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## An analysis of the delayed response to Hurricane Katrina through the lens of Knowledge Management

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### Abstract

*In contrast to many recent large-scale catastrophic events such as the Turkish earthquake in 1999, 9/11 attack in New York in 2001, the Bali Bombing in 2002, the Asian Tsunami in 2004, the initial rescue effort towards Hurricane Katrina in the U.S. in 2005 had been sluggish. Even as the Congress has promised to convene a formal inquiry into the response to Katrina, this paper offers another perspective by analysing the delayed response through the lens of knowledge management (KM). A KM framework situated in the context of disaster management is developed to study three distinct but overlapping KM processes, namely, knowledge creation, knowledge transfer and knowledge reuse. Drawing from a total of more than 400 documents including local, national and foreign newspapers, newswires, congressional reports, transcripts of television interviews as well as internet resources such as wikipedia and blogs, 14 major delay causes in Katrina are presented. The extent to which the delay causes were a result of the lapses in KM processes within and across the government agencies are discussed.*

### Introduction

In recent years, the world has seen a number of large-scale catastrophic events both man-made and natural. They include the Turkish earthquake in 1999, 9/11 attack in New York in 2001, the Bali Bombing in 2002, the Asian Tsunami in 2004 and the South Asia earthquake in 2005. These catastrophes promptly galvanised the international community into offering humanitarian assistance and financial aid. They also invariably drew attention to one of the important aspects of disaster management: initial rescue and relief operations that were carried out speedily.

In the 1999 Turkish earthquake, the International Red Cross alongside the local organizations promptly rushed into the affected areas and carried out rescue and relief operations. The 9/11 disaster triggered swift action from the local and federal agencies in the immediate aftermath of the collapse of the World Trade Center. Likewise, the initial tsunami relief operation in Aceh in 2004 was regarded a success, considering the extent of the destruction, the province's remoteness and that it had been out-of-bound to foreigners due to a long-drawn civil war.

In stark contrast, the initial rescue effort towards Hurricane Katrina in the U.S. in 2005 had been sluggish. It took almost five days before a full-scale evacuation operation was mobilized in New Orleans. This was deplorable given the city's close proximity to sources of relief. Furthermore, hurricane occurrences, which could often be accurately predicted, are not uncommon in the U.S. Just a year earlier, the well-experienced and resource-rich U.S. agencies had responded decisively to the hurricanes in Florida. Due to the delayed response to Katrina, thousands were left without proper shelter, food, water, and medical supplies for days as they waited to be rescued. Following the televised images of frustrated political leaders and victims pleading for help, criticism of the government at all levels became widespread.

Even as the Congress has promised to convene a formal inquiry into the response to Katrina, several preliminary reasons attributed to the delay have been cited. Among them emerged issues related to race and class. Critics have argued that racial injustice was a factor in the government's slow relief effort since Katrina's victims were disproportionately black and poor (Jordan, 2005a). A second reason was the government's on-going emphasis on fighting against terrorism and the war in Iraq which had undermined its preparedness against natural catastrophes such as Katrina. At the time of the disaster, a third of the National Guard was serving in Iraq or war-related efforts (VandeHei and Baker, 2005). Yet, a third reason was the weakened Federal Emergency Management Agency (FEMA) after it was structurally demoted from being a cabinet-level body to one of the 22 agencies reporting to the Department of Homeland Security (DHS) in 2002 (Gorman, 2005).

This paper offers another perspective by analysing the delayed response to Katrina through the lens of knowledge management (KM). KM has emerged as a universally important discipline because knowledge has now become the main factor for production not only in businesses but also governments and charitable bodies. Many organizational successes and failures can largely be attributed to the manner in which knowledge is managed. For this reason, this paper seeks to assess the extent to which the sluggish response was a result of the poor management of knowledge within and across agencies involved in Katrina. To achieve this objective, a KM framework situated in the context of disaster management is developed to study three distinct but overlapping KM processes, namely, knowledge creation, knowledge transfer and knowledge reuse. A research territory such as this has hitherto been relatively uncharted by both KM and disaster management communities. Additionally, this paper teases the major delay factors in Katrina from a wide variety of sources including local, national and foreign newspapers, newswires, congressional reports, transcripts of television interviews as well as internet resources such as wikipedia and blogs.

Katrina provides an interesting context for investigation on two counts. First, its size and severity necessitated the involvement across local, state and federal agencies. Interactions among them were crucial during the initial period of emergency. With Katrina, there exists the opportunity to examine the dynamics affecting KM processes among a web of related agencies which would have been unobservable in studies whose unit of analysis were mono-organizational. Second, most KM studies focus on settings which were usually characterised either by routine organizational conditions, (e.g. Brown and Duguid, 2000; Ardichvili, et al, 2003) or the prospect of impending organizational threats (e.g. Scarbrough, 2003; Braganza and Mollenkramer, 2002). Katrina, on the other hand, represents a major national crisis. Perilous conditions demand not only effective KM processes but also accentuate the importance of the quality, and particularly speed, of those processes. Thus, Katrina offers a broadened perspective on KM against the backdrop of emergency conditions.

This paper is organized as follows: the next section reviews literature related to both KM and disaster management. The literature is conflated into a theoretical KM framework which is used as the basis to study KM processes in Katrina. Thereafter, the methodology section describes the method of data collection, data sources and coding scheme used in the textual analysis. Drawing from a total of more than 400 documents, 14 major delay causes in Katrina are presented chronologically in the findings section. Following that, the discussion section examines the extent to which the delay causes were a result of the lapses in KM processes within and across the government agencies. Finally, the concluding section highlights three KM implications culled from this incident.

## **Literature Review**

### KM Processes

As KM matures over the past decade into a distinct discipline, it continues to attract keen interest from scholars and practitioners in a number of established fields such as strategic management and organizational science. This phenomenon is fuelled by the growing popularity of the knowledge-based perspective of the firm which recognises knowledge as the key sustainable competitive resource (Kogut and Zander, 1992). Increasingly, KM is accepted as a compelling strategy for product and process innovation and improvement as well as organizational adaptation and renewal (Zack, 1999). Three distinct but overlapping processes commonly cited in KM literature are knowledge creation, knowledge transfer and knowledge reuse.

