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# Leveraging Learning to Improve Disaster Management Outcomes

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**Abstract** Disaster management agencies should be exemplars of learning given the volatility of their operating environment. However, there are cognitive, social, and organizational barriers that prevent these organizations from learning. The purpose of this article is to use the Caribbean Disaster and Emergency Management Agency (CDEMA) as an example of an organization that achieves double-loop learning in spite of known barriers. This research shows significant learning variations in the CDEMA organization from the regional to the national level. The results demonstrate that the CDEMA Coordinating Unit and a few national member agencies achieve double-loop learning, while the opposite is true for many national disaster offices. Analysis of this variation is one contribution to the disaster management and organizational learning literature. The article also suggests that organizational culture is an important precursor to learning and adds a much needed case example to the management and learning literature. The study ends with a proposal for future research in the area of disaster management, culture and learning, and propositions for national disaster offices to consider in order to enhance double-loop learning.

**Keywords** Caribbean, CDEMA, disaster management, double-loop learning, learning barriers

## 1 Introduction

Disaster management agencies should be particularly concerned about creating an organizational culture committed to learning. These organizations need to survive and thrive in a changing environment (Torlak 2004). According to Garvin, Edmondson, and Gino (2008), learning organizations are adept at two groups of skills. First, they are good at creating, acquiring, interpreting, transferring, and retaining knowledge. Second, they are able to modify their behavior to respond to the new knowledge and insights they gain. Disaster management agencies operate in volatile environments that require great agility and adaptability. They must orient themselves to routine disaster events as well as to the increasing incidence of low probability catastrophic events that accompany the warming of the globe among other drivers. Sanne (2012) stresses the crucial need for these skills in the survival of

safety critical industries like disaster management agencies that must work to save lives and property.

Prominent organizational theorists including Chris Argyris and Donald Schön (1978), Edgar Schein (1985), Alfred Chandler (1990), Chris Argyris (1996), and Peter Senge (1990, 2003) endorse the idea of creating a culture dedicated to learning in organizational systems. They suggest that a culture committed to self-diagnosis and learning is needed in an environment characterized by rapid change and deepening complexity such as disaster management organizations. If disaster management organizations commit to a culture of learning, then leaders facilitate continuous expansion of their employees' capacity to create the desired results, and they nurture new ways of thinking. Employees—individually and collectively—are continually learning how to learn (Senge 1990). By facilitating learning, leaders in these organizations are then able to meet the challenges of a turbulent world (Morgan 1997).

The empirical evidence on disaster management supports the view that these agencies must learn if they want to adapt and be successful. These organizations must not only intentionally practice information collection, but they must also reflect on the information collected or generated, and reorient their thinking and practices if they are to be effective (Smith and Elliot 2007). The policy and disaster management literature documents the special importance of learning to disaster management organizations (Carroll 1998; Smith and Elliot 2007; Birkland 1997; Sanne 2012). Yet, as McPherson, Elliot, and Antonacopoulou (2010) point out, there is persistent barriers to capturing lessons from failure.

Many of the barriers concern cognitive biases embedded in the values and belief systems of disaster managers that cause them to miss some of the lessons from disaster events (Torlak 2004). Constant reorientation from varying events they face means that they often miss appropriate lessons and repeat errors resulting in future vulnerabilities (Sanne 2012). In addition, self-interest and political oversight make drawing lessons from events difficult. Disaster managers “need to learn through thorough scrutiny of the few serious events that do happen to them, from near-miss events, learn from others' experience and learn from non-events through simulation, interdisciplinary investigation teams, learning seminars, risk analysis and the like” (Sanne 2012, 3). The processes,

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environment, and leadership of managers must be conducive to learning (Garvin, Edmondson, and Gino 2008).

In his 1985 book on *Organizational Culture and Leadership* Schein posed an important question about organizations: Is it possible to create a culture committed to continuous self-diagnosis, learning, and change? (Schein 1985, 361). Using this question as a point of departure, the purpose of this article is to show how CDEMA has used various means to achieve double-loop learning despite well-known barriers to learning in high-hazard organizational environments. CDEMA faces not only routine hazard impacts, but also low-probability, high-impact catastrophic events. This article examines CDEMA's experiences to show how and what information the agency collects or creates and how it applies lessons learned.

This research both contributes to the academic literature on disaster management and organization theory and adds a much needed case example on organizational learning in disaster management. Smith and Elliot (2007) citing Pauchant and Douville's (1993) extensive review of the disaster and crisis management literature, note the neglect of cultural and psychological dimensions of crisis management including organizational learning. Smith and Elliot (2007, 5) emphasize that in crisis management we must move the notion of learning "beyond narrowly defined technical solutions toward fundamental shifts in the areas of culture, cognitive representations and communications—the human-centered, supposedly 'softer' aspects of organizations." This article focuses on culture and how it helps or hinders learning. It also shows that while there are known barriers to learning in disaster management organizations, double-loop learning is possible. In addition, the article offers practical insights on how disaster managers and planners can leverage organizational learning to improve performance and thereby reduce loss of life and property as well as economic, social, and cultural dislocation.

## 2 Methods

This case study is a follow-up study to the one I concluded (Thompson 2010) on disaster management in multi-state disaster management systems and the critical role that learning plays in the CDEMA system. The research's main assumption is that to be effective, disaster management entities must act like active learning systems organized around the logic of anticipating and preempting all possible disasters including low probability, catastrophic events as well as routine emergencies. It uses this state of active learning, anticipation, reflection, and preemption as a proxy for a "culture of learning" as proposed by Schein.

