The Role of Key Early Warning Indicators in Crisis Management: Analytical Review

Ibrahim Al Luhaidan, Daifallah M. Alrazeeni

Ministry of Interior Saudi Arabia, King Saud University

Abstract: This study came to identify the role of applying key early indicators in managing crisis through answering the following main question: What is the role of the key early indicators in crisis management? **Methodology:** The study used an analytical descriptive approach based on induction, analysis, and comparison of the literature on early warning indicators, crisis management, its divisions and how to be built. Subsequently, the study achieves answers for the study questions by analyzing and inferring the reviewed related literature. **Results:** Key early warning indicators for crisis management play a major role in the notification and information about the imminent occurrence of risk that cause the spread of crisis. This helps to move forward in a proactive manner towards the crisis before it occurs. The successful role of key early warning indicators in crisis management requires certain characteristics. It should be a real indication of the imminent crisis and valid. **Conclusion:** The study concludes that there is need for key early warning indicators for their effective role in assisting senior leaders in taking proper decisions. The higher management of the organization should select the appropriate and qualified planning team and develop their skills.

Keywords: Crisis; Key early warning; Indicators

1. Introduction

Early warning indicators play a major role in the effective crisis management and can lead to the right action in a timely manner. Decision related to crisis requires paying attention to these indicators. Organizations are surrounded by risks that may turn into crisis and develop into disasters. Preparation, prevention and control of crisis when occurs is compulsory. This can be achieved by developing early warning indicators to predict crisis before it occurs to deal with it properly.

Proper and effective interaction with early warning indicators of crisis requires primarily, contentment and assess the extent of their role. This comes through knowing the role that can play in protection and preservation of the organization, especially the key early warning indicators.

This study came to identify the role of key early warning indicators in managing crisis through answering the following main question: What is the role of the key early indicators in crisis management?

The answer to the main study question requires answering the sub-queries; Identify the key early warning indicators in crisis, determine how can they be built up and what is considered necessary when building and using them?

2. Methodology

The study used an analytical descriptive approach based on induction, analysis, and comparison of the literature on early warning indicators, crisis management, its divisions and how to be built. Subsequently, the study achieves answers

for the study questions by analyzing and inferring the reviewed related literature.

3. Theoretical background

Crises: Are critical problems for organizations and require rapid movements in a non-conventional way to control and reduce their effects. Crises are different from other routine problems that organizations experience in a variety of merits and characteristics in surprise, threat, and short response time[1,2]. Dealing with crisis properly requires following pattern of behaviors in the administrative, legal, or social levels. Otherwise, crisis will cause physical and moral damage[3].

Early Warning: Provides immediate information about the imminent occurrence of the crisis using variety of visual, audio and written media[4]. It helps to identify the dimensions of the situation to take the necessary action before it developed further[5]. That requires declaring a suitable state of emergency and control the source of threat and reduce its impact[6]. Such move comes as a result of pre-planning process that proceeds crisis, making crisis management a preventive initiative rather than a reaction management[7].

Early warning serves as alerting about potential hazards and discovering the reasons and signals that predict crisis in the stages of latency and formation before its aggravation and destructive[8]. Its construction and design are considered one of the main functions of the state in order to preserve its security and stability. It is also a key and inevitable function that all organizations need to maintain and protect themselves from fall or collapse[6].

Early warning is effective when it succeeds in informing the concerned organizations about when is the crisis. It needs to be built on the basis of accurate, reliable, up-to-date and thoroughly analyzed information. Therefore, when false alarms repeatedly occur, it is an indication that the early warning system is ineffective. However, in case the warning is correct but it is not taken seriously by the organization, it is pointing to irrationality of its management[8].

The implementation of the early warning system aimed to achieve several objectives. It reduces the effects of crisis or at least mitigate its damages[9]. It gives the opportunity and time for those who are at risk to react. It increases confidence in crisis-related agencies. It establishes channels of communication and coordination between the relevant authorities. It determines the exact timing of crisis to help to identify, control and reduce their impact[9].

