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Dysfunction of governmental emergency management system for natural disaster: a case study of Taiwan Xiaolin village

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Taiwan's disaster management system failed to demonstrate its effectiveness of emergency response during a tragedy after Typhoon Morakot, a tropical cyclone, hit Taiwan. A mudslide buried the mountain village Xiaolin, killing 491 residents on 9 August 2009. In this incident, the system responded slowly. Rescue crews were unable to reach the wreckage in time. This in-depth case study explores the sources of the dysfunction and the challenges facing the emergency system by tracing the development of the disaster management system and by investigating the constraints on individuals imposed by the bureaucratic logic embedded in the existing political system. The findings indicate that although the system is designed as a temporary organization mobilized upon disastrous situations, it is controlled and commanded by an existing governmental system, which has been long institutionalized by a bureaucratic logic of centralized control and procedural compliance. This entrenched political system requires individuals to comply with the law, plans and even detail guidelines. At the same time, the centralized authority built into the system (with an aim of increasing the efficiency of control) unintentionally discourages empowerment and responsive actions. Finally, this study provides suggestions for improvements of the system.

Keywords: Emergency system, natural disaster, Typhoon Morakot, Xiaolin village.

Introduction

The Taiwan government has attempted to develop its disaster management system based on models from some advanced nations, particularly the USA. In 2009, when Typhoon Morakot hit Taiwan, a mudslide buried Xiaolin village in the mountain, killing 491 residents on 9 August. Such heavy casualties severely tested the system, and its delayed response in this incident roused overwhelming frustration, confusion and questions about what went wrong. This paper analyses the development of the Taiwan disaster management system over a longer period and its handling of the Xiaolin incident through the lens of organization theory. By doing so, the paper moves beyond incident analysis without examining individual agencies' responsibilities and actions. Instead, it addresses multi-actor interactions in the system and sheds light on more fundamental sources of the system's dysfunction.

The government plays a dominant and crucial role in emergency management because of its capacity and legitimacy to mobilize and allocate a great amount of resources as well as its responsibility of securing social functions. These characteristics make the government's central role irreplaceable in disaster scenarios, in particular under a centralized political system. Nevertheless, disaster management coordination in a bureaucratic organization (e.g. the government) is an enduring problem (Britton, 2007; Morris *et al.*, 2007).

Bureaucratic organizations are designed to ensure functional rationality and administrative efficiency with well-defined divisions of labour, specialized training and impersonal rules (Weber, 1968). The clear hierarchical chains of command, authority structure and role definitions provide the bureaucratic

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organization with a high level of reliability and stability. In Max Weber's ideal type of bureaucracy, organizational members are able to exercise greater discretion by following rationally stipulated principles and rules and thus become more independent to their superiors (Scott and Davis, 2007).

Institutionalists have found inextricable interdependence between the formal-regulative structure (e.g. procedure and authority hierarchy) and the informal-normative cultural operation in organizations (Scott, 2008). Some scholars have long recognized that the formal bureaucratic structure which relies on a regulatory system to produce and maintain a high level of discipline and reliability generates unintended consequences that impede responsiveness. First, decision-making power is centralized at the top of the hierarchy without much influence from members of the lower levels where production takes place (Lipset, 1962). This means that these members, with the experience and knowledge accumulated from practice, are placed far from decision-makers in the hierarchy. Without this experience and knowledge, decision-makers are less able to ensure the quality and feasibility of their decisions (Eisenhardt, 1993). Second, increasing numbers of categories, rules and divisions hinder members from seeing the overall goals and structures (Lipset, 1962), which normally leads to sub-goal formation and resource/function overlapping. Third, compliance to rules gradually replaces the purpose and outcome of actions as the focus of daily work. This 'displacement of goals' (March and Simon, 1971, p. 32) or unthinking compliance causes rigidity. Over time, the original meanings, purposes and knowledge foundations of rules get lost and members become unaware whether these rules remain adequate for present situations. Additionally, the rules and principles gradually become collective rationality that is difficult for a single individual to challenge or revise without painstaking studies and convincing proof. Fourth, elaborated rules unintentionally hint a 'minimum acceptable behaviour' which suppresses organization performance (March and Simon, 1971, p. 39). In a nutshell, the design of bureaucratic organization, including divisions of labour and rules, works best for handling routine and predictable tasks (Perrow, 1986) and for coordinating pooled tasks with the least interdependence (Thompson, 1967).

But it requires certain mechanisms or factors in dealing with emergency situations. Where the level of uncertainty and interdependence is high, tasks are rarely stable and predictable, and rapid and immediate response is required. In coping with natural disasters, responsiveness normally requires decentralization because individuals near the scene can respond and take actions in a short time (Mcconnell, 2008). It is crucial for an emergency organization to possess the capacity to rapidly coordinate resources, both human and material, allocated in different public and private organizations and communities (Thompson, 1967). Three components are essential for the successful coordination of these highly interdependent tasks: (1) information regarding the resources available, (2) information about the resources that are needed (Walter, 2005) and (3) authority to mobilize the available resources. Ideally, decision makers should be located on the meeting point of these three components in order to make timely, high-quality decisions. Moreover, recent studies on disaster management suggest that partnership and network coordination characterized by relational ties, shared understanding and trust can provide effectiveness and efficiency (Mitchell, 2006; Morris *et al.*, 2007). Note that the design and implementation of the disaster management system cannot be simplified as an issue of balancing bureaucratic and network coordination or formal and temporary organizations. More importantly, supportive social norms and cultures have to be taken into account in order to address the building of relational ties, shared understanding and trust.