The original research utilized secondary sources as well as the responses to 24 in-depth face-to-face interviews: nine with national disaster coordinators; four with senior employees of national disaster offices; six with senior employees at the CDEMA Coordinating Unit; two from senior staff at international agencies funding programs at CDEMA; two

with consultants/academics working with CDEMA; and one with a former senior employee of the CDEMA Coordinating Unit. Interviews focused on organizational structure, organizational capacity, learning, and politics, and their effects on the effectiveness of disaster management agencies. The primary research question guiding this research is: Is it possible to create a culture committed to continuous self-diagnosis, learning, and change in disaster management agencies? This question is broken down into four sub-questions: Does CDEMA learn? What are the sources of learning? What does it learn? How are lessons applied? The interviews revealed thick descriptions of the scope of learning, what CDEMA learns and how it applies knowledge. Interviews were followed by observations and discussions with disaster managers at the 6th Annual Caribbean Conference held in Trinidad and Tobago 5–9 December 2011 where the author was the chair of a panel on the *Competencies and Skills for Effective Implementation of Comprehensive Disaster Management* (CDEMA 2011).

The article is organized as follows: It begins with a review of the literature on learning, organizations, and organizational culture that focuses on high hazard organizations. Then it provides a brief background of the Caribbean region where CDEMA resides, and offers an outline of the CDEMA system. Next it presents CDEMA's learning model and describes and examines whether and what CDEMA learns, demonstrates how it applies knowledge, and assesses how this application constitutes double-loop learning. Next the article examines the barriers to double-loop learning. It concludes by revisiting the question proposed at the start of the article: Is it possible to create a culture committed to continuous self-diagnosis, learning, and change—double-loop learning?

## 3 Characteristics of the Learning Organization and Disaster Management

Learning is the intentional practice of collecting information, reflecting on it, and sharing the findings produced by this introspective process within the organization so as to improve the organization's performance (Milway and Saxton 2011). Learning occurs when entities acquire new knowledge or their experiences modify existing knowledge, challenging the default logic (Serrat 2009). According to Weick (1991), if there is a shift in performance when the stimulus has essentially remained the same, then learning has taken place.

Organizations engage in either single- or double-loop learning (Senge 1990). Senge has noted that single-loop learning is a precursor to double-loop learning. Single-loop learning focuses on current, short term problem solving at the expense of critical assessment of the conditions that led to the current results in the first place (Senge 1990). Single-loop learning works in organizations that undertake routine-type work. Double-loop learning, on the other hand, focuses on redefining problems and questioning common sense thinking about them (Senge 1990).

**Table 1. Summary of common features of single-loop and double-loop learning**

Dimensions	Characteristics of Single-Loop Learning	Characteristics of Double-Loop Learning
Focus	Problem solving for goal attainment; Capturing lessons	Strategic questioning of assumptions; Cultivating knowledge; Capturing lessons
Perspective	Future strategies depend on prior experiences	Future strategies involve creating and solving problems; Questioning assumptions; Integration of new and old ideas
Impact	Incremental improvements	Improvements are transformative
Outlook	Short term	Long term
Strategy	Passive engagement	Active engagements; Scenario mapping
Culture	Putting out fires, reducing vulnerabilities; Addressing operational issues	System-wide thinking, self-questioning; Rethinking assumptions

Source: This table was refined from one developed in Thompson 2010, 243. The original table was developed using the works of organizational theorists including Argyris and Schön (1978), Wimberg and Hollins (2002), Wittrock (1992), and Senge (1990), and my understanding of organizational learning.

Table 1 presents a summary of the common features of single- and double-loop learning. The move from single- to double-loop learning constitutes a fundamental shift in an organization's culture, strategic focus, and employee engagement. Disaster management agencies that boast a culture of learning reside on the double-loop learning side of Table 1. These organizations' leaders facilitate an organizational climate that is suited to learning. They encourage and facilitate both access to, and cultivation of, knowledge as well as the transfer and interpretation of knowledge.

No one disaster management agency will acquire all the skills, competencies, and experiences necessary for comprehensive disaster management simply because they will not undergo the range of experiences necessary to build these skills and competences. Because they are expected to handle all types of hazards and all phases of the disaster management cycle, we expect disaster management agencies to reside on the double-loop side of Table 1. Consequently, they have to cultivate knowledge as much as they have to capture it.

Reflection is one method of knowledge creation. Greenwood, borrowing from Schön (1983, 1987), suggests that reflective practices facilitate the integration of theory and practice, the correction of errors, and the questioning of values and norms that underpin the organization's operating context. Reflection leads to an understanding of the barriers that limit effectiveness and generates a more comprehensive knowledge base, thereby improving outcomes in future events. Reflection requires a "cognitive post mortem where a practitioner reviews her actions to explore again the understandings she brought to them in light of her outcomes" (Greenwood 1998, 1049). Double-loop learning involves reflections-on-action.

Sadly, many disaster management organizations do not have the time to reflect because of the hectic pace of their operating environment. There are also sometimes large intervals between disasters, which can lead to complacency. In addition, change in leadership and other key staff and impact the organization's culture for learning.

Double-loop learning does not come easy. There must be a strategic emphasis on learning by leaders to overcome the barriers to this form of learning. Many disaster management leaders, knowing that organizations need to learn, grapple

with how to make their organizations learning organizations (Torlak 2004; Milway and Saxton 2011). Others do not learn from past experiences and near misses because there are barriers to doing so.

#### **4 Cognitive, Social, and Organizational Barriers to Double-Loop Learning in Disaster Management**

Jaques (2009) observes that there is extensive scholarship on the proven barriers to effective post-crisis learning. Smith and Elliot (2007) cite a number of cognitive and social barriers to the emergence of double-loop learning crisis organizations. Cognitive barriers include the rigidity of core beliefs, values, and assumptions; the failure to recognize similar or identical situations that happen elsewhere; and the focus on single-loop, or single-cause, learning.

Disaster managers' beliefs, values, expectations, and preferences heavily determine their perception and interpretation of a situation (Smith and Elliot 2007; Sanne 2012; Carroll 1998). Rigidity of core beliefs, values, and assumptions means that managers tend to absorb those pieces of information that fit in with their own beliefs and disregard the information that does not (Torlak 2004; Sanne 2012). This situation often leads to managers intentionally misinterpreting the real threats and stick to the actions that uphold their belief system (Torlak 2004; Sanne 2012).