The SECI model, one of the most widely-quoted knowledge creation models, describes the spiral conversion between tacit and explicit knowledge (Nonaka and Takeuchi, 1995). The model has been further extended to illustrate the importance of shared spaces in which staff interacts with one another (Nonaka and Konno, 1998). Through dialogue, individually-held knowledge are combined and exchanged to spawn new collective knowledge. Another perspective proposes two paths through which knowledge can be created, namely, “theorising codification” and “tangible integration” (Wright, 1997). The process of theorising codification draws on a theoretical level of understanding to create new knowledge through conceptualising, developing and refining an existing idea. The process of tangible integration, on the other hand, involves a “hands-on”, experiential approach. On a practical front, it is

not uncommon for organizations to implement a validation regime to ensure high quality of the knowledge created. In Xerox, for example, tips and insights contributed by its technical representatives have to be vetted by peers and internal experts before they are formally accepted into the company's knowledgebase (Brown and Duguid, 2000).

Knowledge transfer refers to the flow of knowledge from one part of the organization to other parts (Dixon, 2000). Constituents along the knowledge sharing process include the source, the content, the recipient and the environment. Szulanski (2003) elucidates several factors traceable to these constituents that could impede the knowledge transfer process. The factors include an arduous relationship between the source and the recipient as well as an unfavourable organizational context for knowledge transfer. Along a similar vein, absence of trust and non-reciprocity has often been identified as hindrances to knowledge transfer (Davenport and Prusak, 1999). Companies which exhibited knowledge-hoarding tendency internally were found to be characterised by a low level of trust among their staff (Michailova and Husted, 2003).

Knowledge reuse is the process of capturing knowledge from one part of the organization and packaging it for subsequent repeated applications in other parts of the organization (Markus, 2001). Its purpose is to propagate proven practices in the form of lessons learned so that the recurrence of similar mistakes in the future can be averted. Knowledge reuse is facilitated by an awareness of the original context from which the knowledge emerged as well as an understanding of the rationale underpinning the knowledge (Markus, 2001). Thomas et al (2001) conceive knowledge reuse as "strategic knowledge distillation", wherein knowledge at business-level becomes infused into the modus operandi at the corporate-level. Much of Hoffman-LaRoche's success in expediting its new drug application process, for example, was due to the reuse of knowledge culled from previous successful experiences (Markus, 2001).

The KM literature is replete with reports of propitious outcomes of KM implementation in commercial organizations. The array of benefits of KM includes expedited product development cycles, financial savings, additional revenues generation and increased customers' satisfaction. Beyond the business context, KM has also been applied or examined in different milieus such as libraries (Plaice & Kitch, 2003), hospitals (Guptill, 2005) and universities (Kleist, et al, 2004).

### KM in Disaster Management

A setting which has yet to come under the spotlight of KM scholars and practitioners but in which KM plays an integral role lies in disaster situations. The management of disasters can be described as a cycle comprising four overlapping phases, namely, preparation, response, recovery and mitigation (Lindell and Perry, 1992). The preparation phase requires up-to-date and accurate disaster data to be captured, processed and structured into forms such as detailed disaster management plans for the public. When the disaster severity is precisely evaluated, planning and stockpiling of supplies and resources can be done in advance. Residents in rural areas of Oklahoma, for example, were provided with a wealth of real-time weather information and instructions ahead of the tornado in 1999. Consequently, they were

able to make informed decisions which limited the destructive effects of the tornado on lives and properties (Morris, et al, 2002).

As a disaster unfolds dynamically, the ground situations change. These changes could be the escalating severity of the disaster, the rise in the number of casualties or a complete shift in urgent demands in the affected areas. In the response phase, government bodies and relief agencies have to gain timely knowledge of the ground, make sense of the knowledge as it emerges, efficiently disseminate it and coordinate among themselves to carry out disaster response operations such as damage assessment, perimeter control, and evacuation and relief procedures based on such available knowledge. One reason contributing to the successful rescue operation in the 2000 Fort Worth tornado was the way in which key decision makers and field personnel efficiently collected, acted upon and distributed knowledge during the disaster (McEntire, 2002).

In the recovery phase, knowledge on handling post-disaster efforts such as sheltering, victims' resettlement, donation management, utilities restoration and infrastructure reconstruction is needed to restore normalcy to the disaster areas. The better knowledge is managed among government bodies and relief agencies, the faster the resumption of lives and businesses in the affected areas. In the case of the reconstruction project following the 1990 earthquake in Alto Mayo, Peru, the Intermediate Technology Development Group (ITDG) tapped local building construction knowledge to develop structural materials which were more resilient to earthquakes (Schilderman, 2004).

Finally, in the mitigation phase, follow-up actions ranging from improving disaster management protocols, fortifying city infrastructures to providing greater public education are implemented to lessen the impact of future disasters. These actions are informed by the experiences and insights distilled from the current disaster. Knowledge such as salient features of the disasters, actions taken by participating relief agencies and the outcomes of disaster management efforts can be integrated into well-structured disaster cases. For example, with the constant threat of strong earthquakes, government officials in Tehran have implemented a multi-pronged earthquake reduction plan. The plan includes establishing disaster-resistant building codes, introducing seismic zoning of the city, and diversifying its economic activities (Nateghi-A, 2000).

The entire chain of disaster management activities is not only knowledge-intensive but demands decisive actions to be executed under the intense constraints of time and resources. Particularly in large-scale disasters, sources of knowledge are often heterogeneous and geographically-distributed. Furthermore, the disaster management efforts call for the coordination across multiple autonomous agencies comprising the local emergency services, government bodies, humanitarian organizations and volunteer groups. The need to efficiently manage KM processes in disaster management is therefore compelling.

One of the main reasons that led to a high casualty rate in the 2004 Asian Tsunami was the shortcoming of the pre-disaster knowledge creation process: there was no early warning system in place to alert the victims (Samarajiva, 2005; Oloruntoba, 2005). Thus, knowledge creation concerns the generation of high quality and timely

knowledge for disaster management. Success factors of knowledge creation processes include a system to capture, analyze and translate disaster data into action, the provision of shared spaces for relief agencies to co-develop and validate disaster plans as well as a conscious effort to encourage effective on-the-ground improvisation of rescue operations.

The “silo-mentality” and lack of coordination across agencies has been observed as a recurring problem in disaster management. For example, in the 1987 King’s Cross underground fire in the UK, individual agencies diligently pursued their objectives but there was a lack of liaison among them (Smith and Dowell, 2000). Thus, the goals of knowledge transfer are to foster faster, freer and more reliable flow of knowledge within and across agencies. Clear lines of controls and a culture of trust are essential to swift and spontaneous dissemination of knowledge (Strickland, 2004), not only during the preparation phase when disasters are imminent, but also during the response phase when rescue and relief operations have to be carried out expeditiously. In addition, since large-scale disasters may extensively destroy the physical communication infrastructure, maintaining redundancy in communication networks is necessary (Pincus, 2005).