The disaster management system is a social system that cannot be examined separately from its social context (Perry, 2007). Its development in a nation is a function of national experience and definition of disasters as well as social expectations and perceptions of appropriate arrangement of disaster operations (Britton, 2007). Although up-to-date, cross-national comparative studies on disaster management system are only a few, they have found salient national differences and questioned whether there is a 'best model' that fits all nations' circumstances (May *et al.*, 1996; Britton, 2007). In fact, empirical studies observe that the reliable and responsive coordination is built on social normative-cultural institutions including daily routines, experience, shared understandings and historically rooted culture that permit appropriate improvisation and innovation (Bigley and Roberts, 2001; Morris *et al.*, 2007). This indicates that, for timely actions and coherent responses to occur, the disaster management system needs to be aligned with local social normative-cultural systems guiding people's daily routines and expectations.

This line of studies points out the importance of normative-cultural elements supporting cooperative relations in the disaster management and coordination and promotes the use of longer perspective in examining a nation's disaster management system. With such a viewpoint, this paper search for the source of the failed response to the Xiaolin incident with an emphasis on the alignment of imported model, mainly based on American Incident Command System (ICS), with an existing culture and governmental system.

The next section describes the research method we employed and the case study we conducted, including field investigations, interviews with government officials and reviews of secondary documents. We then present our findings, describing Taiwan's emergency management system and depicting the logic of its operation. This is followed by a discussion and conclusion in which we suggest improvements for the system.

Research method

We believe the case study method is the most appropriate for the current study. This is because first this method is suitable to explore the dynamics of a human system in a designated context (Eisenhardt, 1989; Pinsonneault and Kraemer, 1993), especially for investigating the phenomenon 'within its real-life context' when 'the boundaries between phenomenon and context are not clearly evident' (Yin, 2003, p. 13). In this case, we will explore the Taiwanese emergency management system functioning within the context of Typhoon Morakot. In addition, this method is helpful in explaining the results of data analysis, discovering the relation and the connection between variables and enriching the illustration of the context that sets the stage for the observed phenomenon. Most importantly, it allows the investigators to examine the mechanism and processes that give rise to the outcomes observed. It also helps to address the important questions of how certain effects occurred, supplementing information relating to what factors were involved in their occurrence.

We collected data from three main sources: field investigations, open-ended interviews and secondary archival data. To understand the operational difficulties of rescue actions, the first author along with two research assistants visited the incident site at the Xiaolin village twice after the incident, investigated its geographic and geological conditions and reviewed videos and technical reports of the incident produced by domestic and international experts. Open-ended interviews were conducted in the following month with a total 11 governmental officials (consisting of seven in the central, two in the regional and two in the local governments) who were directly involved in the rescue actions at Xiaolin village. The interviews, which lasted between 20 and 90 min, began with the question: 'What was the most challenging issue for you during the emergency of Xiaolin incident?' In addition, we asked questions about the informants' duties including their experience, interactions with others, responsibilities, and ways of tackling challenges. We secondly reviewed a number of published archival documents including documents referring to regulations of emergency and disaster management, official rescue reports of Typhoon Morakot, prior studies on the Taiwan emergency system, technical papers from professionals, news articles and villagers' recounts of the incident available on the website.

We then transcribed the interview recording and notes, which were subsequently distributed to our research group. Discussion sessions were held to compare these materials and question meanings of interviewees' responses (Corbin and Strauss, 2008). We compiled the collected archival materials to reconstruct the government's actions in the incident, which were further placed in the context of changing weather conditions. We then cross-examined these two categories of data and compared multiple viewpoints (from governmental officials, professionals, media and villagers) in order to improve validity. Moreover, we traced the origin of the emergency system in the 1960s and its evolution to capture the principles and logic behind the government's design of the emergency system. By adopting the long-term perspective, we were able to uncover less explicit mechanisms hindering the system's effectiveness and efficiency.

The emergency system for natural disaster management in Taiwan

The Taiwan government plays a rather passive but dominant role in developing the Taiwan's emergency system as responses to the impacts and consequences of earlier devastating disasters that led to social instability and economic crisis. The simple form of the system was initially founded around the 1960s only after two catastrophic disasters. The first one was an unprecedented flood that swamped Taiwan on 7 August 1959, killing more than 1000 people and destroying more than 45,000 buildings (Teng *et al.*, 2006). The second was an earthquake that struck Taiwan on 18 January 1964, collapsing over 27,000 buildings and killing 106 people in the process (Wang *et al.*, 2009). Later, in 1994, inspired by the Federal Emergency Management Agency's experience on the Northridge Earthquake, the Taiwan government promulgated the National Hazard Mitigation Program aiming to enhance standard plans, documentation and procedures to mitigate disasters. Although the government intended to further regularize and formalize the Taiwanese disaster management system, the first fundamental law regulating disaster management—the Disaster Prevention and Response Act (DPRA)—was not promulgated until 2000 right after a catastrophic earthquake in 1999 (Chen *et al.*, 2006). The DPRA finally addresses all phases (mitigation, preparedness, response and recovery) in the disaster management cycle with a more integrated perspective. Inspired by American emergency system

(i.e. Emergency Support Functions and the ICS), the essence of the DPRA is an all-hazard approach employing a management system to organize all the people and resources of three governmental levels: central, regional (i.e. County) and local (i.e. Township).