Disaster managers sometimes fail to recognize similar or identical situations that happen elsewhere because of the frequency with which these situations occur. For instance, event frequency may cause managers to wrongly assume that the deficiencies seen are representative, when they are not (Torlak 2004). They might assume that because they handle routine disaster fairly well, they would be just as successful in dealing with high impact, low probability events.

A focus upon single-loop, or single-cause, learning may bind managers to a losing course of action as they try to refine existing decisions when they should be questioning their basic assumptions (Torlak 2004). For instance, managers who are always putting out "fires," dealing with one problem after another read everything as a fire to be put out.

Social barriers are often wrapped up in political and psychological factors (Smith and Elliot 2007; Torlak 2004). Psychologically, the manager, self-interested in keeping his job and saving face, often distorts the event in the aftermath of the crisis event. As a consequence, the manager ignores the broader implications of the crisis and exposes the organization to future vulnerabilities. In addition, managers often misinterpret the real threats that exist because of constant pressure by political actors to perform. This causes the disaster manager to behave irrationally so as to save his and the organization's reputation. For example, because of political pressure, disaster managers might be quick to act, ignoring lessons that could be critical in successfully resolving crises.

There are also organizational barriers to learning. Simon and others suggest that structure and learning are related in a circular manner. Structure is an outcome of learning, but also determines learning processes (Simon 1969; Fiol and Lyles 1985). A centralized mechanistic structure tends to reinforce past behaviors, while an organic, more decentralized structure tends to allow shifts of beliefs and actions and facilitates greater learning because there is a reduction of the cognitive overload on the individual (Fiol and Lyles 1985). To overcome some of the cognitive, social, and organizational barriers Torlak (2004, 96) recommends that disaster management organizations "should have flexible structures and cultures that motivate managers to find better ways of behaving, or new methods, contexts, and alternatives." The barriers noted above are rooted in the cultural context of the disaster management organization.

## 5 Organizational Culture and Its Importance to Learning

Culture is the climate, learned behavior, and practices that organizations develop over time. It guides the way people work, the way they communicate, and the values they share and is an important explanatory variable in clarifying why organizations succeed or fail (Schein 2004). Culture points to phenomena that are below the surface, that, although invisible, are powerful influences on the organization in important ways. It creates shared values in organizational members and also guides their actions much like an individual's personality does (Schein 2004; Chandler 1990). In the area of crisis and emergency management, McPherson, Elliot, and Antonacopoulou (2010) lament that organizational culture is so little taken into consideration when we assess learning, yet culture is important because it constitutes the organizational context. Learning, they note, is purposeful and contextually specific. The context within which learning takes place shapes the learning process because it provides symbolic undertones for learning. Hence, when we ignore culture in disaster management and how it impacts learning, we miss some of the explanatory richness that culture facilitates.

Culture affects organizations at several levels of operation. At the level of overall business environment, cultural values guide business operations, provide its legal context, and,

importantly, provide the broad meanings by which we interpret business events (Chandler 1990). For instance, disaster management organizations that are focused on technical issues tend to understand crises in technical terms and propose technical solutions. Their culture limits these organizations' assessment of phenomena, which results in them missing cues that are not technically linked. At the sub-organizational level, we belong to socially defined groups that have common experiences that further filter our interpretation of events—subcultures. The prevalence of multiple groups and, consequently, multiple identities provide diversity to values and understanding. This enriches learning (Chandler 1990). Unfortunately, technical values often co-opt other dominant values in disaster management. At the level of the organization, it is the overall business culture that dominates and dictates the values of the organization and its operational context. A business culture that places value on learning promotes a culture dedicated to it and vice versa. Schein (2004) cites research that shows that we can improve organizational performance by creating a certain kind of culture that nurtures inquiry, values performance, and identifies with the entire organization.

This review has several implications. The literature offers a guide to the link between organizational culture and learning. It also identifies necessary attributes of learning and cues us into the variations between single-loop learning and double-loop learning. It shows the importance of double-loop learning to disaster management, but also questions whether this type of learning is possible in disaster management organizations. The disaster and crisis management literature tends to focus on technical, cognitive, and social barriers to learning, ignoring the organizational factors such as structural and cultural barriers. This article shows how organizational factors, including organizational culture, inhibit double-loop learning at the country level. In addition, the literature on learning indicates that the learning organization displays a culture of learning throughout the organization. A disaster management organization might also exhibit different cultures throughout its multiple levels. Moreover, the article pulls together the theoretical knowledge on learning as well as empirical investigation into CDEMA to add to the disaster management and organizational learning literature. The attributes of double-loop learning form an analytical frame for assessing whether CDEMA learns, and whether what it learns constitutes double-loop learning (learning culture).

The following sections draw on the experiences of the Caribbean regional disaster management system CDEMA. These sections present CDEMA's background, and its implicit learning model. They also examine how CDEMA uses knowledge, and whether this application implies single- or double-loop learning.

## 6 Caribbean Regional Background

In the Caribbean, the impact of natural hazards has had serious negative consequences on economic development

(Thompson 2010). Disasters related to hurricanes have been the most frequent hazard, but earthquakes and volcanoes have caused the most loss of life. Since the late 1970s several hurricanes have devastated the region and overwhelmed each territory's efforts to respond (Poncelet 1997). Most notable storms are Gilbert (1988), Hugo (1989), Ivan (2004), Katrina (2005), and Dean (2007). Multiple flooding and landslides caused by heavy rains occurred in between (Thompson 2010; Reliefweb n.d.).

