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Research paper



The Role of Human Factors in Emergency Management: A Malaysian Company Perspective

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Abstract

Effective emergency management aims to minimize loss during real emergency or disaster. For that reason, Public Listed Oil and Gas (PLONG) companies have conducted numerous emergency response exercise (ERE) to evaluate their capability in handling emergency situations, but challenges in PLONG ERE reports obtained did not clearly identify nor categorized challenges based on emergency management effectiveness. With the objective of identifying challenges and influence of human factors based on elements of emergency management effectiveness, documents were analysed towards PLONG ERE reports in 2015. Results were then discussed and validated by experts where it was found that challenges were identified in each element of emergency management and the number of challenges increases with the increasing Tiers of ERE. Trends were also found at each Tier of ERE indicating that the human factors in each element of effective emergency management where 46% of the challenges are organization structures. It is believed that more detailed studies could be contributed to the understanding and further analyse the role of human factors towards effective emergency management..

Keywords: *Emergency management, emergency exercise, MNSC 20, Human factors*

1. Introduction

Emergency Management, is the managerial process charged with creating the cycle framework of prevention, preparedness, response and recovery [1]. A good prevention and preparedness process may control risk from escalating to incident [2], but properly managed incident may lead to an effective response and recovery process. Hence, it is important to have an effective emergency management. Complying to the international framework on disaster risk reduction [3], Malaysian government have laid out in Malaysia National Security Council directive 20: Policy and Mechanism of Disaster in Malaysia (MNSC 20) [4]. MNSC 20 stated that entities in Malaysia including oil and gas company have the responsibility to developed and test emergency response plan accordingly, together with lead responding agency in Malaysia [1], [3].

Due to this, Public Listed Oil and Gas (PLONG) company in Malaysia has developed and maintain emergency plan and teams conforming to regulatory requirements in managing the physical response to incidents and the associated external issues [4]. In assuring capability and capacity in managing real emergency or disaster, PLONG are required to perform numbers of emergency exercise by each of their entity on a yearly basis [5]. To the extent of the researchers knowledge, the are no studies or analysis conducted in identifying challenges based on emergency management effectiveness [6] and the influence of human factors in managing emergency effectively. Studies by Khairilmizal et. al. [6] found that there are five (5) elements for an effective emergency management and these elements are supported by other studies [7], [8]. The five (5) elements of effective emergency management are as per following:

- command structure
- planning and information management
- communication
- situation awareness
- resources and logistics

Studies by Khairilmizal et. al. [6] which was conducted with lead responding agency in Malaysia, also concluded that the five (5) elements of effective emergency management need to be supported by systems, as experts may not always be available all the time. Based on the five (5) elements of the effective emergency management, it is the objective of this study to identify challenges and the influence of human factors for each element of effective emergency management..

2. Materials and Methods

Public listed oil and gas (PLONG) companies emergency management are based on three (3) tier response protocol according to the severity of the emergency itself. Tier1, Tier 2 and Tier 3 provide a clear demarcation of response control and capability of emergency and crisis teams [4]. For the purpose of this study, 276 PLONG emergency response exercise (ERE) reports that were conducted in 2015 reviewed by researchers. This study which uses

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ERE reports from 2015 considered as beneficial, as the challenges identified was the current challenges in PLONG ERE with the data representing the overall facility in the country.

There are 270 Tier 1 ERE conducted where ten (10) reports were selected based on three (3) criterias which act as limitations for this study. One (1) Tier 1 ERE report was selected from each of five (5) PLONG plants, while one (1) Tier 1 ERE report was selected based from five (5) selected Gas Transmission (GT) which located within Malaysia regions namely southern, northern, central, western and eastern regions. Reports for Tier 1 ERE are selected based on the criticality (highest number) of challenges identified. This proves to be advantageous as it represents the overall facility in Malaysia and covers all five (5) regions as stated earlier. Furthermore, the remaining six (6) Tier 2 and Tier 3 ERE reports were selected in fulfilling these study objectives as both tiers activated their emergency management team.

Understanding and evaluating ERE reports requires a systematic approach for reviewing documents, both printed and electronic materials, hence document analysis method [9], [10]. The challenges identified within all ERE documents are divided into five (5) elements of effective emergency management namely command structure, planning and information management, communication, situation awareness and resources and logistics. These will produce a total challenges for each element. Results were validated using content validity method which is defined as validation of research tool based on credible resources and face validity method which is defined as a test that appears to be valid or accepted by the researcher, field experts including decision makers [11], [12].