The use of the early warning system requires its division into levels. They are encoded for shortening either in colors (green-yellow-red) or in numbers (1 2 3) or letters (A B C). Therefore, each stage and level has method and specific procedures to deal with it. A name or description is given for each level. As for the number of levels, there is no limit, where they vary according to the risk, its sensitivity and impact. However, it is common, especially in security and administrative crisis, to be divided into three levels[10].

Indicators: Indicators are signs and indications that are generally used in two main dimensions. First, it's used to monitor, measure and evaluate the progress towards achieving the objectives of the organization, including indicators of performance and production. Second, it is used to identify the extent of risk and determine the current situation and the consequences; these are the early warning indicators which are capable of predicting future risks[11].

The main function of the indicators is to measure a particular phenomenon, processes or system. They are used for assessment, control and management as well[12]. In order to reach effective indicators, several of conditions are required. They should reflect the element to be measured directly, have sensitive nature, be measurable and based on valid data[12].

4. Literature review

A study developed a set of performance indicators for each administrative units within hospitals. It analyzes the nature of their respective work to determine the extent of performance efficiency within each unit. The researcher treated the development of performance efficiency indicators in hospitals units, which establishes and identified indicators properly and develop them on continuous basis[13].

Another researcher identified the readiness of the security and safety managements to cope with crisis through a survey study of workers at the Royal Commission for Jubail and Yanbu and whether they have been experienced to previous crisis and how they handled them, their causes, ways and means to enhance

the role of security and safety managements. The study focused on early warning indicators as a part of readiness to cope with crisis[14].

Indicators and standards were built in a study through which administrative and field performance are measured, for promotion of virtue and prevention of vice centers in Riyadh. The model thought to be applied to all of the general presidency and its branches. The study focused on the role of proper building of early warning indicators[15].

A system of key performance indicators was designed through which performance can be measured at King Abdulaziz University in. The measurements can be adapted by different university branches. This study, interested in the construction process in order to have effective early warning indicators[16].

In a project of Improving Safety and Security in Public Surface Transport (ISSPTS) aimed to develop indicators for the safety and security of public surface transport in Europe and to set standards to achieve these indicators. This study identified how the early warning indicators can be built up and their impact on its role and efficiency in crisis[17].

A reported implementation of the key performance indicators for universities in the UK that have already been prepared in 2006. The project were welcomed by 89 universities out of 100 at which the indicators were presented. In 2008, this study was conducted, which included a report on nine universities in England, Scotland and Wales using these indicators. The aim was to identify the opinion of British universities in the implementation of key performance indicators[18].

Important methods of developing early warning indicators in the field of economic crisis was presented. It included a theory of categorize early warning indicators through the vision of the perspective on past financial crisis. It aimed to deal with the mechanism and methods of developing early warning indicators for crisis[19].

This study identified the role of early warning indicators in effective crisis management and the ability to reduce crises impact s. Achieving this by identifying how they are built and the reasons for failure in dealing with them effectively. Therefore, this study is different from the previous studies, as it addresses different dimension. Nonetheless, The previous studies have been utilized throughout the phases of this study, starting with setting the questions, passing through theoretical framework and ending with the findings and recommendations.

5. Answering questions of the study

The following are answers for the sub-questions of the study through which the main research question was answered accordingly:

First; identify the key early warning indicators in crisis?

Key performance indicators are often used by organizations' senior leaders in order to manage, monitor, evaluate and measure the performance, as linked to the vision and strategic objectives. Key indicators are carefully selected towards a particular process or system to be achieved according to specific standards and criteria. These indicators can be used as early warning indicators through a reverse reading of them. In this study, the idea of key performance indicators will be used to be converted into key alarm indicators, where the higher management will monitor them to detect and respond to potential crisis and to act appropriately towards them.

Second, how can key early warning indicators built up in crisis?