Organization structure

Interestingly, Taiwan initially adopted a decentralized approach in disaster operations under its centralized, authoritarian political system from 1965 to 1993. The local government and police department were in charge of the execution of disaster operations with a temporarily assembled taskforce (Chen, 2005). But it became clear that these local agencies lacked necessary capacity and expertise so that setting a specialized organization was frequently mentioned in many circumstances. As a result, in 1994, the central government established the National Fire Agency under the Ministry of Interior to carry out disaster operations. However, the same issue remained. This agency lacked adequate authority to mobilize and coordinate all levels of government. All the decisions deferred to the higher levels of government hierarchy for approval overwhelmed the operation and delayed the response. Consequently, after 2000, fortified by the DPRA, the central government pushed a top-down reform of its emergency management system by creating the National Disaster Prevention and Protection Commission to coordinate across multi-ministries and agencies in the government hierarchy.

The organizational structure of the emergency system is layered and complex, mirroring the governmental hierarchy. Figure 1 shows a simplified idea of the system. Under the Disaster Prevention & Response Council (DPRC) of the central government (chaired by the Premier of the Cabinet, Executive Yuan), a specific agency, the Disaster Prevention & Response Committees (DPRCM, chaired by the Vice Premier), is in charge of overseeing and implementing the overall disaster management policies and plans. Under DPRCM, two agencies, the National Science and Technology Center for Disaster Reduction and the National Disaster Prevention and Protection Experts Advisory Committee, are involved as technical advisors on disaster prevention and reduction affairs. In addition, the DPRC directs a DPR Office which has a similar function to that of the DPRCM. After the Morakot event, the DPRCM was merged into the DPR Office to eliminate the multiple chains of command.

Operation

Ideally, the Taiwanese disaster management system should work as follows. At each level, the disaster

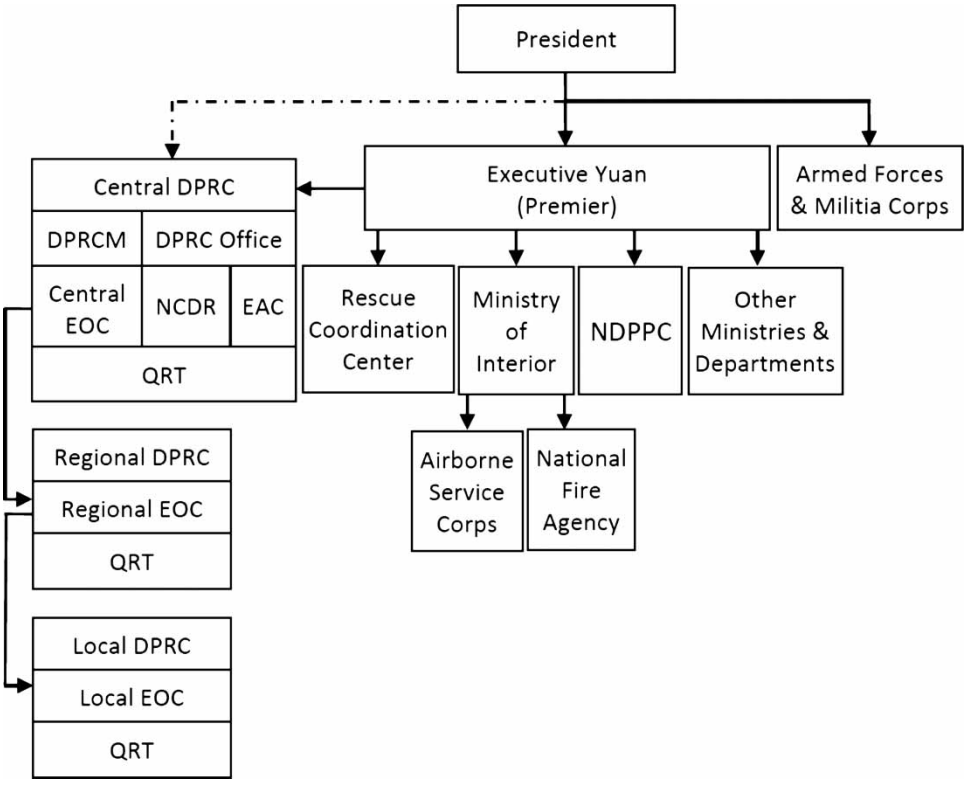

Figure 1 The Taiwan emergency system for natural disaster management

management is under the supervision of a DPRC staffed by officials from formal government agencies, each with a specified jurisdiction. Once a disaster occurs, each level of the DPRC would quickly form its own disaster Emergency Operation Center (EOC) to command all the actions taken by its quick-response team. In practice, however, the central government plays a unique role and takes the greatest responsibility to most aspects of disaster management from policy-making, planning till execution. In addition, the Taiwanese armed forces and militia corps, groups that are able to offer extensive emergency response resources, are linked up to this system beyond the authority of DPRC/EOC. Two more agencies, the National Rescue Coordination Center and the National Airborne Service Corps, which are in charge of all rescuing matters (and form a central part of quick-response actions during disasters) are not under the command of the central DPRC/EOC either. Since the Taiwan government is historically characterized by its authoritarian and centralized approaches (Whitley, 1999), this decoupling between theory and practice shows that governmental disaster operations is largely guided by the political culture (e.g. authority hierarchy, intergovernmental relations (coercive versus cooperative) and power distance) in which it is embedded (Waugh and Streib, 2006). Consequently, the social aspects of the system, specifically the communication and coordination of different organizations and individuals, are increasingly complicated when the scale of disaster increases.

Disaster management planning

This system operating under plans, guidelines and standards stipulated by agencies at different levels reflects a salient top-down control principle.