Knowledge reuse is necessitated whenever the problem to be solved at hand is similar to one previously tackled. By leveraging knowledge culled from past experiences, the learning curve of disaster management personnel can be significantly shortened. Success factors of knowledge reuse include a system to accurately evaluate disaster situations to invoke appropriate disaster plans, the access to a repository of lessons learned compiled from previous disasters, as well as a culture which promotes sound understanding of the underlying rationale of major disaster procedures. Agencies responded well to the 2000 Fort Worth tornado in part because they had successfully reused knowledge gained from previous disasters and emergencies such as the 1995 hailstorm and the Wedgwood Church shooting (McEntire, 2002).

Framework for Analysis

On the basis of the literature reviewed, a two-dimensional framework as shown in Table 1 is developed to examine the extent to which the sluggish response in Katrina was a result of the poor management of knowledge. The first dimension comprises the three KM processes, namely, knowledge creation, knowledge transfer and knowledge reuse. The second dimension represents the phases in disaster management. This is limited only to the preparation and response phases as the scope of this paper lies in the failure of Katrina during these two phases.

Table 1: Framework to analyze the management of knowledge in Katrina

	Preparation Phase	Response Phase
Knowledge creation	<ul style="list-style-type: none"> <li>• A system to capture, analyze and translate timely disaster data into action (Samarajiva, 2005; Oloruntoba, 2005)</li> <li>• A provision of shared spaces for relief agencies to co-develop and validate disaster</li> </ul>	<ul style="list-style-type: none"> <li>• An encouragement of effective on-the-ground improvisation of rescue operations (Wright, 1997)</li> </ul>

	plans (Nonaka & Konno, 1998; Brown & Duguid, 2000)	
Knowledge transfer	<ul style="list-style-type: none"> <li>• Clear lines of control and a culture of trust within and across agencies to disseminate knowledge about the disaster's imminence (Strickland, 2004)</li> </ul>	<ul style="list-style-type: none"> <li>• Clear lines of control and a culture of trust within and across agencies to support rescue and relief operations (Strickland, 2004)</li> <li>• Maintaining redundancy in communication networks (Pincus, 2005)</li> </ul>
Knowledge reuse	<ul style="list-style-type: none"> <li>• A system to accurately evaluate disaster situations to invoke appropriate disaster plans (Markus, 2001)</li> <li>• Access to a repository of lessons learned (McEntire, 2002)</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of disaster procedures with the understanding of the underlying rationale (Markus, 2001)</li> </ul>

## Methodology

### Method of data collection

Data were drawn from various sources including news reports, press releases, television interview transcripts and congressional hearings via LexisNexis. In addition, meta-search engine Copernic was used to locate blogs and wikipedia that discussed Katrina. Although these sources reflect different narrative styles and standpoints in recounting the rescue and relief operations, the purpose of collecting as many and as varied accounts was to construct a nuanced perspective of the incident. It must be acknowledged, however, that across the diverse sources, there could be instances where materials on a given event differ or even contradict each other. Thus, in the absence of a feasible verification mechanism, only data found to be internally consistent within the total set of sources collected were admitted for analysis and discussion.

The search for the sources of data was done through the “pearl-growing” method (Ramer, 2005) since a comprehensive list of search terms was unknown initially. The “pearl-growing” method involves relying on a limited set of keywords to search for relevant materials, and thereafter generating more keywords from the retrieved materials to search for other relevant materials which otherwise would not have been found. In the opening round of search, different combinations of the keywords including “delay”, “sluggish”, “slow”, “rescue”, “relief” and “Hurricane Katrina” were used. The first batch of returned reports and web-pages were analyzed using TextSTAT, a simple text analysis tool which produces word frequency lists and concordances. New keywords such as “block”, “blocked”, “criticism”, “evacuate”, “evacuated”, “evacuation”, “failed” and “failures” were uncovered. These keywords were then used to search for more reports and web-pages. Through several rounds of iterative search, more keywords including “breakdown”, “communication”, “inaccuracies”, “misinformation”, “mismanagement” and “overwhelmed” were found and used.

The search covered materials dated from 26 August 2005, a day after the first landfall, to 26 October 2005, two months later. No reports on Katrina dated after 26 October was found to be pertinent to the objective of this study at the time the search was done. This two-month period comprises reports that cover significant events related to the rescue and relief operation in Katrina, from the beginning of the disaster, the mass airlift and forced evacuation of the victims to a number of separate congressional hearings on the government's response to Katrina including those which probed Michael Brown, former Director of FEMA and Michael Chertoff, Secretary of the Department of the Homeland Security. The search yielded nearly 600 relevant reports and webpages.

Sources of data collected

The data for this study were drawn from five sources, namely, newspapers, newswire, television interview transcripts, congressional reports and the internet. Using the strategy of search and retrieval discussed above, a total of 597 documents shown in Table 2 was yielded.

Table 2: Sources and number of documents analyzed

<b>Sources</b>		<b>Number of documents*</b>
Newspapers	Local newspaper (e.g. New Orleans CityBusiness, Seattle Times, Times-Picayune (New Orleans))	193
	National newspaper (e.g. New York Times, Washington Post)	57
	Foreign newspaper (e.g. Irish Times, Financial Times (London, England), The Vancouver Province (British Columbia))	44
Newswire	(e.g. Associated Press, Knight Ridder/Tribune News Service, Newhouse News Service, Scripps Howard News Service, States News Service)	130
TV interview transcripts	(e.g. CNN, NPR, CBS)	51
Congressional reports	(e.g. Congressional Press Releases, Congressional Testimony)	17
Internet sources	Blogs	81
	Wikipedia	24
Total		597

\* In this paper, a document refers to either one of the following: (1) an article published by a newspaper, or newswire; (2) a complete interview transcript produced by TV stations or the Congress; (3) a unique URL on the internet

## Coding Scheme and Procedure

The data collected were analyzed through a two-step systematic textual analysis. In the first step, all documents were coded by four coders who were graduate students trained in textual analysis. The coding scheme used was designed to capture the following details in a given document: 1) whether causes contributing to the delay in the rescue and relief efforts were cited (CD), 2) brief descriptions of each of the causes (DC), 3) the agencies involved in the causes cited (AI) and 4) the time period at which the causes occurred (TP). CD is a binary variable coded either as 'yes' or 'no', denoting the presence and absence of causes for delay respectively. DC represents a *a posteriori* variable whose values were derived only during the coding process. Since there could be more than one delay cause cited in a given document, multiple values of AI and TP could be found. Hence, AI comprises a set of binary variables, referring to specific groups: local, state, federal, all of which coded either as 'yes' or 'no'. Likewise, TP is a set of binary variables, denoting three distinct time periods: pre-Katrina, between first and second landfall and post-Katrina, all of which coded either as 'yes' or 'no'.

