improve and enhance the prior fragmented epidemiological surveillance system. Drawing heavily on its experience with SARS’s wide-net surveillance, Singapore’s MOH introduced a number of novel surveillance measures to integrate epidemiological data and to identify the emergence of a new virulent strain faster. For example, a rigorous measure of thrice-daily temperature surveillance of all healthcare workers was introduced by MOH in every institution, as well as active surveillance for clusters of febrile patients. These novel measures were embraced by the public given the high level of trust they have towards formal institutions. One informant responded:

"In general, every public health control measure introduced by Singapore’s health authorities was well-received by the public for two main reasons: Firstly, the level of trust Singaporeans had for their government was relatively high and support for the party in office was strong. Secondly, most Singaporeans have a strong belief in the government institutions that are able to deliver public services, based on the track record." (Director, Ministry of Health Singapore)

The past experience of SARS reminded Taiwan’s CDC of the importance of implementing a nation-wide health intervention in epidemics. To achieve this end, my research indicates the CDC collaborated with a wide range of key individuals from various organizations to consolidate different information links.

"SARS provided us a chance to revisit the existing surveillance systems, and generate an accumulation of new information for actionable plans." (Director, Epidemic Intelligence Centre, Centers for Disease Control, Taiwan)

Second, having a prehistory of fighting SARS became a linking mechanism across sectors. The common memories of the painful experience had been ingrained in the whole community, which formed the shared understanding when Taiwan’s CDC and Singapore’s MOH facilitated its links with other sectors. Sharing the same memory has become the foundation of shared understanding on various fronts. Many interviewees indicated the lessons drawn from fighting SARS created common memories of the bitter suffering in the entire community. The common memories have formed the backdrop of organizational and regulatory reforms following SARS.

"The memory in fighting SARS had been deeply ingrained in the whole Taiwanese society, so much so that from leaders to the general public, everyone felt it important to work together against disease outbreaks. At the same time, the health institutions fully recognized the importance of implementing infection control measures and policy guidelines.” (Former Deputy Health Minister, Taiwan)

"Because everyone went through the same health crisis, they knew how severe an impact an epidemic could cause, and the worst scenario that could threaten the economy,
and endanger our national survival.” (Senior consultant, Ministry of Communication and Information, Singapore)

Third, having an imaginary enemy – H5N1avian flu – set up a precautious motif following the SARS epidemic. Since 2003, the H5N1 virus has spread from Southeast Asia to the rest of the world. The threat of the next influenza pandemic has been constantly haunted in the international community. Human cases of H5N1 were reported from time to time.

"…because the perception that deadly bird flu [H5N1] pandemics might attack has prevailed in the years following SARS, though everyone knew it was likely an exaggerated conjecture, more or less each country felt the pressure [of the next pandemic].” (Former Health Minister, Taiwan)

Having a hypothetical enemy indeed helped enhance the level of pandemic awareness at all levels. For example, Taiwan’s CDC was able to embark on a free influenza immunization program aiming to increase the coverage rate to 80% for those above the age of 65. There had been an increase in immunization of the elderly from 68.4% in 2003 to 91.3% in 2009. This was an important step in fighting H1N1 as the vulnerable were used to get vaccinated for influenza.

Key information channel

Information channels can either take the form of earlier formal agreement or they can also be established via personal connections. The channels provide the means for each partner to examine information and decide how future action will be affected. Through existing or created channels, information on resources and needs of each partner is shared and better aligned. By sharing information, organizations can further respond quickly to uncertainties based on the mutual trust – a shared belief that the partners will carry out their part of the joint agreement.

However, information channels are not limited to formal ways because disease control and prevention is a task in a high demand of timely information. As Peterson and Besserman’s survey (2010) pointed out, emergency expert practitioners gained substantial and useful information by creating and maintaining informal information links. In practice, disease control measures should stay agile so that disease outbreaks can be better coped with at any time. To achieve agility, it is imperative for health authorities to develop key information channels in epidemic management, actively collect domestic and international disease information and stay alert at all times in the hope that disease outbreaks can be properly handled.