In the last decade, there have been two high-impact, low-probability events in the region: Hurricane Ivan in 2004 and the Haitian earthquake and subsequent cholera outbreak in 2010. These events and the responses to them highlight multiple weaknesses and flawed assumptions in CDEMA. Hurricane Ivan highlighted the multiple, devastating impacts that one storm system could have on several countries. The countries of Grenada, Jamaica, St. Kitts, and Nevis were the most severely impacted. In fact, Grenada was so economically devastated after Hurricane Ivan that that country's government was unable to repay its national debts and had to enter into cooperative arrangements with creditors including the International Monetary Fund on debt repayment terms for the rest of 2004 and 2005 (United Nations Economic Commission of Latin America and the Caribbean 2007). The same hurricane almost completely obliterated Jamaica's agricultural sector, costing the country about 8 percent of its GDP (United Nations Economic Commission of Latin America and the Caribbean, United Nations Development Program, and Planning Institute of Jamaica 2004). Hurricane Ivan slowed economic developmental activities and resulted in long-term persistent economic difficulties (Thompson 2010; Jones, Bisek, and Ornstein 2001; United Nations Economic Commission for Latin America and the Caribbean, United Nations Development Program, and Planning Institute of Jamaica 2004). Overall, James (2005) estimates over USD 5.7 billion in recovery costs from Hurricane Ivan. The Haitian earthquake and cholera outbreak in 2010 killed tens of thousands of people, injured another 300,000, and left nearly one million homeless (Associated Press 2011). The earthquake overwhelmed Haiti's health care and economic infrastructure. It required concerted efforts on the part of bilateral and multilateral agencies as well as from CDEMA to get the disaster in check. The efforts to rebuild Haiti are ongoing.

## 7 The Caribbean Disaster and Emergency Management Agency (CDEMA)

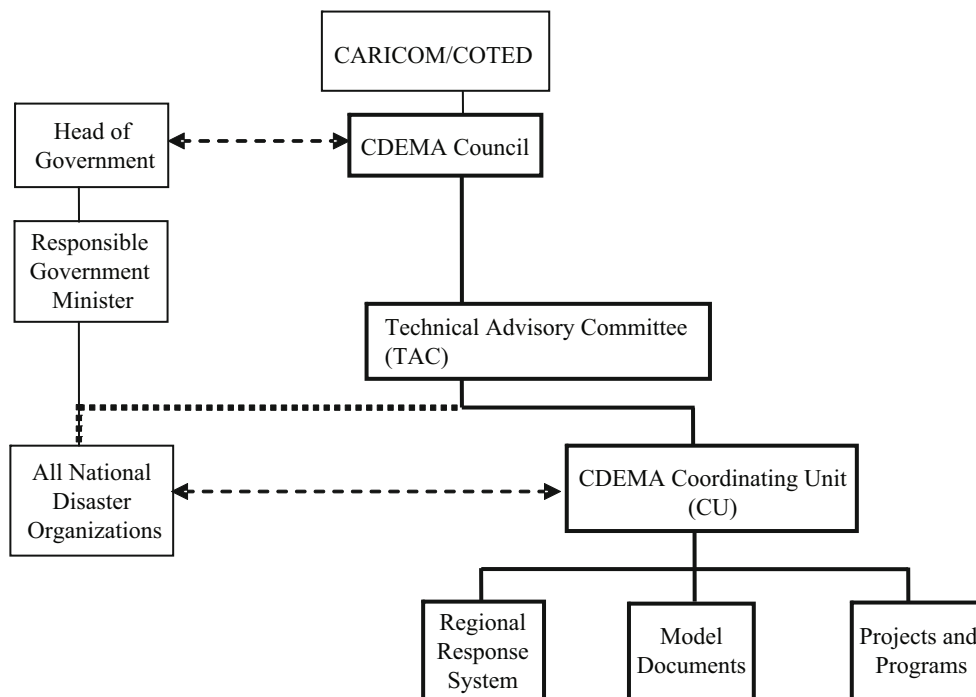
An agreement of the Conference of Heads of Government of Caribbean Community (CARICOM) countries established the regional disaster management mechanism Caribbean Disaster and Emergency Response Agency (CDERA) in September 1991. Its mission was to plan for and respond to disasters in the Caribbean (CARICOM Secretariat n.d.). By September 2009, there was a name change to the Caribbean Disaster and Emergency Management Agency (CDEMA) to

better comport with the shift in focus from disaster response to comprehensive disaster management using the all hazards, all phases approach (PreventionWeb 2009). CDEMA's focus is to plan for and mitigate disaster risks in the Caribbean including a central focus on the interface between climate change and disaster management (CDEMA n.d., a). CDEMA's founding philosophy is that the countries of the region succeed or fail together. As such, the organization adopted common standards for sharing responsibility and common commitments to disaster management (Collymore 2008).

The CDEMA organization is complex and comprises several levels of operation and decision making and multiple vertical and horizontal linkages (Figure 1). It is one of the specialized agencies of CARICOM coming under the portfolio of the Council for Trade and Economic Development (COTED), which is one of CARICOM's seven protocols detailing how it functions. The Council sits atop the CDEMA organization, comprises the heads of government of the participating member states or their nominees, and determines the policies and programs of CDEMA. The Technical Advisory Committee (TAC) is the technical and programmatic advisory mechanism of CDEMA. It comprises the National Disaster Coordinators and representatives of specialized regional bodies, such as those engaged in technological, meteorological, and seismological fields whose programs are directly related to the regional disaster management agenda (CDEMA n.d., b). The eighteen CDEMA participating member states—Barbados, Jamaica, St. Lucia, St. Vincent and the Grenadines, Antigua and Barbuda, Montserrat, Anguilla, Turks and Caicos, the Bahamas, British Virgin Islands, Trinidad and Tobago, Dominica, Grenada, Belize, St. Kitts and Nevis, Guyana, Suriname, and Haiti, sit on the TAC (CDEMA n.d., c).

The regional Coordinating Unit (CU) is an inter-governmental agency that coordinates all the disaster management activities. The CU concentrates on five programming areas: (1) education, research, and information; (2) finance and administration; (3) preparedness and response; (4) mitigation and research; and (5) information and communication technology (CDEMA n.d., d). An Executive Director who is appointed by the CDEMA Council manages the Coordinating Unit.