Given that this coding process was open to coders' interpretation on the latent content as opposed to mere mechanical extraction of "on the surface" information, intercoder reliability was established (Potter and Levine-Donnerstein, 1997) by using Cohen's kappa for the following variables, namely CD, AI and TP. Due to its open-ended text value, DC was examined through a qualitative textual analysis carried out by the Principal Investigator alone during the second step of the data analysis described later. Statistical testing for intercoder reliability of DC was thus unnecessary.

The coders first underwent training on the coding scheme to familiarise themselves with the variables' operational definitions and categories used. Thereafter, they independently coded a pilot set of 60 sample documents, more than the recommended size of 40 to create the reliability sample (Lacy and Riffe, 1996).

Table 3: Average pair-wise intercoder reliability among four coders on 60 sample documents

<b>Variable</b>		<b>Average Intercoder reliability</b>
Causes contributing to the delay cited		0.87
Agency Involved	Local	0.77
	State	0.72
	Federal	0.82
Time period	Pre-Katrina	0.92
	Between first and second landfall	0.88
	Post-Katrina	0.76

Cohen's kappa for all variables was more than 0.7, indicating a strong non-chance agreement among the coders (Neuendorf, 2002). Having established the intercoder

reliability, the remaining news documents and web-pages were divided evenly among the four coders for coding.

The second step of the data analysis was a qualitative textual analysis of DC, AI and TP, which involved unitizing and categorizing. Through the process of unitizing, ‘raw’ DC values, together with their associated AI and TP values, were identified and isolated. Subsequently, DC values were categorized and organized into broad categories of delay causes on the basis of similarity in meaning. For example, “FEMA did not send workers into New Orleans before Katrina struck”, “FEMA dispatched only seven of its 28 urban search and rescue teams” and “Superdome was not pre-stocked with medical supplies or food” were classified under the broad category of “inadequate pre-deployed resources”. The list of delay causes underwent iterative revisions and refinements until it met three criteria, namely, exhaustion of sources, saturation of categories and emergence of regularities (Lincoln and Guba, 1985).

Where delay causes were found to differ or even contradict in the documents, they were not admitted for analysis and discussion. For example, one document (Wikipedia contributors, 2005a) notes that Nagin was “criticized for not following the city's evacuation plan” while another (Lipton, et al., 2005) reports that he had “largely followed the city plan, eventually ordering the city's first-ever mandatory evacuation”. Since Nagin’s failure to carry out the evacuation plan could not be confirmed, it was excluded from the final list of delay causes.

## Findings

Of the 597 documents analyzed, a total of 438 documents were found to cite causes contributing to the delayed response to Katrina. The sources from which the findings were extracted are shown in Table 4.

Table 4: Sources of documents from which findings were extracted

Sources		Number of Documents	Average word count per document
Newspapers	Local	144	820
	National	43	1,109
	Foreign	29	550
Newswire		112	1,053
TV interview transcripts		23	8,322
Congressional reports		10	3,308
Internet sources	Blogs	64	7,100
	Wikipedia	13	6,340
Total		438	2,422

To better appreciate how the delay causes emerged chronologically, DC is clustered around the three categorical values of TP, namely, pre-Katrina (25 August and earlier), between the first and second landfall (26 August – 29 August) and post-

Katrina (30 August and after). In addition, the agencies involved are indicated against each of the causes as shown in Table 5.

Table 5: Chronological Development of Delay Causes

Time Period	Delay Causes	Local	State	Federal
Pre-Katrina	Levee fortification procrastinated			✓
Between First and Second Landfall	Inadequate pre-deployed resources			✓
	Delayed Declaration of the Incident of National Significance			✓
	Federal troops not requested		✓	
	No provision to evacuate residents without cars	✓		
Post-Katrina	Collapse of first responders	✓	✓	
	Breakdown in communication network	✓	✓	✓
	FEMA bureaucracy			✓
	Aids from local agencies blocked			✓
	Ignorance of ground situation			✓
	Tussle over lines of authority		✓	✓
	FEMA overwhelmed			✓
	Delayed military deployment			✓
Delayed acceptance of foreign aids			✓	

### Overview of Hurricane Katrina

Hurricane Katrina is the most destructive and costliest urban disaster in the history of the U.S. Katrina made the first landfall just north of Miami, Florida on August 25 2005 as a category 2 hurricane. It further strengthened into a category 4 hurricane and made a second landfall on August 29 2005 along the Central Gulf Coast in the states of Louisiana, Mississippi and Alabama. While the damage brought about by the first landfall was limited, the destructive force of the second landfall created a series of levee breaches which caused New Orleans to be extensively flooded. It also cut off power supplies and communication network in the affected states. Even though most of the city's residents had evacuated from the area before the hurricane struck, more than 100,000 were still trapped in the city (White and Whoriskey, 2005). Many of them were either stranded on rooftops, cramped into the convention center or the Superdome stadium. Thousands of victims, including the aged and the sick, waited in thirst, hunger and without medical supplies for days due to the sluggish rescue and relief operations. To aggravate the situation, there were incidents of shootings, carjackings and thefts across the city. The first delivery of supplies to Superdome was reported only on August 31 (Wikipedia contributors, 2005c). As anger mounted over the delay in getting aid to people in New Orleans, the federal government expedited the rescue effort by activating military resources on a colossal scale. The airlift of victims on September 3 became the largest civilian airlift operation in the U.S. (Mineta, 2005). Dissatisfied with his role of managing Katrina relief effort on the

ground, the U.S. government removed Federal Emergency Management Agency (FEMA) director Michael Brown from his post on September 9 (Vargas, 2005).