Challenges identified in each ERE reports were grouped into five (5) elements of effective disaster management [6]. PLONG technical standards [4], [5] and documents that govern disaster management in Malaysia [11] were used to validate these findings. Furthermore, by utilizing face validity method, these results are then discussed and verified by five (5) emergency management experts consisting of professionals from industries and officers from lead responding agencies in Malaysia.

3. Results and Discussion

Three-tiered response established by Public listed oil and gas (PLONG) company is Tier 1, where emergency situations are within the control and capability of the organization; Tier 2 is defined as tier 1 except for the involvement of external assistance from response agencies and authorities, and; Tier 3 is a situation where the emergency response is beyond the control and capability of the organization in which the crisis requires involvement and management of external response agencies or authorities as listed in MNSC 20 [3], [4]. From 16 ERE reports, a total of 128 challenges were identified.

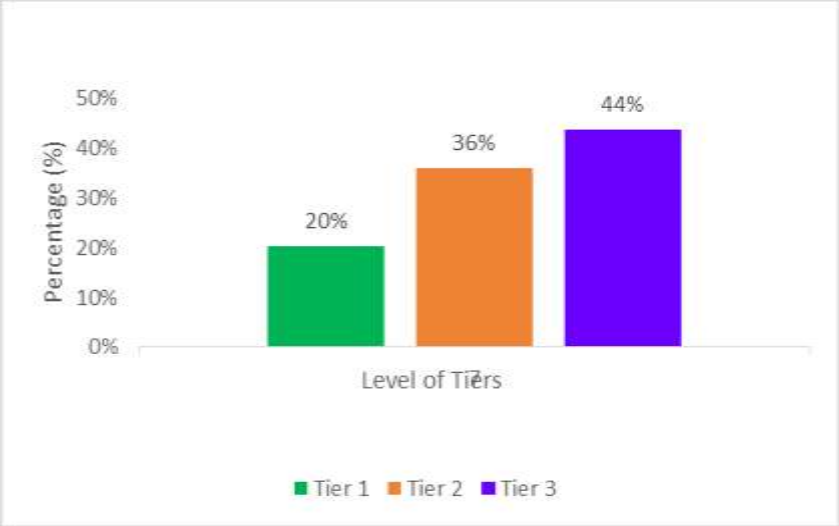


Figure 1: Total of challenges during ERE based on tiers

Figure 1 shows that although only six (6) Tier 2 and Tier 3 ERE reports were used in this study, the percentage of challenges identified exceeds ten (10) Tier 1 ERE reports. This shows that with the increasing level of disasters (Tiers), percentages of challenges are also increased as analyzed in Figure 1. In overall, Tier 3 ERE reports contribute up to 44% of overall challenges identified comparing to 36% of Tier 2 ERE and 20% of Tier 1 ERE.

Detailed studies of each tier's ERE report found that, in Tier 1 ERE reports as identified in Figure 2, command structure contributes to 27% of total challenges identified, 0% for planning and information management, 23% for communication, 12% for situation awareness and 38% for resources and logistics. This data implies that there are no planning and information management challenges during Tier 1 ERE due to the reason of the emergency response team activated within the facility did not engage much in planning information management [4].

Tier 2 ERE reports in Figure 3 shows that command structure contributes to 33% for resources and logistics, 24% from the command structure, 22% for communication, 11% for both situation awareness and planning and information management respectively. In addition to this, Tier 3 ERE reports as analyzed in Figure 4 also shows that there are challenges identified at all five (5) elements of effective emergency management [6], [7] where, command structure contributes to 46% of total challenges identified, 20% for resources and logistics, 16% for communication, 14% for situation awareness and 4% for planning and information management. During Tier 2 and Tier 3 ERE, there are numbers of challenges identified for planning and information management were due to the involvement of emergency management team and crisis management team in managing the overall emergency [4].

3.1 The Role of Human Factors in Effective Emergency Management

Analysis of the results indicates a significant trend on the influence of human factors in the identified challenges. The researchers found that the higher the needs of human involvements in elements of effective emergency management, the higher the number of challenges identified. Tier 1 and Tier 2 emergency response exercise (ERE) challenges represented by Figure 2 and Figure 3,

shows that there are increasing percentages of challenges with the increasing number of human factors.