At the country level are the national disaster offices (NDOs) each with its own partners, systems of operation, governance frameworks, and protocols. There is no standardization of organization name, structure, or title of officers in charge; these vary from country to country (Thompson 2010). National disaster offices are part of the national governments of each country and are under the constant watch of the national governments and other actors in the national political environment. The national disaster offices remain strongly centralized but have relationships with many organizations within and outside of government. They are located at a low level of their government structure: in only a handful of countries they are at the cabinet level, and they are usually situated



**Figure 1. CDEMA organization structure**  
 Source: Revised from Thompson 2010, 33.

in line ministries. This low status was noted as a point of concern in the *Enhanced CDM Strategy and Program Framework 2007–2012* (CDERA 2006). It denies NDOs many of the resources they need, including staffing, funding, and technology and makes decision making difficult. These situations have led to high turnover among national disaster coordinators.

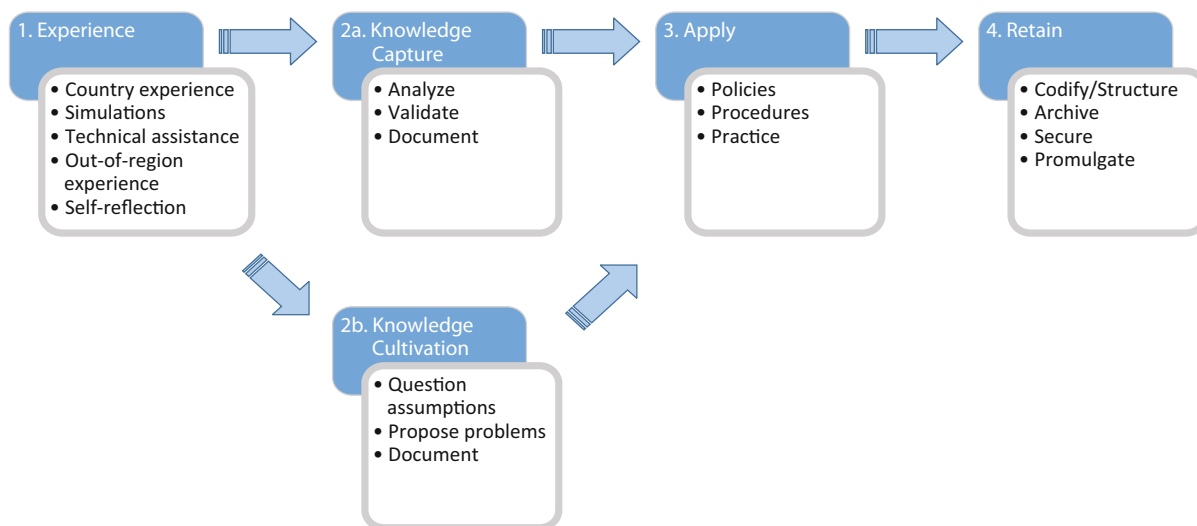
To more fully understand how CDEMA functions, one must not only understand the vertical linkages presented in Figure 1, but also understand the horizontal relationships that exist within CDEMA and between CDEMA and outside partners. The horizontal linkages include CDEMA CU relationships with other regional bodies as well as the NDOs working collaboratively with each other to share knowledge and technical expertise. In addition there are many bilateral arrangements by both NDOs and the CDEMA CU collectively and individually. Although these arrangements cannot be seen on the organization chart, they are important to the overall CDEMA operation. The vertical and horizontal linkages displayed by CDEMA comport with the general consensus from the disaster management and organization theory literature that the network organizational form is the most appropriate organizational form for handling disasters (Takeda and Helms 2006; Waugh and Streib 2006; Roberts 2006). Because the region is resource poor, no single agency has the capacity including technical expertise, technology, and financial resources it needs to effectively manage large-scale disasters when they occur. So, they enter into formal and informal arrangements with those that do.

At the same time, it is not uncommon for bureaucracy and network to coexist within the same organization, even in public organizations (Mintzberg 1979; Perrow 1993; Considine and Lewis 1999; O’Toole and Meier 2004; Josseland, Teo, and Clegg 2006). A hybrid on network and bureaucracy in disaster management facilitates access to capabilities needed during different phases of the comprehensive disaster management cycle, while at the same time promoting good organizational memory for knowledge retention, internal efficiencies, control needed for the routine operations in disaster management, and the ability to coordinate the disparate functional groups that must work together for disaster management to be effective when there are major hazard events.

Because it understands the organizational, national, macro-environmental, and geographic issues—including the need to address climate change as a region of small island states—the regional coordinating unit of CDEMA realizes that learning is a crucial component in managing disaster planning and response. CDEMA utilizes an implicit learning model that entails capturing lessons from wherever they occur, cultivating knowledge, analyzing those pieces of information, and using them to guide regional and national level policy and practice (Thompson 2010). This model is presented in Figure 2 below.

**CDEMA’s Implicit Learning Model**

In my research on CDEMA (Thompson 2010), I depicted the CDEMA learning process (see Figure 2) as a step-wise



**Figure 2. Model for capturing, cultivating, applying, and retaining information**

Source: Modified from Thompson 2010, 257.

iterative process of capturing information from various sources, applying this information to organizational processes, and then refining and retaining knowledge acquired for future use. Figure 2 depicts the learning logic of CDEMA. It shows four stages for capturing, creating, and retaining knowledge. Together these stages show how CDEMA achieves double-loop learning. This process of learning evolved through the CDEMA CU leadership's exploration of ways to increase effectiveness given their resource-poor nature of their institutions and the potential impact of climate change. This section draws heavily upon Thompson's work.

At stage one, CDEMA's regional Coordinating Unit captures information from its observation of various experiences and from national disaster coordinators via regular reports, telephone conversations, situation reports, after-action-reports, and audits. The regional CU also collects information from incidents that take place in countries outside of the region through news reports, best practice reports, contacts with international agencies, and agreements (Thompson 2010).

Stage two comprises two sub-stages: (1) CDEMA analyzes, validates, and documents the collected information, and (2) it cultivates knowledge through events such as self-reflection and simulation exercises. The CU and the CDEMA Board scrutinize the information collected or generated to make sense of events and scenarios and plan for the next steps to be taken. During this stage, CDEMA assesses the relevance and applicability of the information by comparing them with other relevant and available information (Thompson 2010).