#### Pre-Katrina (August 25 and earlier)

##### *Levee fortification procrastinated*

The delay in the rescue operation contributed in part to the massive flooding in New Orleans which destroyed much of the transportation and communication infrastructure. The failure to mitigate the risk of flooding can be traced back to years before Katrina struck. Built in an area largely below the sea level, New Orleans had always been vulnerable. Its levee system, designed to withstand hurricanes no more intense than category 3, was breached by Katrina. Ironically, the possibility of a hurricane hitting New Orleans had long been recognised. FEMA studied the potential catastrophic impacts of a Category 4 or 5 hurricane strike near New Orleans in early 2001 (Herrald, 2005). Likewise, in 2002, Times-Picayune published a series of reports which detailed the magnitude of the risk (Editors, 2005). In early 2005, Louisiana Sea Grant forum, part of Louisiana State University program, presented the results of several simulations of strong hurricanes hitting New Orleans. Nonetheless, plans to fortify the levees were postponed and delayed by inadequate budgets. Walter Maestri, emergency management chief for Jefferson Parish, Louisiana, attributed the funding shortfall to the cost of combating terrorism and the Iraq war.

*"It appears that the money has been moved in the president's budget to handle homeland security and the war in Iraq, and I suppose that's the price we pay... for us, this levee is part and parcel of homeland security because it helps protect us 365 days a year"* (VandeHei & Baker, 2005).

It had been acknowledged that even with full funding in recent years, none of the flood-control projects would have been completed in time to avert the flooding (VandeHei and Baker, 2005). Still, procrastinating for years to fortify the levee system proved costly.

#### Between First and Second Landfall (From August 26 to August 28)

##### *Inadequate pre-deployed resources*

In addition to the years of published warnings about the consequences of a strong hurricane in the region, the development of Katrina from a tropical storm to a menacing hurricane was also closely monitored. After the first landfall, National Hurricane Center Director Max Mayfield conducted briefings to senior government officials and warned them of the impending large-scale catastrophe. Homeland Security Secretary Michael Chertoff convened interagency meetings and assigned FEMA Director Michael Brown as his representative on the ground. However, FEMA seemed to have underestimated the magnitude of the storm. While supplies such as food, water, blankets and personnel were pre-positioned in anticipation of the disaster, they were inadequate. For example, FEMA did not send any workers into New Orleans and dispatched only seven of its 28 urban search and rescue teams

before the storm hit (Lipton, et al., 2005). 40,000 of 360,000 military rations and five of 15 water trucks promised were sent (Curtius, 2005).

There were also insufficient emergency aircraft, boats and vehicles to evacuate the residents even though the requirements were agreed in “Hurricane Pam”, a drill conducted a year earlier. In addition, in the drill, the Superdome sports stadium was designated as a place of refuge in the event of a disaster, but when Katrina hit, no medical supplies or food were pre-placed there (Swann, 2005).

#### *Delayed Declaration of the Incident of National Significance*

On August 27, President Bush responded to an urgent request from the Louisiana State and activated the National Response Plan. This was in adherence to the Stafford Act which authorises the federal government’s intervention on conditions that the severity of the incident is beyond the capabilities of affected State and local governments and that a request from the governor had been lodged. A federal emergency was thus declared in Louisiana. However, it took another 36 hours before Chertoff designated Katrina as an Incident of National Significance. This delay certainly inhibited the trigger of a heightened and concerted federal response, yet no official explanation was given.

#### *Federal troops not requested*

Shortly before the second landfall, Louisiana's Governor Kathleen Blanco still could not grasp the full extent of the impending disaster. Her priority was to secure federal funds for post-hurricane relief rather than to ensure that sufficient troops were being deployed to carry out search, rescue and relief missions. In a letter to Bush dated August 28, Blanco requested various forms of federal funding to deal with post-Katrina reconstruction but she neither asked for federal troops nor highlighted any immediate humanitarian needs (Editors, 2005). As New Orleans was flooded, and beset by looting and violence thereafter, the number of National Guardsmen to aid in search and rescue operations, as well as to restore order was found to be insufficient.

#### *No provision to evacuate residents without cars*

Based on a census conducted in 2000, local officials were aware that an approximate 120,000 (27%) residents in New Orleans did not possess private transportation (Wikipedia contributors, 2005b). Even so, the 41-page “City of New Orleans Comprehensive Emergency Management Plan” which provided a long list of hurricane evacuation procedures gave scanty details on how these residents would be evacuated or sheltered. Thus, when New Orleans Mayor Ray Nagin ordered the mandatory evacuation on August 28, no provision was made to evacuate households without cars. Had the several hundreds of school and city buses been used during the pre-hurricane evacuation, the need for extensive rescue and relief operations later would have had been alleviated. On August 29 when the flood came, the idle buses became submerged in water. A former state representative in Washington State Bob William commented on Nagin’s failure to use those buses:

*"I find it unthinkable that he didn't get the buses and go into those areas. He allowed the buses to remain at a low level and to be flooded and useless"* (Lakely & Seper, 2005).

### Post-Katrina (August 29 and thereafter)

#### *Collapse of First Responders*

The National Response Plan designates the National Guard as the military's first responders to a crisis. However, when the levees broke after the second landfall on August 29, Louisiana's small National Guard force was quickly deluged. The Guard troops were preoccupied with protecting their headquarters at Jackson Barracks and rescuing soldiers who could not swim. They lost 20 vehicles which could have carried soldiers around the city (Lipton, et al., 2005). The storm also incapacitated the local police, fire crews and medical staff. With highways severely flooded, supplies could not be sent into the city (Shane & Shanker, 2005).

#### *Breakdown in communication network*

With more than 80% of New Orleans flooded, there was a near-total collapse of communications infrastructure: many cell phone towers were submerged; fixed phone lines were inoperable and power supplies were cut. While some satellite phones and handheld radios were available, they became useless after the batteries ran out. The few generators that could have recharged them were in Iraq or at command centers far away from the city. Thus, the ground teams from DHS were without working telephones or radios for days.

Another problem was the incompatible radio systems used by the first responders. As a result, New Orleans police could not communicate with each other, and helicopters were unable to reach rescue boats. House Democratic Leader Nancy Pelosi charged:

*"...when New Orleans was hit, emergency personnel were on at least five different channels and were hampered in communicating with one another.."* (States News Services, 2005b)

#### *FEMA Bureaucracy*

Despite the massive flooding, FEMA still maintained its strict enforcement of bureaucratic procedures. To curb uncoordinated responses, FEMA issued a news release and urged *"all fire and emergency services departments not to respond to counties and states affected by Hurricane Katrina without being requested and lawfully dispatched by state and local authorities under mutual aid agreements and the Emergency Management Assistance Compact"* (States News Service, 2005a). As a result, all forms of voluntary help to meet the urgent needs at the ground were squelched.