For hazard mitigation and reducing disaster losses, the DPRA classifies the operation of the emergency system into four main disaster issues (i.e. mitigation, preparation, response and recovery). For the implementation of operational policies, it further requires governmental agencies to draw upon three statutory disaster management plans: The Disaster Prevention and Response Basic Plan (DPRBP), the Disaster Prevention and Response Operational Plans (DPROPs), and the Local Disaster Prevention and Response Plans (LDPRPs). At the central government level, the DPRBP and the detailed DPROPs are drawn up by the DPRCM and by some ministries with government-owned utility companies, respectively. At local government level, LDPRPs are developed for different jurisdictional regions. These plans are prepared based on the hazard vulnerability with respect to environmental, social and economic conditions. All LDPRPs are comprehensive plans in accordance with the DPROBP and DPROPs of the central government, and they are subjected to be reviewed and revised every three to five years to reflect the according changes.

With the guidance of these disaster management plans, all the members of the DPRCs at the central and the local government level clarify the details of operating procedures and special actions that need to be undertaken in different disaster scenarios by developing supporting ordinances, regulations, guidelines and standard operating procedures, which the system's operation should follow. And all these efforts aim to codify disaster scenarios into predictable tasks that can be best handled by this bureaucratic system (Perrow, 1986) so as to ensure its reliability and efficiency (Weber, 1968).

Tragedy of Xiaolin village

Typhoon Morakot struck Taiwan on the night of Friday, 7 August 2009. This tropical storm brought in heavy downpours with sustained winds of 150 km h (92 mph or 85 knots). It dumped copious amounts of rainfall (peaking at over 2400 mm or 95.1 in. in three days), resulting in the worst flood in Taiwan in 50 years (Figure 2). The rain also triggered devastating mudflows resulting in toppled buildings, broken roads and landslides among many other ravages. It led to 619 fatalities and damages amounting to roughly NT $110 billion (US$3.3 billion) loss (Central Emergency Operation Center, 2009).

Typhoon Morakot created the worst damage on Xiaolin village, which was entirely buried by a mudslide that flattened over 393 houses, leaving only 44 survivors. Satellite images (Figure 3) indicate that nearly 100 ha of mountain with about 23 million cubic metres of earth collapsed and immersed the whole village in the debris.

Xiaolin village is part of Jiaxian Township in Kaohsiung County. It was an agricultural village nestled in the mountains and situated on the east bank of the Nanzixian River. The close passing highway connected it to the outside world. In Taiwan, a village is an administrative division subordinating to the jurisdiction of Township and County. According to the DPRA, the EOC of Jiaxian Township (local government level) was supposed to promptly report the serious situation of Xiaolin village. The EOC of Kaohsiung County (regional government) should not only have transferred the information to the central EOC, but they should have taken immediate actions. However, our investigation and interviews with officials (including the Mayor of Jiaxian Township) indicate that all these EOCs (from the local to the central level) were entirely

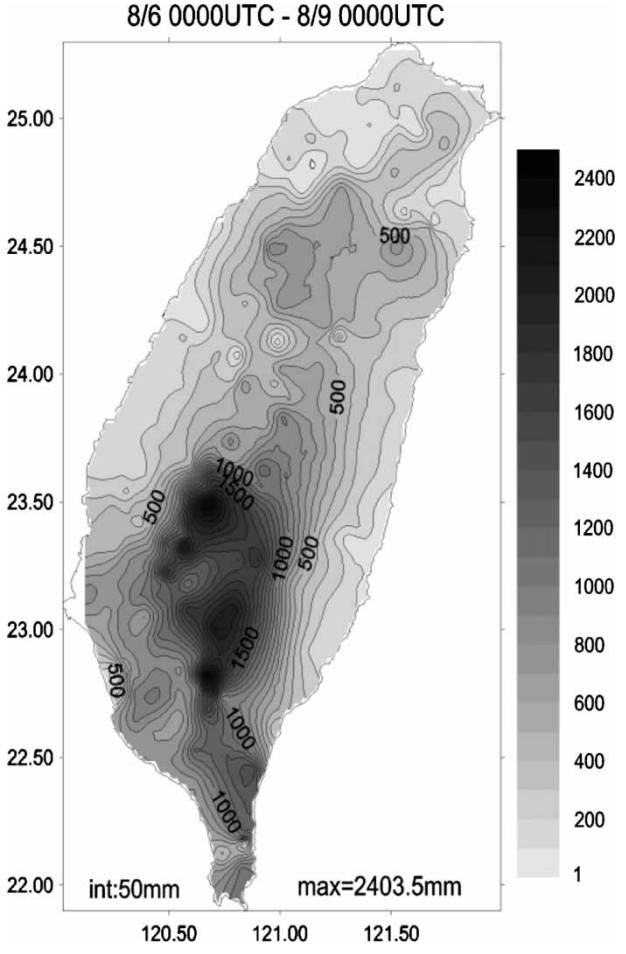

Figure 2 Accumulated precipitation from 6 to 9 August 2009 (Source: Tao *et al.*, 2009, Figure 2, p. 2)

unaware of this disastrous situation. Members of these EOCs were occupied with other ongoing matters and ignored crucial messages, such as a local TV news report indicating the possibility of casualties.