At stage three, the application of learning by organizational leaders results in some behavior modification as seen in the policies, strategies, procedures, practices, and model documents. Although CDEMA CU is the driver for learning and knowledge application, it is up to the national disaster offices to implement lessons in order to drive change nationally.

At stage four, information is codified into appropriate categories. Organizational leaders are the agents of information collation, analysis, and change. At this stage, archived information is secured to prevent loss. This information is then promulgated in various reports and models so that those involved with CDEMA or wanting information on CDEMA can access and use that information. This stage is not yet fully developed.

## 8 How CDEMA Uses the Learning Model to Achieve Double-Loop Learning

Caribbean disaster managers describe five broad sources of knowledge capture: Country experiences, simulation exercises, best practices, out-of-region disaster experiences, and self-reflection (Thompson 2010). Together they constitute CDEMA's double-loop learning logic. Table 2 provides a summary of these knowledge sources along with the lessons learned from each source and their application.

### Country Experiences

Learning from country experiences can best be summed up in the lessons learned from Hurricane Ivan described earlier and from CDEMA's response to Hurricane Dean three years later that resulted in significantly less loss of lives and property damage and internal displacement. Heeding the lessons of Hurricane Ivan, all projected storms are now taken seriously. As an example, in preparation for Hurricane Dean, CDEMA did a number of things differently. The CDEMA CU activated the Regional Response Mechanism (RRM), which was placed on standby seventy-two hours before the projected landfall of Hurricane Dean (Arthurs 2008). The National Disaster Committees in the threatened states reviewed their preparedness and response plans and initiated readiness actions. CDERA



**Table 2. Summary of learning modes and their application throughout CDEMA**

Modes of Learning	Summary of Lessons Learned by CDEMA	Application of Lessons Learned
Country experience	Technical and technological capabilities and human resources are areas of weakness for CDEMA. Low positioning of national level disaster offices hinders access to critical resources (Grenada and Dominica are examples); NDOs' performances at the national level hindered overall CDEMA performance	<ul style="list-style-type: none"> <li>– Enhance technical and technological capability in areas of response (seen in excellent Hurricane Dean response);</li> <li>– Improve contingency planning for multi-island hazard impacts; development of regional response mechanisms</li> </ul>
Simulation exercises	Simulation exercises are important to improve systems and processes in disaster management; they are especially useful for planning and system appraisal in resource scarce areas	<ul style="list-style-type: none"> <li>– Improvement in communications and coordination based on tabletop and field exercises (as in Hurricane Dean);</li> <li>– Building community response capability and involving leaders of economic sectors in disaster planning</li> </ul>
Best practices	Introduction of international standards like Hyogo Framework for Action <sup>1</sup> into regional practice allows access to resources for CDEMA through project funding, as well as important lessons from other countries and methodologies for disaster risk reduction	<ul style="list-style-type: none"> <li>– Lessons led to Coordination and Harmonization Council—leads to better optimization of funding, etc;</li> <li>– Introduction of results-based approach (better measurement of progress and also identify/quantify areas of need—more targeted interventions result</li> </ul>
Out-of-region experiences	Mitigation is an important component of comprehensive disaster management (CDM) that needs to be emphasized in the region	<ul style="list-style-type: none"> <li>– Improvements in contingency planning capability;</li> <li>– Mitigation of hazard impact on coastal community thereby boosting community resilience;</li> </ul>
CDEMA self-reflection	How to deliver objectives and leverage limited resources better; Lessons on how CDEMA can become more effective	<ul style="list-style-type: none"> <li>– Better organizing and strategizing for delivery of CDM—e.g. Thematic Coordinating Groups;</li> <li>– Using projects to drive the delivery of CDM and leverage scarce resources;</li> <li>– Strategically filling capability gaps in the CDEMA system by linking with international disaster reduction arrangements (Hyogo Framework for Action)</li> </ul>

Source: This table was refined from one developed in Thompson 2010, 227.

contacted National Disaster Coordinators and government officials to ascertain preparedness levels. None of these activities took place prior to Hurricane Ivan. In addition, both the Eastern and the North Western Caribbean Donor Groups convened meetings, and CDEMA developed an operational plan for worst case scenario in Jamaica and Belize (Gentles 2008). The Pan American Health Organization pre-deployed in Jamaica, St. Lucia, and Dominica to more readily assess the public health needs in the impacted states. The United States Agency for International Development's Office of Foreign Disaster Assistance (USAID/OFDA) deployed a team to Jamaica, and simultaneously stationed a consultant in Dominica to coordinate response activities in the smaller Eastern Caribbean States (Gentles 2008).

The response to Hurricane Dean highlighted the value of the Eastern Caribbean Donor Group now renamed the Eastern Caribbean Development Partners Group for Disaster Management (ECDPGDM). The ECDPGDM was formed after Hurricane Ivan to support regional mechanisms and member states in the smaller eastern islands to facilitate an effective, timely, and coordinated response operation to a rapid onset emergency (United Nations Development Program n.d.). The group was able to provide substantial assistance to Dominica during Hurricane Dean. Given the success of the ECDPGDM during Hurricane Dean, donors collaborated to develop a Northwestern Caribbean Donor Group in order to coordinate donor activities post impact in the Northwestern Caribbean region (Jackson 2008; Mullings 2008).

### Simulation Exercises

CDEMA has learned that when there are scarce financial resources, simulation exercises can help to identify gaps in key areas of operation and also provide insights into what is needed to fill these gaps in order to better respond to future events. Exercise FAHUM is a case in point. This annual field exercise is coordinated by United States Military Southern Command (SOUTHCOM) to help the region improve response coordination, communication, logistics, contingency planning, and improve efficiencies among member countries in the CDEMA organization. By posing different scenarios and attempting to solve problems, simulation exercises allow CDEMA to facilitate its mandate of comprehensive disaster management. Simulation exercises (both tabletop and field) allow CDEMA to be preemptive in planning for disasters. Simulation scenarios help CDEMA to make systemic improvements throughout the system through highlighting successes, failures, and unintended consequence. Simulation exercises offer opportunities for transformative changes and associated improved performance as a result of these changes.