William Vines, a former mayor of Fort Smith, Arkansas, who helped deliver food and water to the hurricane victims testified that FEMA halted two trailer trucks carrying thousands of bottles of water to Camp Beauregard, a staging area north of New Orleans for the distribution of supplies:

*"FEMA would not let the trucks unload... the drivers were stuck for several days on the side of the road about 10 miles from Camp Beauregard. FEMA said we had to have a 'tasker number.' What in the world is a tasker number? I have no idea. It's just paperwork, and it's ridiculous."* (Lipton, et al., 2005)

FEMA's insistence on following standard operating procedures in sending Urban Search and Rescue (USAR) teams by bus and truck rather than by air drew concern from Senator Barbara Boxer that there would be a critical time delay to the rescue effort.

Separately, hundreds of firefighters who responded to a nationwide call for help in the disaster were held in Atlanta for days to be trained on community relations and sexual harassment before being dispatched to the devastated area.

On August 30, a day after the second landfall, more than 50 civilian aircraft arrived in New Orleans in response to different requests for evacuations from hospitals and other agencies. However, FEMA prohibited the evacuation attempts, citing the reason that the rescuers were not authorised. President of the Association of Air Medical Services Thomas Judge pointed out: *"Many planes and helicopters simply sat idle"* (Gaouette, et al., 2005).

#### *Aids from local agencies blocked*

According to the National Response Plan developed by the DHS, private relief agencies such as the Red Cross would play a key role along with first-responders to *"sustain life, reduce physical and emotional distress and promote recovery ... when assistance is not available from other sources"* (Department of Homeland Security, 2005). However, humanitarian efforts offered by private relief agencies appeared to be blocked by federal and state officials.

The Red Cross was eager to send relief to New Orleans Convention Center and the Superdome but was prohibited by the Department of Homeland Security (Spalding, 2005). President of Jefferson Parish, south of New Orleans, Aaron Broussard complained that when Wal-Mart sent three trailer trucks loaded with water, FEMA officials turned them away (Shane, et al., 2005). Louisiana officials argued that an influx of food and other supplies might make it harder to persuade residents to evacuate (Gaouette, et al., 2005). Ironically, they were not evacuated and left stranded without food, water or medicine until the National Guard arrived days later.

#### *Ignorance of ground situation*

Shocking images of the victims, particularly those herded in dilapidating conditions at the Superdome and the Convention Center were published in the media in the aftermath of Katrina. Yet, neither Chertoff nor Brown knew about the crisis at these venues. In fact, amid rising public criticisms over the sluggish disaster relief efforts, Chertoff declared that he was *"extremely pleased with the response that every element of the federal government, all of our federal partners, have made to this terrible tragedy"* (Gaouette, et al., 2005). Three days later on September 1, both Chertoff and

Brown admitted publicly they were not aware that thousands of survivors were stranded at the New Orleans Convention Center without food or water. Chertoff confessed: "*it was disturbing to me when I learned about it, which came as a surprise.....*" (Hudson, 2005).

#### *Tussle over lines of authority*

When it became clear that the local and state government could not cope with the disaster, Blanco sought help on September 2 from the President for active-duty troops. The President's order to deploy the troop was made only after the following day as the White House and Blanco tussled over the leadership of the rescue effort. Blanco declined to sign a proposed memorandum of understanding which specified she would have to share control of the National Guard with the federal authorities. Instead, she opted to preserve her authority of the Guard. Nagin noted the tension between the state and the federal government:

*"We're still fighting over authority... A bunch of people are the boss. The state and federal government are doing a two-step dance."* (Moller & Scott, 2005)

A Bush administration official acknowledged the dispute over lines of authority had caused problems but denied it led to the delayed deployment of the military forces (Moller & Scott, 2005). Still, any sluggishness to mobilize military support meant further deterioration to the ground conditions.

#### *FEMA overwhelmed*

Once the dire situation became clearer, a sense of chaos spread within FEMA, from the ground in Louisiana to its headquarters in Washington. An anonymous FEMA official in the Washington office disclosed:

*"Everything is being done by the seat of the pants.... it's like reinventing the wheel. We're starting from scratch as though no planning had even been done before."*(Gaouette, et al., 2005)

Internal memos obtained by The Associated Press exposed FEMA's ill-preparedness for the disaster. For example, an email written by William Carwile, the top FEMA official in Mississippi dated September 3 reads

*"Biggest issue: resources are far exceeded by requirements....Getting less than 25 percent of what we have been requesting from HQ daily"* (Jordon, 2005b).

Furthermore, FEMA did not have adequate backup communications when Katrina destroyed power lines and telecommunications systems. FEMA workers had to wait for days to receive working satellite phones.

### *Delayed military deployment*

Before Katrina struck, military commanders throughout the country were told to prepare their units for possible deployment. To cut through layers of bureaucracy, Joint Chiefs Chairman General Richard Myers instructed the rest of the joint chiefs on August 30 to work directly with Northern Command, a military headquarters responsible to coordinate the military's response to domestic emergencies. Active duty troops from the 82nd Airborne Division and 1st Cavalry Division were put on alert. Yet the deployment order was not called. Admiral Timothy Keating, Northcom's commanding officer decided against sending troops because he was concerned that the local relief effort would be confounded by soldiers who were ill-equipped to handle the search, rescue and humanitarian operations (Gaouette, et al., 2005).

As public criticism of federal relief efforts continued to mount, Defence Secretary Donald Rumsfeld overruled Keating's decision and recommended that the President dispatch troops to the region. Bush finally announced the deployment of 7,200 active duty soldiers and Marines on September 3, six days after the second landfall (Gaouette, et al., 2005).

### *Delayed acceptance of foreign aids*

The size of the disaster drew an outpouring of sympathy from many countries. Although some offers of foreign aid had been promptly accepted, many international donors expressed frustration over the delay in shipment approvals to the U.S. Nearly a week after they were offered, four Canadian rescue vessels and two helicopters had been accepted but were cleared to arrive in New Orleans only on September 10. For four days, a transport plane ready to lift supplies including a water purification system urgently needed by Katrina victims stood idle at an air base in Sweden (Ritter, 2005). Claes Thorson, press counsellor at the Swedish Embassy in Washington explained:

*"We are ready to send our things. We know they are needed, but what seems to be a problem is getting all these offers into the country... we don't know exactly why, but we have a suspicion that the system is clogged on the receiving end.... but we keep a request alive all the time, so we are not forgotten"* (Williamson, 2005).