Building early warning indicators is an important part of the crisis pre-planning process and is built according to several steps:

Step 1: Identify the most possible crisis: This requires in depth research and hearing from and brainstorming sessions with workers of knowledge and experience. This is significant to identify all potential crisis associated with the organization or its objectives and functions. Afterward, present to a matrix of potentiality to identify the degree of its potential occurrence and severity (**Figure 1**). It is located in (Box 1) because of its probability and dangerousness.

Figure 1. Potential crisis matrix

Figure 2. Potential risks matrix

Figure 3. Potential scenarios matrix

Step 2: Identify the most significant risks leading to crisis: Once the most possible crisis have been identified for a specific phenomenon, system or process. All risks that cause each potential crisis will be quantified, and then presented on the potentiality and risk matrix to determine the degree of its potential occurrence and severity (**Figure 2**), which is located in (box 1) because it is the most likelihood and dangerous.

Step 3: Identify the most important scenarios for each crisis: The scenario is a creative approach aims to draw the potential images for the future of the phenomenon, system or process of interest. It is inclusive for all factors influencing it[5]. The scenario is used through drawing a imaginary map for each potential crisis. These images are obtained through the launch of imagination, lateral thinking and comparison. That are

performed by the research data collected and summoning previous experts and experiments. Subsequently, they are presented on the scenarios matrix to identify the degree of potential occurrence and its degree of seriousness (**Figure 3**), where the potentials in (box 1) are chosen being the most important possible scenarios, and then a full conception is developed of what each scenario can be.Step 4: Develop plans to meet the potential scenarios, taking into account the influencing factors and circumstances associated with the scenario. Political and social situations, identifying the expected parties to be involved in the crisis, their relationship and impact, and the plan are required to include all aspects of handling with the crisis, especially the media and logistics.

Step 5: Building Key Early Warning Indicators for potential crisis: Once the identification for potential crisis is completed, the crisis planning team will build key early warning indicators. Therefore, the potential crisis can be predicted for the purpose of prevention and preparedness.

Step 6: Select the appropriate measurement for each indicator: Once the key early warning indicators have been identified, a mechanism is set by which the positive and negative change in indicators is measured. It is–preferably-determined by quantitative measurement away from qualitative, where quantitative measurement is characterized by stability, objectivity, easy to read and rapid detection of any changes or shifts that may occur (**Figure 4**).

Step 7: Identify members of the team to manage potential crisis: Crisis management is difficult to be administered by one person or through one view. It requires the formation of a working team to manage crisis. Among the team's tasks, monitoring the key early warning indicators and balance in the team's performance for achieving success.

Step 8: Simulation: Come as practical tests on the ground for the same community to ensure several measures. The safety of the plans, employees' understanding and gap between the existing potential and the required skills identified. In case, it's difficult to apply, models can be used, which is implemented through Imagining the expected situations. Therefore, appropriate procedures are made to assure the successful implementation of this step.

Step 9: Designing a Crisis Management Card: This step comes to arrange the above to refer to it when necessary. The card contains all the basic information about each possible crisis in clear and concise manner. Card details are designed according to the following procedures; First: Identify the required information for each card. Second; Numbering and encoding cards for easy reference. Third; Enclose the details and demographic information such as names of the experts, employees, relatives and their contact details. Fourth; Transfer the card to the electronic system, where the indicators need to be read automatically. Fifth; Continuous improvement of cards: through permanent review, updating and the necessary amendments (**Figure 5**).
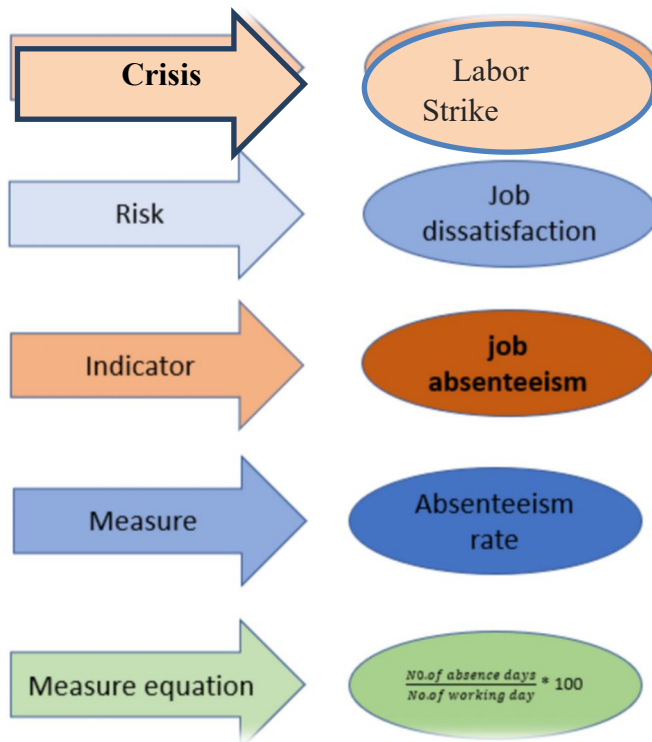
Figure 4. Building key early warning indicators model