In the case of Taiwan, the health authority joined in the operation of the IHRs system under WHO’s Global Outbreak Alert and Response Network on 13 January 2009. Being a responsible agent for the operation of the IHR, the health authority was able to establish a unified information link with international organizations and ensured that public health emergencies were reported and responded to as quickly as possible. The Focal Point enabled Taiwan CDC to receive a direct alert and notification from the WHO and to timely access critical information on public health incidents on the Event Information Site established by the WHO. One informant from the local health authority commented on the importance of obtaining the key information,
During the H1N1 battle we were able to obtain latest epidemic data from IHR network, developing responding strategies and action plans. The battle proceeded almost as planned in advance. (Department Director, Kaohsiung City Government, Taiwan)

In the case of Singapore, informal key information channels helped the MOH obtain critical information that its external surveillance system failed to provide an early warning at the beginning of H1N1 outbreak. Indeed, it was through private partnership with health professionals – an informal global network – that MOH was able to obtain valuable information on H1N1.

One of Singapore MOH’s notable innovations was the establishment of an Infectious Disease Alert and Clinical Database system to integrate critical clinical, laboratory and contact-tracing information with a new information technology infrastructure developed to support the surveillance and management of emerging infectious disease information. Such interdepartmental information exchange platform was supported by modern cutting-edge information communication technology on the disease control frontlines. This platform was an information framework consisting of prior existing systems and newly added systems.

The platform was a multi-level communication interface where multiple parties and stakeholders could report, update, retrieve and convey timely and relevant disease information on a common channel in an open fashion. (Director, Communicable Disease Division, Ministry of Health, Singapore)

Discussion

My research on comparative analysis of agility development amid uncertainties has provided implications for both theory and practice of agility. The implications can be illustrated in three fold.

(1) Demands of knowledge and expertise in agility vary according to different control measures. Due to the different nature of disease behaviours, the task of disease control and prevention requires cutting edge evidence based on scientific methods for its routine and crisis services. This is one particular organizational feature of the CDC and the nature of services provided. As the CDC is a knowledge-driven public organization that deals with both routine and non-routine services, the huge gap between routine and crisis periods might be explained by the extent resources that are required to deal with public health crises.

(2) Governance structure shall be deliberately designed and instituted. In the face of public health crisis, forming a policy of control countermeasures is never easy given time pressure and changing information. Therefore, it is imperative to establish a clear but flexible governance structure that can be swiftly adapted to changing circumstances. Among other things, the flexibility of the governance structure facilitates the building of trust between the state and its people. This in turn ensures that government measures are quickly accepted by the general public.

(3) Formal procedures have a contradictory influence on agility. However, establishing formalized procedures can also be done in an informal way by which each
partner operates across organizational boundaries, including compatible standards and data systems, and communicates frequently to address such matters as cultural differences. In order to deal with changing conditions, informality allows flexibility and adaptability for organizations to remain open in the midst of major changes, such as changes in major goals and members. The flexibility and adaptability allows organizations to be loosely coupled and more efficient in certain situations than more tightly structured organizations.

For public health authorities to fight epidemics, the flexibility to work with other sectors remains a core capacity to achieve agility. This is because no matter how perfect pandemic preparedness plans are, variations between the plans and subsequent implementation will occur. This does not mean that plans must be obeyed absolutely. Instead, plans need revisions and should be updated according to contingencies at the implementation stage. This could not be overemphasized in influenza pandemics – a complicated biosocial context full of unexpectedness and uncertainty. This is obvious at an epidemic outbreak when public health authorities are expected by the general public to flexibly work with other formal/informal organizations. The resulting formal and informal interactions thus have a greater potential to increase effectiveness of agility at less cost than authority-based structural changes arrived at through a formal reorganization.

Hence, the health authority needs to review current procedures, laws and regulations related to infection countermeasures, including emergency health control measures, accreditation, qualification, training, certification, surveillance, isolation and punitive measures, and, at the same time, develop procedures for implementing standardized, coordinated monitoring and evaluation of healthcare facility infection control. This is in line with the concepts of fighting infectious diseases which need to be integrated in the laws and regulations concerning disease control.