## **Discussion**

It is impossible to pinpoint a single major cause that resulted in the sluggish response to Katrina. The confluence of various delay causes and the levee breaks led to a "crisis in a crisis": a disastrous response during a natural catastrophe. Besides the failures within every level of government, cooperation among them also badly faltered. Nonetheless, for the purpose of providing a KM perspective, the delay causes are analyzed in terms of three KM processes, namely knowledge creation, knowledge transfer and knowledge reuse.

### Knowledge creation

Years before Katrina struck, disaster-related data had been collected, analyzed and reported in the form of published warnings about the potential hurricane threat.

However, such knowledge failed to be translated into tangible actions. In particular, plans to fortify the levee system did not materialise. The “knowing-doing” chasm persisted even shortly before Katrina. The gravity of Katrina was predicted in a series of emergency briefings held by the National Hurricane Center but it did not trigger a decisive and unanimous response among government agencies.

There was also no evidence that the development of emergency plans were subject to any stringent validation processes. The National Response Plan developed by the Department of Homeland Security (DHS) was intended as the blueprint for integrating and applying federal resources to natural disasters and terrorist attacks. In spite of that, the plan did not take into account the collapse of the first responders. The plan also presumed that victims and residents would be relatively cooperative in disaster situations. Even Hurricane Pam, the drill conducted a year earlier, did not address the possibility of violence and disorder. Thus, when the Guard was inundated in the immediate aftermath of Katrina, and thereafter chaos and crime erupted in New Orleans, FEMA was caught by surprise. Likewise, at the local level, the New Orleans Emergency Management Plan which comprised a comprehensive list of hurricane evacuation procedures was not scrutinised for its omission of details on the evacuation of the sizeable population without private transportation. In the absence of reality checks, the value of some 440 scenario drills the DHS had purportedly conducted since 9/11 (Lin, et al., 2005) is called into question.

On the upside, there was evidence of spontaneous on-the-ground improvisation of the rescue operations. For example, military personnel found ways to cut through bureaucratic tangles to expedite the evacuation and delivery of supplies (Wood, 2005). City officials boosted the morale of the dwindling number of New Orleans police officers working under intense pressure and supplies-stricken conditions by offering free medical examinations and expenses-paid trips to Las Vegas and Atlanta (Anderson, 2005).

### Knowledge transfer

Disaster management in the US is based on the premise that individual states rather than the federal agencies hold the primary responsibility for emergency preparedness and response in their geographical jurisdiction. Under the Stafford Act, the governor could nonetheless request for federal help when a disaster exceeds the capability of the state. However, such an arrangement which demands close cooperation across all levels of the government proved untenable as the agencies were plagued by infighting, the lack of trust and the failure to establish a unified command structure.

While Katrina’s imminence was quickly disseminated before landfall, the knowledge transfer processes among the agencies in directing the relief and rescue operations was found wanting. Once Katrina was declared an Incident of National Significance, Chertoff and Brown were designated the principal officials empowered to mobilize federal resources, including the Defense Department. However, they weighed on bureaucracies, expected the local and state government to direct their own efforts and proceeded at a deliberate pace to act only when called upon. Military resources which were ready to be mobilized did not receive any deployment order from FEMA. As the delayed response escalated from a humanitarian to a public relations crisis, local, state and federal agencies began to criticise each other, revealing an arduous working

relationship among them. Federal officials blamed Blanco and Nagin for the inefficient pre-disaster evacuation, while the latter accused the former of being slow in sending food, water and other much-needed supplies. A sign of tussle over lines of authority was seen in Blanco's refusal to share authority over the Guard with the federal government. She even created their own base of emergency management power by enlisting former FEMA director James Lee Witt to run emergency operations. Meanwhile, without a unified command structure, several officials including Nagin and Honore appeared at competing daily news conferences as if they were in-charge of the overall rescue effort. The military appeared to be a detached entity and was only activated upon the President's order.

Katrina also exposed the weaknesses in the communication system. The White House relied mainly on FEMA for daily updates on the rescue operations and disaster situation. However, Brown who was uninformed of the mounting crisis at Superdome and the Convention Center, continued to furnish the President with optimistic reports. Federal authorities, who could have tapped into the media network for a glimpse of the ground situation, chose instead to downplay the severity initially. When shown live scenes of survivors in the city chanting angrily for help into the cameras, Chertoff insisted "*everybody is confident of the ability to maintain order....the fact of the matter is the Superdome is secure*" (Gaouette, et al., 2005). There was no sense of urgency to deploy federal resources.

At the infrastructural level, the lack of redundancy of communication networks proved costly. When the city was flooded, many communication towers were submerged and power supplies cut. Both landlines and cell phones were out of service. Local officials were neither able to assess the damage nor clearly identify the assistance they required from the federal government. In particular, the appeal Blanco directed to the President was urgent but ill-defined: "*I need everything you've got... I am going to need all the help you can send me.*" (Lipton, et al., 2005)

### Knowledge reuse

Despite dire predictions made by the National Hurricane Center, Katrina's severity was not taken seriously initially. Influenced by cognitive biases (Watkins and Bazerman, 2003), Brown underestimated the approaching disaster and handled Katrina as if it was a regular hurricane:

*"We were so ready for this.... We've planned for this kind of disaster for many years because we've always known about New Orleans and the situation. We actually did catastrophic disaster planning for this two years ago."* (Gaouette, et al., 2005).

This flawed pre-disaster evaluation resulted in the inadequate pre-deployment of resources. It could also explain why Chertoff delayed the declaration of the Incident of National Significance and why Blanco did not request for federal troops in the first instance.

Lessons were not learned from prior experiences. Hurricane Pam, a drill conducted a year earlier turned out to resemble Katrina to a large extent. The drill suggested positioning barges in the Mississippi, and designated the Superdome as a place of

refuge. Yet, no medical supplies or food were pre-placed there (Swann, 2005). After 9/11, one of the recommendations was to equip responders with interoperable communication systems (Chertoff, 2005). However, in Katrina, besides the fact that much of the communication infrastructure was destroyed, emergency workers could not communicate with each other because the radio systems they used were on different channels.