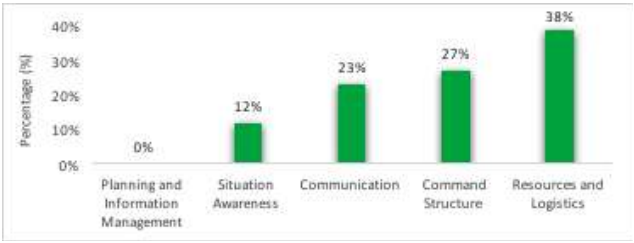


Figure 2: Types of challenges based on Tier 1 ERE

This is supported by challenges identified in both ERE reports where it is found that percentage of challenges increase from the elements of planning and information management; situation awareness; communications; command and control; to resources and logistics.

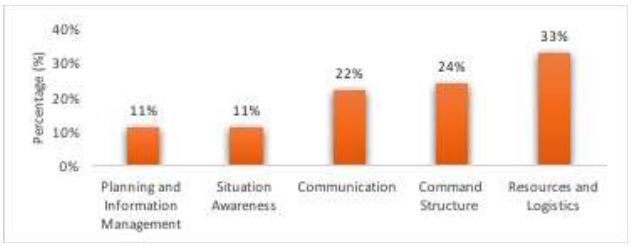


Figure 3: Types of challenges based on Tier 2 ERE

Compared to Figure 2 and Figure 3, there are some changes at two final elements namely resources and logistics, and command structure in Figure 4. this is due to the reason that during Tier 1 and Tier 2 ERE, roles and responsibility of management team are based on pre-defined roles and responsibility with the very minimum involvement of outside agency [4].

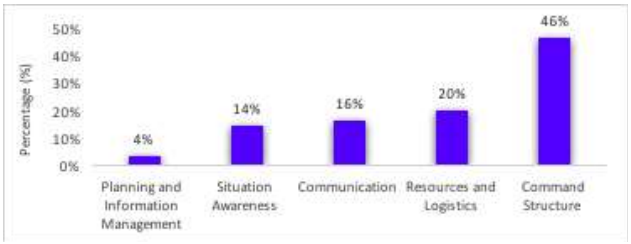


Figure 4: Types of challenges based on Tier 3 ERE

Comparing to Tier 3 ERE, the Involvement of multi-agency from outside contributes to the increasing percentage of challenges in the elements of command structure.

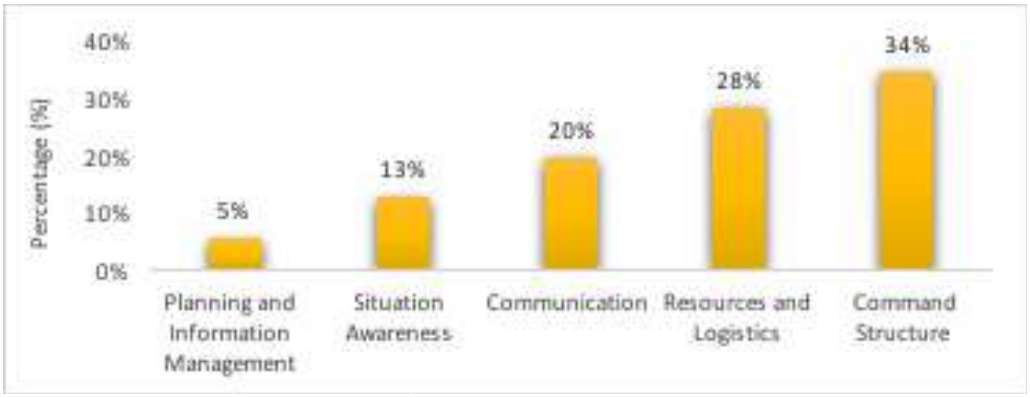


Figure 5: Types of challenges based on all three (3) tiers ERE

Figure 5 summarizes the whole results of Tier 1, Tier 2 and Tier 3 ERE challenges. It is found that there are increasing trends from elements of planning and information management; situation awareness; communications; resources and logistics; to command and control. These increasing trends also show the influence of human involvements in each element of effective emergency management. With 34% of challenges identified in the elements of organization structure, the researchers' is in the opinion that the more the involvement and contribution of humans during any emergency response and management, the more challenges it is in managing emergency effectively.

4. Conclusion

Studies have shown that challenges identified in Tier 1 to Tier 3 PLONG ERE contain the elements of effective emergency management namely command structure, planning and information management, communication, situation awareness and resources and logistics. Analysis of the challenges identified also shows that there are increasing trends from planning and information management; situation awareness; communications; resources and logistics; to command and control. These trends are believe to be influenced by human factors towards effective emergency management. Researcher also believed that future detailed studies can be done in understanding the role of human factors towards effective emergency management, as these studies limits only to identify challenges. These challenges can be detailed out even further to understand the role of human factor in effective emergency management.

Acknowledgement

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