**Putting it together – principles for an agile organization**

From the comparative case study, this paper points to a number of factors conducive to the development of organizational agility. I come up with four determinants (prerequisites) that are most relevant to developing agility in the course of public health crisis.

**Leadership.** Committed leadership overcomes many barriers to working across agency boundaries effectively. In response to crises, leaders’ perception with diffused nature and divergent conceptions in agility creates the need of legitimacy and power to solve the policy problem. Legitimacy and power are critical determinants at the inception of agility, especially at the cross border level. Legitimacy deficits, in part, explain why some well-designed preparedness policy fails to solve right policy problems.

There are two important common factors that determine how agility is configured and perceived among leaders. The first one is the relevant prior knowledge and skills of the leader regarding the issue. This includes the extent to which the leader understands the situation, the issue and the organization he/she leads. Indeed, the organizational leaders have personal orientation to the problem that are shaped by their knowledge, ideology, training, political commitment and experience. The other factor is the institutional context following the change compared to earlier decisions. This, on the other hand, is more about the external factors that involve societal and bureaucratic interests,
the historical and international context within which the problem has emerged. The change in context forces decision makers to address the reactive changes and make the planned changes (Brinkerhoff & Crosby, 2002; Woll, 2007).

Realizing the perception is basically composed of knowledge of leaders and institutional context within which they can exercise the legitimacy to make decisions. That is because leaders are greatly influenced by the nature of their relationships with, and the roles played by, their constituencies in the political process. Leaders may have more confidence in leveraging the trade-off among various policy alternatives that lead to changes from status quo. Ultimately, it is essential to critically understand why and how perception of leaders is important in the discourse of policy making. My study also revealed public health leaders redefined the way the general public views outbreak control.

Once crisis is clearly defined and situated, it becomes ‘instrumental’ in the decision-making and yields a drastic course of action. The contextual change also gives decision makers a legitimized authority to increase the scope of responsibility and the span of control in crisis (Brinkerhoff & Crosby, 2002; Lai, 2010; Lai, He, Tan, & Phua, 2009). Those who favour the adoption of particular contextual change often strive to establish a sense of urgency in order to enhance the agility that significant action will be taken.

Knowledge and expertise. Literature shows that it requires context-specific knowledge and certain type of expertise to exert on agility amid uncertainties (Berliner, 1994; Crossan, 1998). Expertise is defined as domain-relevant and task-related skills (Faraj & Sproull, 2000). Knowledge and expertise focus more on the capability development in the response organizations to be able to break the routines. Such determinant ensures that the interventions essential to developing agility have the necessary skills and support. Amid crisis situations, the quest for knowledge is more telling in informational networks where partnering organizations come together exclusively to exchange program updates and solutions, resource exchange and knowledge sharing, while action networks focus more on resource sharing for service delivery (Brass, Galaskiewicz, Greve, & Tsai, 2004; Kettl, 2003). Since transmission of infectious disease respects no geographical and political borders, knowledge and expertise of disease control is expected to be regularly and timely updated.

Interdependence. The organizational agility is characterized by high levels of interdependence involving multiple organizations engaged in delivering services based on implicit relationship and open-ended contracts. For instance, there are key ministries involved in the taskforce for pandemic control. Being an agile organization means one has to rely on the purposeful interaction with another to achieve mutual goals. The implicit and open-ended relations have two features that enable agility to thrive. On one hand, formal lines of authority are blurred and diverse policy actors are knitted together to focus on common problems (Schneider, Scholz, Lubell, Mindruta, & Edwardsen, 2003, p. 143). On the other hand, interdependence allows flexibility and adaptability, which helps organizations adapt to environmental contingencies and be better posited to coordinate and safeguard exchanges (O’Toole & Meier, 2004). As a result, the resulting formal and informal interactions have the potential to increase response effectiveness at less cost than authority-based structural changes arrived at through formal reorganization (Schneider et al., 2003, p. 143).

Interdependence also facilitates collaboration. In crisis, the appropriateness of complex operations hinges on whether the response organization can achieve collaborative
Collaborative efforts enable response organizations to facilitate the information exchange and resources pooling and make contributions to each new circumstance quickly and effectively (Agranoff and McGuire, 2003; Bardach, 1998; O'Toole, 1997; Simo & Bies, 2007).