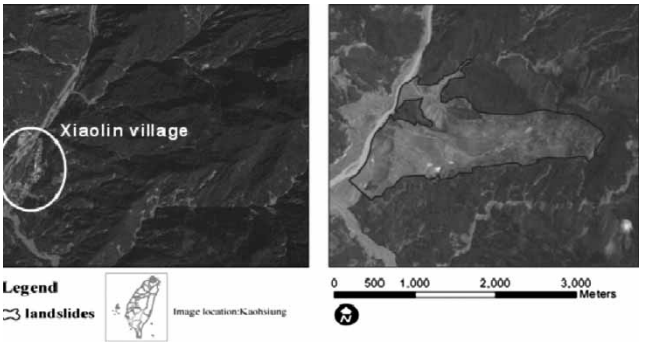

Figure 3 Satellite images of Xiaolin village before (left) and after (right) the mudslide (Source: Lin *et al.*, 2010, Figure 2 (a), p. 13512)

This incident, occurring at 6.00am on 9 August, did not receive any immediate response. It took nearly 26 h before the system successfully launched its first action and rescued the trapped survivors on the second day (on 7.56am, 10 August). A note at 6.00am, 10 August, on the #12-1 Disaster Response Report of the central EOC, reporting a request for helicopter services to escort 44 trapped villagers, was the first record regarding this incident. According to the consecutively issued Disaster Response Reports and the statements given publicly by the Vice Director General of the National Fire Agency, it was not until the first trapped villager was rescued out from the site on 9.45am, 10 August (i.e. nearly 28 h later) that none was aware of the seriousness of the situation. These reports indicate that fully mobilized emergency services were only delivered on the third day (11 August).

Breakdown of information flow and coordination

The appalling failure of the emergency system in Xiaolin village disaster can be explained by the fragmented flow of information (or lack thereof) during the crucial hours following the disaster. We already noted that the Taiwanese emergency response system is highly centralized, and most of the commands for actions are top-down from the central DPRC/DPRCM/EOC. During disasters, officials working in the system tend to follow the rules and norms in their bureaucratic agencies. All the information for decision-making must be carefully examined and confirmed before being sent on to decision-makers. Accordingly, the demand/request must be issued with comparable authority and documented for the record. The process of scrutinizing details can leave out crucial messages and thus hold down the communication and coordination for quick decision-making. In addition, the complex three-layer hierarchy further impedes the information flow. Most of our informants mentioned the problem of confirmation and a senior official of the central EOC explained their ineffective response to the Xiaolin incident on 9 August: 'there was no assured information on the mudslide and there was no confirmed request for rescuing'. Responding to this, the Mayor of Jiaxian Township (the commander of the local EOC responsible for Xiaolin village) explained his failing to promptly provide updates on the unfolding event:

> Xiaolin was 10 km away from our EOC, and we had no access to the site during the storm … I did ask one staff to check the situation of Xiaolin Village about 9 o'clock in that morning 8/9, since we lost contact with

villagers the night before. But he returned in vain and reported that all the roads and trails were washed away.

His chief staff recalled in a separate interview: 'The first information of the incident was a text message sent to a local councilor by one trapped survivor using a cell phone'. This message failed to draw any attention from the emergency system; the media did, however, respond. A TV interview was soon held in a nearby area with a villager who was stuck on his way home and had lost contact with his family at Xiaolin. He urged the government to check the situation. This interview was broadcasted nationwide on the 7 o'clock evening news (about 13 h later) but still did not draw attention from the emergency system. In fact, in another interview, a senior official of National Fire Agency confirmed that his agency received a request of a helicopter to be sent to Xiaolin from the Fire Department of Kaohsiung County (the regional government supervising Jiaxian Township) about 4 h after the incident. But they did not consider this request high priority because there was no clear instruction regarding the seriousness of the situation from the higher echelon. Consequently, the response action dragged for nearly 24 h and the bad weather was used as the reason in public statements. Figure 4 is a time line summarizing all the relevant activities mentioned by our informants and stated in official records. We have super-imposed this timeline onto the local rainfall intensity. This figure reveals that the bad weather does not seem to be a convincing reason for the governmental inaction, since the rainfall intensity dropped substantially shortly after the incident.

Once aware of casualties, the Jiaxian Mayor was eager to carry out his duty as the commander of the site. Nevertheless, his authority was usurped when his request of boarding a helicopter to collect timely information of the situation was turned down by the pilot sent to assist the rescue. The Mayor complained that, 'He [the helicopter pilot] asked me to comply with the rules and get an approval from the central government