### Best Practices

Best practices come from both the country and international arenas. For instance, international best practice has assisted CDEMA in positioning disaster management on the regional policy agenda. For example, the *Hyogo Framework for Action* (UNISDR 2005) articulated a vision that integrating disaster reduction considerations into public policies and

programs was the most effective way to have disaster management policy instituted at the national level. As a result, the CDEMA Council decided to make mainstreaming disaster management into government policies and programs one of the objectives of the *Enhanced CDM Strategy and Program Framework 2007–2012* (CDERA 2006). Much of the CDEMA comprehensive disaster management benchmarks come from international organizations such as the United Nations International Strategy for Disaster Reduction that promotes the *Hyogo Framework for Action*. Further, CDEMA has learned, based on international best practice, that managing for results facilitates better targeted interventions, monitoring of progress, and measuring of outcomes. CDEMA, then, has integrated results-based management approach into its *Enhanced CDM strategy and Program Framework 2007–2012*.

### Out-of-Region Experiences

Experiences from the 2008 Sichuan Earthquake in China, and the Southeast Asian Tsunami in 2004 have been instructive in helping CDEMA to assess its state of readiness for such large scale, high impact, low probability events (Gentles 2008; Herbert and Peets 2008; Mullin 2008). For instance, by assessing the impacts of these overseas events, CDEMA understood that there were critical deficiencies in mitigation. As a consequence, emphasis on mitigation was an important part of the enhanced CDM strategy for 2007–2012.

CDEMA has also embarked on efforts to mainstream mitigation measures, specifically to mitigate hazard impact on coastal communities. One such example is the testing and subsequent adaptation of the tsunami protocol suite in Antigua and Barbuda 7–9 July 2009 (Smart 2011). This set of tsunami response rules was adopted after the Southeast Asian Tsunami to shore up the regional capacity to detect tsunamis, relay tsunami-related information in a timely manner, and respond to them if necessary (United Nations Educational, Scientific, and Cultural Organization n.d.).

### Self-Reflection

CDEMA does annual self-reflections through its board meetings, conferences, and dialogue with regional stakeholders such as the Caribbean Center for Development Administration (CARICAD) as well as with international aid agencies (Gentles 2008). Through these questioning and strategizing sessions, the CDEMA CU proposed, and the CDEMA Council adopted, several fundamental changes. For example, the name change from CDERA to CDEMA in 2010 was the culmination of this reflection—changing the name would allow the organization to better position itself to acquire the resources needed to achieve the broader comprehensive disaster management (CDM) strategy. The name change comported better with the new focus on all phases of the disaster management cycle, not solely on disaster response.

Reflection on the name change began a decade earlier in the late 1990s after a series of storms devastated the region

and CDERA's management started to question whether a response focus was the right vision or mandate for the organization (Mullings 2008). The discussions intensified in 2006, when the CDERA management again realized that there were gaps in the CDM mandate as developed in 2001 and that it needed to improve its then current strategy. The result was the enhanced comprehensive disaster management strategy 2007–2012, which focused on measurable sector-specific outcomes in four key areas: enhanced institutional support for CDM program implementation at the national and regional levels; effective mechanisms and programs for management and sharing of CDM knowledge utilized especially for decision-making; mainstreaming disaster risk management in the key sectors of national economies such as tourism, agriculture, and healthcare; and enhanced community resilience to mitigate and respond to the adverse effects of climate change (CDERA 2006). The sectors are coordinated by the CDM Coordination and Harmonization Council.

Through self-reflection CDEMA has realized that focusing on economic sectors via Thematic Coordinating Groups to drive the enhanced CDM efforts would be more beneficial than continuing to do so at the national level. For instance, progress reports suggest that using the sector focus has increased awareness and advocacy for CDM and collaborative initiatives on CDM (Rahat n.d.). The sector focus is coordinated by thematic Coordinating Groups, which provides more targeted interventions and yields better results. The sector focus ensures more effective coverage and monitoring. Information from sectors filters up to the national level and is analyzed, documented, and sent to the regional level, which completes a comprehensive assessment of achievements and shortcomings. Guided by the Coordinating Unit, the CDEMA system then implements remedial action.

In sum, CDEMA, guided by the regional Coordinating Unit, not only captures lessons, but also cultivates knowledge and acts upon this knowledge to promote change. CDEMA does this because it wants to detect and correct flaws through strategic interventions so that the organization is not left vulnerable in the future. More fundamentally, CDEMA cultivates knowledge through self-reflection on its fundamental assumptions so as to strategically position itself to perform better in the future. Argyris and Schön (1978) remind us that when we start to question the governing variables themselves, we operate in the realm of double-loop learning.

Senge (1990) instructs us that double-loop learning is generative and strategic. Its perspective surrounds future strategies involved in creating and solving an organization's own problems as well as integration of new and old; its impact is transformative; its outlook is long term; its strategy is active engagements; and its culture is system-wide thinking and self-questioning. Using lessons learned, CDEMA, through the CDEMA CU has questioned governing principles and assumptions by moving from a focus on disaster response to comprehensive disaster management. It has shifted focus from national level planning to a more sector-specific

approach, which involves more people in disaster management efforts. Its stance has altered from passive engagement to a more proactive one in which it foresees problems and tries to solve them through regional and international alliances.

As the examples above highlight, CDEMA does experience double-loop learning. This is seen in the learning activities and changes fostered especially at the regional level. As national level disaster management operations show, inculcating a culture committed to learning is extremely difficult given CDEMA's structure and the cultural variation present among CDEMA participating member states and the regional Coordinating Unit. This is the biggest impediment to establishing the learning culture that Schein advocates.