The federal agencies unwittingly upheld bureaucracy in numerous instances during the rescue operations. For example, FEMA prohibited voluntary assistance of fire and emergency services departments of other states to attend to Katrina victims; aids offered by local agencies were blocked while those offered by the international community were belatedly accepted. While bureaucracy is necessary in large-scale, complex entities like the U.S. government agencies to ensure efficiency and consistency of quality, the need to exercise discretionary judgement in balancing between enforcing and waiving formalised procedures was brought to bear in Katrina. Had the officials across all ranks understood the rationale underpinning the implementation of disaster procedures and weighed it against the gravity of Katrina’s scale, much of the red-tape impeding the rescue operations could have been circumvented. In other words, officials could have been more flexible to allow temporary suspension of rules under extenuating circumstances. Table 6 provides a KM perspective of the delay causes in Katrina.

Table 6: A KM perspective of the delay causes in Katrina

	Preparation Phase	Response Phase
Knowledge creation	<ul style="list-style-type: none"> <li>• Existence of “Knowing-doing” gap. Plans to fortify the levee were procrastinated; adequate response to impending disaster was not triggered</li> <li>• Disaster plans were not validated. There was no provision for residents without cars; FEMA was overwhelmed;</li> </ul>	<ul style="list-style-type: none"> <li>• Pockets of effective on-the-ground improvisation of rescue operations were observed</li> </ul>
Knowledge transfer	<ul style="list-style-type: none"> <li>• Katrina’s imminence was quickly disseminated among local, state and federal agencies.</li> </ul>	<ul style="list-style-type: none"> <li>• No unified command structure and lack of trust. Agencies tussled over lines of authority; agencies were ignorant of the ground situation; delayed military deployment</li> <li>• Redundancy not built into communication networks. Communication broke down when physical infrastructure was destroyed</li> </ul>
Knowledge reuse	<ul style="list-style-type: none"> <li>• Disaster severity was underestimated. Inadequate pre-deployed resources;</li> </ul>	<ul style="list-style-type: none"> <li>• Failure to understand the underlying rationale of disaster procedures and weighed it</li> </ul>

	<p>delayed declaration of Incident of National Significance; federal troops not requested</p> <ul style="list-style-type: none"> <li>• Lessons were not learned. Barges were not pre-positioned in the Mississippi; supplies were not stock-piled in Superdome; incompatible communication devices were used</li> </ul>	<p>against Katrina's gravity. FEMA maintained its bureaucracy; aids from local agencies were blocked; foreign aids were belatedly accepted</p>
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## Conclusion

It is likely to take many more months, if not a few years, before the formal inquiry into the delayed response to Katrina can be concluded. This is because investigating a disaster of such magnitude involves not only trawling through copious classified documents, email correspondences and legal proceedings but also interviewing eye-witnesses, volunteers, surviving victims and officials in numerous agencies across different levels of the government. Nonetheless, even before the final verdict is announced, it appears that much of what has already been published about Katrina provides a fertile ground for developing insights into the roles KM plays in disaster management.

Relying on a variety of news and internet sources, this paper makes an attempt to piece together the major causes that hampered the initial rescue and relief effort in Katrina. The findings reveal that the delay causes were inter-related and were largely traceable to the lapses in the KM processes within and across agencies involved in Katrina. Three main KM implications for disaster management are as follows.

First is the high cost of the knowledge-doing chasm in the knowledge creation process. Capturing and analysing disaster data cannot be mere cognitive activities confined within the intellectual sphere, but they must be dovetailed with tangible, follow-up actions. Otherwise, the purpose of an early warning system is defeated. Another implication related to the knowledge creation process is the need for an institutionalized validation regime. Emergency plans are intended to clarify operational procedures in the event of a disaster while drills allow disaster management personnel to test their reflexes and responses in disaster situations. However, the development of emergency plans and drills must constantly be validated against ground realities. The absence of a rigorous validation regime could result in sketchy emergency plans and unrealistic drills.

Next, to facilitate knowledge transfer process particularly in large-scale disaster that demands the involvement of multiple agencies, it is imperative to establish a unified command structure. Confusion and chaos often stem from not having a clear chain of command. Besides having a proper authority structure, the importance of building a sense of trust and cooperation cannot be overlooked. Without solidarity among the agencies, knowledge transfer will be impeded by turf-protection and infighting. Another significant aspect of supporting knowledge transfer is the reliability of the communication network. Redundancy needs to be built into the physical infrastructure

to enable rescue workers to remain in contact with one other even when communication lines are severed by the disaster.

Third, the precursor to knowledge reuse in disaster management is an accurate assessment of a disaster severity. The underestimation of Katrina’s impact was the start of a series of mistakes in managing the incident. Also, preparatory and rescue efforts towards the current disaster ought to be informed by the experiences learned in the past. Specific lessons gained from Katrina, for example, how to handle massive urban flooding, could be published in the form of training materials or incorporated into disaster management doctrine. It might also be worthwhile to explore the introduction of a job rotation scheme among disaster management personnel across different agencies. By allowing them to better appreciate each other’s work, a greater understanding of the overall system can be promoted. Table 7 is a checklist intended to provide a KM perspective for leaders and policy makers in disaster management.

Table 7: A KM perspective of disaster management

Knowledge Creation	<ul style="list-style-type: none"> <li>• Are disaster data captured, analysed and followed-up with actions?</li> <li>• Are disaster plans and drills validated against ground realities?</li> </ul>
Knowledge Transfer	<ul style="list-style-type: none"> <li>• Is there a unified command structure to direct rescue efforts?</li> <li>• Have redundancy been built into the communication infrastructure?</li> </ul>
Knowledge reuse	<ul style="list-style-type: none"> <li>• On what basis is the severity of an imminent disaster assessed?</li> <li>• How can lessons learned from previous disasters be brought to bear?</li> <li>• To what extent do disaster management personnel across different agencies understand the workings of the overall system?</li> </ul>

Having to constantly contend with ecological threats such as global warming and the El Nino phenomenon, countries need to be braced for large-scale natural catastrophes in the future. Unless the failures in disaster situations such as Katrina are analyzed and corrected, confused disaster responses could well recur. This paper examines the delay causes in Katrina and offers a parsimonious KM framework against which the initial rescue and relief operations are studied. Hopefully, the effort represents a modest step towards a better understanding of how future potential disasters can be better managed through a KM perspective.

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