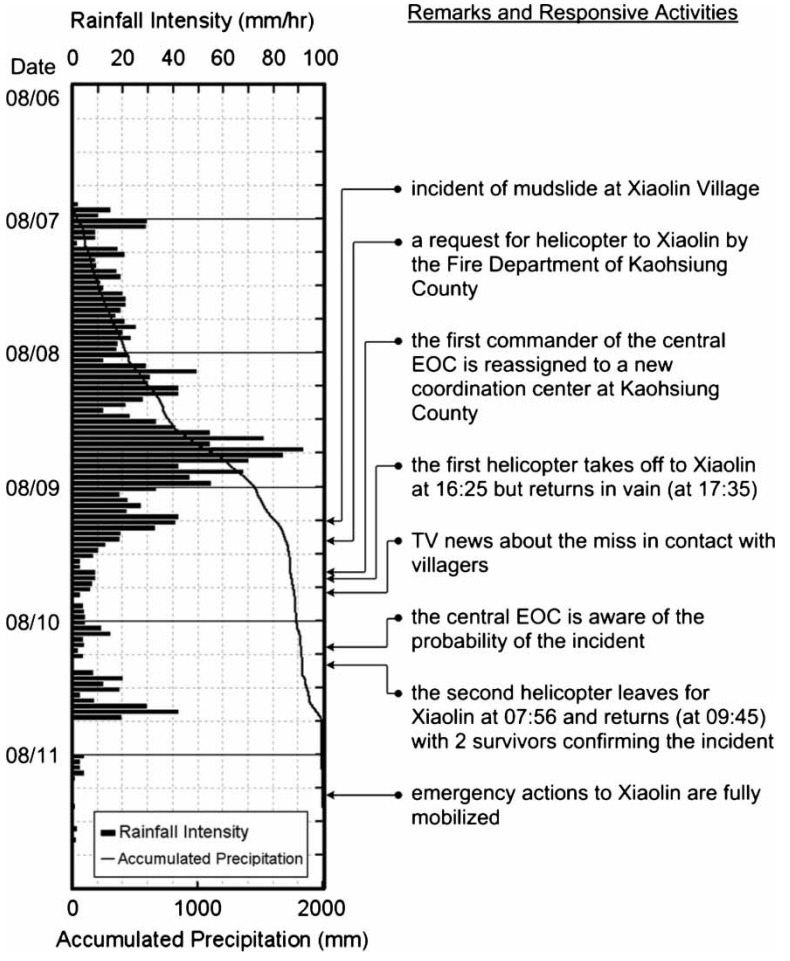

Figure 4 Time Line of Activities for Rescuing Xiaolin village

first'. Very soon, he became an outsider when the army took over control of the site.

The Mayor's lack of authority was not uncommon. Even the commander of the central EOC, who was a minister, encountered similar challenges because he had no authority to direct other ministries. As a result, the commander relied solely on his own ministry and the resources under his authority. For instance, the Minister of the Public Construction Commission (PCC) was the commander of the central EOC during the Xaiolin incident (from 8 to 13 August). Since the PCC possessed little resource (human or otherwise) suitable for conducting rescue missions, his authority was relatively useless, especially compared with the other two commanders preceding and succeeding him (the Minister of Interior and the Minister of Transportation and Communications respectively). He soon stepped down under widespread criticism of the government's sluggishness in response to this disaster.

Political consequences of failure

Although the DPRA statute authorizes the commander of the central EOC as the highest authority on response actions, this authority is challenged by both his peers and by the Premier and the President. In an interview with a senior official, we learned that the President chaired many DPRC meetings to direct response actions. The EOC commander took such intervention for granted and commended: 'this is normal in our culture'. In fact, the President's intervention reflected his concern of future blame, as his comments in a CNN interview on 16 August reveals: 'I will take full responsibility whatever the blame is. After all, I'm the President of this country'.

Facing overwhelming criticism, the President announced in public: 'I will find out if there is anything wrong with the system or with the actions. Certainly we will find out, not only to correct these mistakes, but also to punish the people who are responsible' (CNN interview, 16 August 2009). In fact, when the first author visited Xiaolin and Jiaxian one month after the incident, the Mayor was occupied with compiling a report to the Control Yuan, the highest investigatory agency, because he was impeached for his incapability and failure to fulfill his duty. He was frustrated, trying to refute all the charges. Later, his refutation was declined and accordingly punished. Within a month, the Premier, along with a number of high ranking, officials were also compelled to resign. This illustrates the serious political consequences of a 'failure' under a political culture favouring punitive approaches. It also helps to understand why officials strive to avoid admitting mistakes or disclosing actual operations in public statements.

Discussion

From the case study, it can be seen that several issues prevent the emergency system from quick decision-making and being responsive. Information of local needs is scattered at the bottom of the hierarchy, while information of resource availability is distributed among a few top governmental agencies. In addition, authority is concentrated at the top of the government hierarchy. However, these issues are not new. They are repeatedly brought up in previous diagnosis reports. The persistence of these issues after a few major organizational restructures and authority adjustments of the emergency system indicates that some underlying normative cultural factors other than organizational structure are at work. In this paper, we suggest that existing political culture and bureaucratic mentality impede the operation and performance of the temporarily enacted emergency system.

Repeated issues and organizational solutions

The emergency system is constantly criticized for its confusing chains of command, fragmented information flow and lack of authority and resources (Cheng, 2002; Shan *et al.*, 2006; Kuo, 2009). The complex system engages a wide range of governmental agencies but only a few of them possess required resources and capability for rescue actions. In addition, the activation of EOCs is initiated from the top of the government, mainly by the Cabinet and the Ministry of Interior, and therefore takes days to complete the process (Cheng, 2002). As a result, regional and local EOCs, which should provide timely responses to and acquire information of local emergency needs, are established later and removed earlier than the central EOC (Mars and Lin, 2009). This reveals the lack of delegation in the system. The officials, mostly ministers, who take commander positions are unfamiliar with the operation of the system (Kuo, 2009). In the efforts to enhance the system over the last decade, the central government specifies authority allocation and procedures in increasing details and involves increasing numbers of agencies in the system. In 2001, the emergency system involved 19 agencies, 20 in 2004, 26 in 2006 and 30 in 2010. A major structural change was adopted in 2006, when the central government implemented the principle of American ICS and creates functional units to be enacted by emergency situations (Shan *et al.*, 2006).

However, the same problems remain according to a governmental internal report reviewing the rescue actions of the Morakot disaster provided by our informants from the National Fire Agency. In a total of 11 issues regarding the system organization, 4 are related

to the lack of authority and resources, 1 the lack of information integration and quick distribution, 1 the lack of a central and unified chain of command and 3 the lack of effective coordination mechanisms between different agencies across different governmental levels. Our study suggests three major reasons: (1) the form of a temporary (synthetic) organization with a bureaucratic structure, (2) persistence of political culture and (3) the tendency of using bureaucratic control triggering the process of bureaucratization. We discuss each of them in turn.