As the landscape of public administration is shifting from hierarchical control to networked collaboration, agility becomes critical for organizations in explaining and solving the problems of coordinating and adapting exchanges by using social mechanisms rather than authority, bureaucratic rules, standardization or legal recourses. Therefore, interdependence explains the organizational behaviour of connections and information flows among public organizations existing in highly turbulent environments. Moreover, interdependence closely links itself to the next prerequisite of agility – shared understanding.

**Shared understanding.** Shared understanding emphasizes the interpersonal and relational elements in the configuration of response process. Elements in the shared understanding are sometimes referred to as social capital (Colman, 1988; Putnam, 2000) or organizational culture (Greenberg, 1999). Once initiated, shared understanding reinforces or accelerates the adaptive process. Perceiving agility as self-interest, the first self-reinforcing element in shared understanding, serves as an internal incentive for collaborative action (Emerson, Nabatchi, & Balogh, 2012).

Common goals lead us to look at a shared mentality at the early stage of the adaptive process. It means each shares the same goal, with clearly agreed upon mission, objective and strategy. Common goals may exist at the outset of adaptation; or the organizations may develop a shared vision as they move along together. However, having a goal in common is no easy task. It is because organizations and managers in charge always have their own particular goals, values and interests on the agenda. It is important to communicate these differences to enable cohesive processes and to create a shared vision required to enhance and sustain the effectiveness of agility.

**Conclusion**

Organizational agility is dynamic as organizations evolve and adapt to the changing environment. Moreover, it matters as organizational performance usually go beyond single-shot implementation efforts or a single-minded focus on either the vertical dimension of program or the horizontal component. Agility is not developed overnight. In the real world, not every organization is equally capable of being agile amid uncertainties.

This paper indicates that demands of agility are subject to different activities as the nature of a crisis event differs. This research argues that each determinant of agility contributes to a different extent depending on the nature of communicable disease. Each determinant plays out differently for diseases with an unknown nature, such as SARS, from diseases that are better known, such as H1N1. The contextual change gives decision makers a legitimized authority to increase the scope of responsibility and the span of control in crisis. Those who favour the adoption of particular contextual change often strive to establish a sense of urgency in order to enhance agility that significant action will ensue.
The H1N1 event has clearly shown that a major factor that affects effective organizational agility against the outbreak relates to the high level of uncertainty surrounding the disease. The uncertainty in a crisis event is conducive to greater organizational agility to develop as a larger variety of network players are brought together in the collaborative network setting, for example Taiwan’s CECC or Singapore’s HCMC in the fight of H1N1. Since every stakeholder interpreted the epidemic in his/her own way, the mismatch between expectations and outcomes accrued. The lead public health organizations have to identify the mismatch and corrected it to achieve the common goal.

To conclude, this research indicates that a leader’s perception of agility, a good command of critical information through governance structure and key information channel, active communication with target groups and prehistory are the prerequisites for global policy implementation in extreme events. While procedural issues, such as legal framework, are critical for positive reinforcement, our evidence indicates that it is more important from the start for the building of mutual trust and confidence in the working relations if a leader feels it necessary to operate beyond routines and communicates key information of the nature of events actively with stakeholders. Given the conditions of urgent stress, high demand and tight time constraints across multiple jurisdictions, such prerequisites enhanced the agility of lead public health organizations in an emergent multilateral network.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Dr. Allen Lai is now the senior vice president of ACT Genomics, strategizing corporate development, planning and execution of cancer genomics clinical & research projects in Southeast Asia. He holds several high key profile roles as Advisor Board of ISPOR Asia Consortium, and concurrently Senior Consultant, Ministry of Health and Social Welfare, Taiwan. He received his Ph.D. and MPA, from Lee Kuan Yew School of Public Policy, National University of Singapore, M.Sc. (Preventive Medicine) from National Taiwan University and M.D. from Chung Shan Medical Dental University, Taiwan. He was the principal consultant at IMS Health Asia, and the director of Institute of Health Economics & Management and the academic director of MSc Management of Health Industries in ESSEC Business School. He has authored more than 40 articles in peer-reviewed journals.

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