## 9 Barriers to Double-Loop Learning throughout the Entire CDEMA Organization

Even though the CDEMA CU does practice and facilitate double-loop learning at the regional level, there are barriers, especially at the national level that prevent the entire CDEMA system from being a learning organization. Two different cultures coexist in the CDEMA system. One culture at the regional level is amenable to self-reflection, strategic assessments and intervention, and wide staff involvement. Another culture at the national level wants to learn, but is trapped in a vicious cycle of putting out fires because it lacks human and other resources. This might be because the national disaster offices are so steeped in their national government bureaucracies. The exceptions are countries like the British Virgin Islands, the Bahamas, and Jamaica. In other words, there is a problem-solving culture pervasive at the national level upon which the CU and the Council attempt to superimpose and inculcate a learning culture.

It is important to understand this context and how it impacts learning. Carroll (1998) rightly points out that, bureaucracies tend to drift towards rigidity because of the politics that grow around them and their need for efficiency. This rigidity at the country level is seen in the rules, procedures, sanctions, and political oversight built into national systems. The regional Coordinating Unit is an intergovernmental agency and not as bogged down by the level of political oversight seen at the country level. The CU focuses all its efforts on disaster management and is less constrained by fights over resources than are participating countries. In addition, decision-making is easier at the CU than at the national level where national disaster offices must struggle through multiple levels of decision-making because of their low status. As a consequence, double-loop learning is easier at the regional level.

Structure determines learning processes (Simon 1969; Fiol and Lyles 1985). While a centralized mechanistic structure tends to reinforce past behaviors, more decentralized structure tends to allow shifts of beliefs and actions and facilitates

greater learning (Fiol and Lyles 1985). CDEMA is an organization that displays both network and bureaucratic structures and relationships both at the regional and national levels—the national level is more bureaucratic than networked, while the regional level is more networked than bureaucratic. It is understandable that we see more generative learning at the regional level, while the national level often fails to optimize learning opportunities. At the national level there is a focus on single-loop or single-cause learning in that there are frequent enough emergences that they become routine events, political fallout from handling or reporting them must be dealt with, and the constant struggle to access financial and other resources exists. These conditions mean that disaster managers are constantly responding to issues besides disaster management. As a result, they miss important disaster management lessons.

Learning organizations typically possess a culture committed to continuous learning and change throughout the entire organization. As the case of CDEMA shows there are different cultures and, consequently, different dispositions to learning throughout the various organizational levels. Chandler (1990) observes that at the level of overall business environment cultural values guide business operations, structure its legal context, and provide the broad meanings by which we interpret business events. There are leadership issues at the national level. Because leadership is an important precursor to a culture committed to learning, those organizations that frequently change leadership will not possess a culture committed to learning. Most of the national disaster offices suffer from this malady; there is high turnover at the top. This frequent changing of the guard does not provide a fertile environment for active learning. The barriers to fostering a culture committed to learning in the CDEMA system rest mainly at the national level.

## 10 Conclusion

This article shows that CDEMA practices double-loop learning despite its known barriers. The research question guiding this research was: Is it possible to create a culture committed to continuous self-diagnosis, learning, and change? The evidence suggests that the regional CDEMA CU practices double-loop learning. CDEMA detects and corrects flaws through strategic interventions to minimize future vulnerabilities. CDEMA also cultivates knowledge through self-reflection on its fundamental assumptions and what is needed to succeed in disaster management. These reflections and self-questioning help CDEMA position itself strategically to perform better in the future. The notion of facilitating a culture committed to continuous self-diagnosis, learning, and change is especially important for resource poor regions like the Caribbean, which are vulnerable to external shocks and numerous hazards. As the case of the CDEMA CU shows, resource-poor organizations can learn and leverage double-loop learning to limit their vulnerabilities.

The evidence also suggests that culture and organizational structure are important prerequisites for double-loop learning. In the CDEMA case, this article argues that in the regional CDEMA CU where the structure is more flexible and the leaders promote inquiry and reflection there is double-loop learning. A culture where leaders nurture inquiry, flexibility, and change is more conducive to double-loop learning than one where leaders are bound by political oversight and constant distractions.

Considering CDEMA's culture, structure, national variations, operating agreement, and ability to deliver comprehensive disaster management, there are important questions about CDEMA's future performance. Currently the national disaster offices are distracted by multiple issues, including reporting requirements, and find it difficult to engender effective learning. Should there be a push for each country to build its own learning capability to facilitate double-loop learning? Alternatively, should the CDEMA system continue to rely on the regional CU to be the driver of learning and knowledge generation, and should it continue to be the repository of lessons learned?

If there is a push for each country to build its own learning capability to facilitate double-loop learning, then there must be a reorientation in culture and structure in each member country. Torlak (2004) recommends flexibility in organizational structure and culture that motivate managers to find better ways of behaving, or new methods, contexts, and alternatives. This flexibility includes instilling a new mindset in NDOs geared to anticipation, experimentation, and leveraging strategic knowledge. NDOs are less stable at the top given the high turnover of leaders, and generally have more rigid organizational structures than the CDEMA CU. In addition, CDEMA should address the lack of a unified vision, focus, and objective among its members on learning as a critical mission strategy.

Given the vagaries of frequent changes in political leadership at the country level, as well as the rigidity of government bureaucratic structure and culture, the CU should be given greater authority to support a learning culture at the country level. This move will require some structural changes in the CDEMA organization to give the CU greater impact at the national level. Currently, organizational structural factors of CDEMA and its governance mechanism hinder the regional CU from mandating action at the country level; it can merely suggest or persuade.

## Note

- i The *Hyogo Framework for Action* was adopted at the World Conference on Disaster Reduction held in Kobe, Hyogo, Japan, 18–22 January 2005. The result of this conference was a framework for action on *Building the Resilience of Nations and Communities to Disasters*. The *Hyogo Framework for Action* is promoted by the United Nations International Strategy for Disaster Reduction (UNISDR) and guides many of the strategies and actions taken on disaster reduction and building community resilience globally, including in developing

countries. More information on the *Hyogo Framework for Action* can be found in United Nations International Strategy for Disaster Reduction 2005.

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