Identifying Resilient Actions in Decision Making During Emergencies

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INTRODUCTION

All emergency management phases demands knowledge that is embedded in procedures and also in the minds of people who handle them. Specifically in emergency response, a great amount of contextual information is generated which results from the development of the event, including the unplanned remedial actions carried out by the teams. Part of these remedial actions and decisions are made on the fly because they are not part of the formal procedures. After the event, the understanding and the analysis of these situations are important to refine the emergency plans. Many emergency investigations do this, but they usually concentrate on failures. Our approach is to concentrate on those actions that resulted in success.

Telling stories is a natural way of transmitting tacit knowledge among individuals and groups. Stories are great vehicles for wrapping together elements of knowledge such as tacit knowledge, emotion, the core, and the context. They are a very powerful way to represent complex, multidimensional concepts. While a certain amount of knowledge can be reflected as information, stories hold the key to unlocking vital knowledge, which remains beyond the reach of codified information (Ruggles, 2004).

This article shows how collective stories (Valle, Prinz, & Borges, 2002) could be used for identifying resilient actions during an emergency response. The approach used to analyze the incident reports is based on resilience engineering. This approach is challenging, but the benefits are very useful to the design of response procedures. Among these benefits we can mention the initial understanding of how emergency workers adapt their actions in response to unpredicted situations, the identification of the security boundaries, and the possibility of incorporating new successful procedures in the emergency plans. As pointed out by Cook and Woods (2006), "an important question for resilience management is a better understanding of how the window of opportunity for learning can be extended or enhanced following accidents" (p. 317).

The article also reports a case study where we used the method and the tool (Carminatti, 2006) to recall stories during a large fire in a supermarket in Rio de Janeiro. The stories were told by firefighters who participated in the response to this incident.

The article is divided as follows: the second section reviews the background of collective knowledge recall and the characteristics of the knowledge generated during emergency response situations. The next section explains a method for identifying resilient actions from stories and the group dynamics associated with this process. It also reports an experiment performed by firefighters who used group storytelling to report their decisions and actions during a fire in a supermarket in Rio de Janeiro, Brazil. The following section examines the future trends in the use of the resilience engineering approach in emergency situations and we then conclude the article.

BACKGROUND

The importance of knowledge has motivated companies to develop practices to facilitate its management. Many organizations assign high priority to documentation, but not all knowledge is stored in documents (Desouza, 2003). The experience of its members, their ideas and decisions are also part of the organization's knowledge.

Nonaka and Takeuchi (1995) define these elements as tacit knowledge. It consists of technical abilities: mental models, beliefs, and ingrained perspectives not easily manifested.

When we want to recall an episode that has occurred in the past and which has been witnessed by a group of people, we should count on their collective testimony to try to reconstitute the episode. It usually happens, however, that any individual participant is unable to tell the full story because the individual knows only part of the full event. Only when grouped together do the events make sense. This state is achieved through knowledge exchange and combination. Although this is not enough to guarantee the full reconstitution of the episode, as some events may not have been witnessed or some witness may not be available, the collective knowledge recall is more complete than individual recall reports.

The reporting of an episode can have four versions: the version stored in the minds of the people who witnessed or participated in all or some of the events (the stored version); the version reported by these people, that is, the externalization of their tacit knowledge (the recounted version); the version known by these people, that is, the set of knowledge the participants possess (the tacit version); and the real or true description of the events, which is probably nonexistent (Carminatti, Borges, & Gomes, 2006) (the faithful version). The distinction between the stored and the tacit versions bears explanation.

The reported version is generated when the participants externalize their knowledge about the events they have witnessed. However, during this process they can forget and disregard events they think are not relevant, making the reported version different from the known version. There are also cases where faulty memory, subjective perception, and partial or erroneous knowledge may distort the report. The goal of the tuning/recalling process is to approximate the reported version to the known version. The closer the reported version is to the known one, the better the recalling process is. Thus, the first goal of our method is to reconstruct the story as closely as possible to the collectively known story. In our work we used a group storytelling technique, instead of the more traditional approach, based on interviews.

Before an emergency response story can serve as knowledge transfer, it must be constructed. The assembly of a real story is the process of recalling knowledge from past events that have occurred. This can be an individual or a group task depending on whether the story fragments are remembered by one or more individuals. In the latter case, members of a group contribute to creating a story collectively. This technique is called group storytelling. The knowledge generated by a group storytelling process is usually richer than that generated by individuals interviewed individually (Shen, Lesh, Vernier, Forlines, & Frost, 2002). A group storytelling process develops on and explores possible differences in points of view, is stimulating and dynamic, and promotes synergy among participants.

The idea of using a group storytelling mechanism is simple, but its execution or implementation is not. It depends on the existence of a knowledge management culture as well as that of a collaborative culture. A collective story is more difficult to obtain but in many cases is also richer.

The group storytelling approach has been used in some works. Valle et al. (2002) reported its use for recalling decision processes. Carminatti et al. (2006) compared the group storytelling approach against the interview and the group dynamics techniques, demonstrating the advantages of the first. Schäfer, Valle, and Prinz (2004) applied group storytelling to create team awareness. Acosta, Collaxos, Guerrero, Pino, Neyem, and Motelet (2004) used the group storytelling approach to support the externalization of tacit knowledge.

According to Bertlanffy, as mentioned by Sundström and Hollnagel (2006), a system is "a complex set of elements in [dynamic] interaction" (p. 221). We can consider that the composition of one or more teams of workers responding to an emergency, or even the occurrence of the emergency itself, is a system, inasmuch as it is possible to define the elements that compose it and the objectives of its existence. Therefore, a unit of the fire department fighting a fire or a police unit responding to a hijack event can also be considered a system.

It is possible to define a system's working states and the transitions among them (Hollnagel & Sundström, 2006; Sundström & Hollnagel, 2006). These states are established considering how close the system is to its safety limits and how effectively it reaches the objectives for which it was created. Thus, we consider resilient those decisions that are successful, adopted to guarantee a system's dynamic equilibrium, so as to correct, minimize, or even avoid the effects of an unforeseen

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