The form of a temporary (synthetic) organization with a bureaucratic structure

Existing authority structure and bureaucratic fragmentation were duplicated in the emergency system, which constrained participants' behaviour. The emergency system was a complex system comprising many temporary taskforces that were expected to coordinate spontaneous tasks by mutual adjustment (Thompson, 1967). However, these units were loosely coupled without a unified chain of command and specific reward and sanction systems. Participants could get little praise when disaster was handled well but would be subject to severe punishment or criticism when things went wrong. Because government officials from different agencies occupied major positions such as commanders in the system, they brought in the governmental hierarchy and multiple chains of command. As a result, they delivered information and orders in a way that followed layered bureaucratic structure and thus slowed down the processing of a great influx of information. Additionally, these officials followed different rules and routines and chains of command within their jurisdictions. Their priority was to still defend the interests of their own agencies. For example, only the President and very few officials retain the authority to mobilize crucial resources such as helicopters and the military. Despite possessing information regarding resource availability, most officials (including the Minister of the PCC) had no authority to mobilize resources outside of their jurisdictions and thus were unable to command actions of a larger scale. Furthermore, the system was composed of both appointed and elected officials in the governmental hierarchy who were subject to different political incentive systems. Appointed officials normally possessed more authority in resource allocation but had no direct control power over these elected officials. On the other hand, the elected officials normally had a better understanding of local situations and needs. For instance, the Mayor could not use the helicopter sent to assist the rescue of Xiaolin to collect information of local needs. Therefore, in an emergency, interactions between these complicated political and human factors paralysed the system.

Persistence of political culture

In Taiwan, prevalent cultural orientations are high power distance and high uncertainty avoidance (Hofstede, 2005), which means conflicts with supervisors or peers tend to be handled by resorting to higher authority (Tsai and Chi, 2009). The orientations are particularly salient in the political realm where authority status is explicit and directly related to controllable resources. In addition, the Taiwan government has historically been an authoritarian system with a top-down approach to decision-making (Wu, 2005). The centralized authority allocation and power distribution is extremely durable (Pierson, 2000). In the emergency system, the top-down communication channel hindered information of local needs flowing in from the bottom. Local residents could voice their worries only through the media. But the information was still neglected by the system, which was responsible for misdiagnosis and delayed response. Moreover, officials at the top of the hierarchy often showed signs of unfamiliarity about disaster operations and overly intervened in the actions of the units at the lower level and thus lost sight of the overall emergency operation. Their decisions are often affected by public opinions and criticism of media (Kuo, 2009). This suggests that governmental officials inject political considerations into the actions and tend to focus on avoiding blame, especially in disaster situations when inadequate responses normally incur serious political consequences (Olson, 2008).

The entrenched political culture also explains why taking the form of American ICS fails to solve the issues besetting the emergency system. The ICS is a temporary organization with many characteristics of bureaucracy including specialized roles, hierarchical authority structure and extensive procedures and rules. The system is composed of nine modular components arranged as a commander leading four functional sections: planning, operations, logistics and finance/administration. Bigley and Roberts (2001) identified four processes crucial for the system's responsiveness and flexibility. First, the system is activated by emergencies and organized by assembling structure components and units according to actual situations. The organization should be filled with *only* participants necessary for handling the emergencies. Overdevelopment tends to compromise efficiency. Second, the system requires participants to immediately switch their roles whenever re-organization occurs. They may need to move into newly assigned roles or be discharged. Third, decision-making authority, particularly

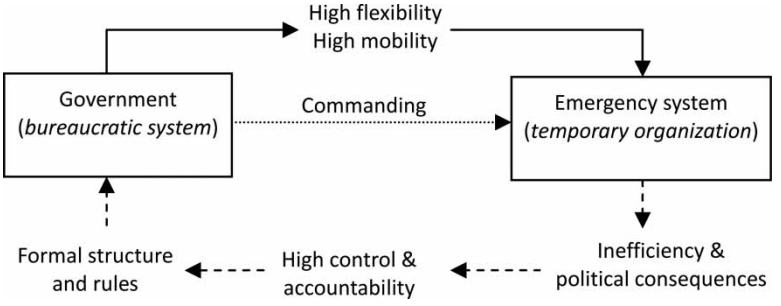

Figure 5 The pattern of bureaucratic decision-making for enhancing emergency system

at the technical level, needs to migrate among the participants who possess the expertise and capability to solve problems at hand. Fourth, the system re-assembles its modular components and units when unexpected situations render the original plan infeasible.

Bigley and Roberts' analysis on the ICS shows that hierarchical structure and centralized command system are not tradeoffs for organizational flexibility and reliability. In fact, they can facilitate organization responsiveness and urgent decision-making in high uncertainty situations. It becomes apparent that the major determinants of the flexibility, reliability and responsiveness are culture and logic that guide participants' behaviours and interactions in the system. For instance, in the ICS, subordinates on the spot who possess sufficient experience and training respond to unexpected problems by improvising solutions. When necessary, commanders at the lower level can mobilize resources. Their improvised behaviour and coordination focusing on problem solving is legitimized and supported by their supervisors' delegation and a shared culture. In comparison, although the Taiwan emergency system was also enacted by emergencies and comprised small units, the authority structure and role positions were largely fixed and delegation and improvised behaviours were limited.

Tendency of using bureaucratic control triggering the process of bureaucratization

Tracing the origin and the evolution of the emergency system, we observe a pattern of ineffectiveness and inefficiency by the Taiwan government in response to emergency management. This is shown in Figure 5. The government appears to have a strong tendency to increase accountability and control by establishing designated organizations and by stipulating regulations and guidelines. This puts the focus on the accountability of officials or agencies rather than on the reliability of the emergency system, suggesting a mentality favouring control by formal structure and rules to avoid uncertainty. However, the price paid for the control and accountability provided by formal structure and regulatory procedures is normally a cycle of bureaucratization. This is because the formal structure and rules often accompany penalties of violations or non-compliance. But in disaster scenarios, uncertainty is so high that rules or procedures cannot appropriately accommodate all eventualities. Therefore, non-compliance becomes a likely choice and punishments a threat to officials' careers. Over time, the formalization of the system encourages compliance and creates a culture of avoiding blame and punishments (Hirschhorn, 1993), therefore representing a process of bureaucratization. This provides empirical support for March and Simon's (1971) argument: unanticipated consequences of bureaucratic organization reinforce the tendency to use the control mechanism in the 'machine' model embedded in organizational design.

Conclusions

This paper has closely examined the Xiaolin village disaster in an attempt to understand the shortcomings of the Taiwanese disaster management system. Our findings point to a need for coordination and resource mobilization in disaster rescue and contribute to a fundamental understanding of how the system has deviated from its designed purpose due to a process of institutionalization and formalization. The buried village case reveals critical defects in the Taiwanese emergency system, even a decade of extensive enhancements. An entrenched political culture serves as self-reinforcing mechanisms, leading to the government adopting a similar bureaucratic approach in improving its natural disaster management. Salient authority structures make authority migration and delegation during emergencies exceedingly difficult, if not impossible. Creating more designated units increases the fragmentation of the system, thereby moving further away from a unified command system and a shared understanding of how the system operates.

We argue that design of any human system has to consider cultural orientations because culture provides people with meanings and guidelines for action (Scott, 2008). This is especially salient in stressful situations (like disasters), where cultural-cognitive factors become dominant in guiding behaviours, with individuals tending to respond more egocentrically, reacting with their most habitualized behaviours (Weick, 1990). Based on the observed culture of the Taiwan government, we provide the following suggestions.

1. *Cultivating cooperative culture through sustainable development.* The Taiwan central government should recognize that cultivating cooperative culture and proactive attitude in coping with emergencies requires long-term commitment. It takes significant effort, through both actions and education, to change people's expectations regarding the roles and responsibilities of the public and private actors in emergency scenarios. Policy-makers can integrate a disaster management system into a long-term plan of national development and environmental management (May *et al.*, 1996; Britton 2007). By doing so, the preparedness of disaster operations can be embedded in routine activities and trainings.
2. *Tapping into local authority and resources.* Since the government structure is inherently fragmented and lacks a coherent goal, searching and making use of informal coordination mechanism rooted in local culture is important. The ICS operating in the American cultural settings delegates authority to those local actors near the location of impacts with required expertise and information of actual needs. This level of delegation may be difficult to implement in a centralized and authoritarian cultural environment. Particularly, in the Taiwan government, authority to mobilize crucial resources always resides at the top of the hierarchy. Therefore, local governmental agencies can tap local resources and talents by strengthening coordination relations with local communities and cultivating local capability and knowledge to cope with disaster scenarios. For example, according to the news reports, the Meishan village, an hour's drive away from Xiaolin, was about 80% destroyed but no life was lost. This was due to a village head who evacuated villagers early (BKPOST, 2009; Tan, 2009). In addition, partnership with the private sector cultivated at the local level can serve as a communication and coordination mechanism that helps generate accurate diagnosis and quick responses on the spot. Although the Taiwan government has historically lacked such coordination ties with the private sector (Wu, 2005), it has more recently begun to implement public-private partnership in delivering public projects (Lin *et al.*, 2000).
3. *Centralized decision-making with a unified command system.* Since the Taiwan government is a centralized system governing a relatively small territory, it can consider establishing a unified command system and simplified organization structure for its emergency system. To be able to perform continuous control, monitoring and deployment, a few decision-makers at the top of the hierarchy should have timely communication and real-time information from both central and local agencies. More importantly, to ensure the quality of their decisions, consulting individuals with sufficient experience and technical knowledge is crucial (Eisenhardt, 1993). Additionally, these decision-makers need to shorten the commanding lines to send orders to the execution units directly and immediately. Unity of command reduces potential conflicts of interest, confusion and anxiety of participants facing disaster situations and provides clear channels and directions for information delivery and dissemination. These governmental decision-makers are ultimately responsible for the performance of the emergency system and thus they have sufficient incentives to make better decisions taking care of all the people. Given the cultural orientations of high power distance and high uncertainty avoidance, actors can follow the instructions and move swiftly when top decision-makers take risks and create a less uncertain operating environment.

This paper identifies (1) the misalignment between the organizational design and operational behaviours of the Taiwan emergency system and (2) the pattern of government's remedies to the dysfunction of the system. The paper thus provides an empirical case of self-sustaining process of bureaucratization, demonstrating that actual organizational operation is undergirded by prevalent normative-cultural principles that guide actors' behaviour. In addition, the analysis using technical, structural and normative cultural perspectives enables us to better explore the interaction of multiple interdependent factors in the process of emergency response. By doing so, the study is able to deepen the understanding of the nature of the emergency system's dysfunction and to broaden the government's alternatives to enhance the system by suggesting longer-term improvements. Since Taiwan routinely suffers from the impacts of natural disasters, substantial rather than superficial change is imperative.

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