Crisis Management Card			1
(1/1) (Crisis Title) poor trust of customers in the organization' credibility			
(1/1/1) Risks lead to crisis	(1/1/2) Causes related to risks	(1/1/3) Early warning indicator	(1/1/4) Indicator relative weight
Labor strike	Job dissatisfaction	Job absenteeism rate	%
(1/1/5) Indicator measuring mechanism	(1/1/6) Risks rate		(1/1/7) Precautions procedures
Absenteeism rate $= \frac{\text{N0. of absence days}}{\text{No. of working day}} * 100$	(1/1/6/1) Safe / (1/1/6/2) Caution / (1/1/6/3) Risk		
(1/1/7) Indicator reader	(1/1/8) reading period		
(1/1/9) Current performance description	(1/1/10) Risk reporting mechanism	(1/1/11) Crisis manager	
(1/1/14) Expected scenarios and procedures for its management and potentials			
(1/1/14/1) Expected scenarios	(1/1/14/2) Main procedures		(1/1/14/3) Special Potentials
(1/1/14/1/1)	(1/1/14/2/1)		(1/1/14/3/1)
	(1/1/14/2/2)		(1/1/14/3/2)
(1/1/14/1/2)	(1/1/14/2/3)		(1/1/14/3/3)
	(1/1/14/2/4)		(1/1/14/3/4)

(1/1/14/1/3)		(1/1/14/2/5)		(1/1/14/3/5)	
(1/1/14/2/6)				(1/1/14/3/6)	
(1/1/15) General potentials		(1/1/16) Attachments		(1/1/17) Notes	
(1/1/15/1)		(1/1/16/1)		(1/1/17/1)	
(1/1/15/2)		(1/1/16/2)		(1/1/17/2)	
(1/1/15/3)		(1/1/16/3)		(1/1/17/3)	
(1/1/15/4)		(1/1/16/4)		(1/1/17/4)	
(1/1/15/5)		(1/1/16/5)		(1/1/17/5)	
(1/1/15/6)		(1/1/16/6)		(1/1/17/6)	

What is considered necessary when building and using key early warning indicators?

In order to access key early warning indicators, number of issues should be taken into account. (1) Respect the external conditions[20]. (2) Develop indicators for monitoring movement with big impact for proactive action to deal with the immediate cause. (3) Use accurate and documented data for building the indicators[19]. (4) Signs of the indicator must be valid. (5) Interaction with false indicators, which is called noise. (6) Wrong reading of the indicator can lead to counterproductive. (7) Indicators do not tell everything but give a snapshot of the situations. (8) Not every statistic is an indicator. (9) Select the appropriate timing for reading the indicators.

6. Results

The answer to the sub-questions has led subsequently to the answer of the main research question. Key early warning indicators for crisis management plays major role in the notification and information about the imminent occurrence of risk that cause the spread of crisis. This helps to move forward in a proactive manner towards the crisis before it occurs. Nonetheless, the distinctive role of the indicator comes from its follow-up and monitoring which is a of the organization's top management. These indicators are geared towards risks that can cause crisis, which means that they are not directed at risks with low or limited effects. These indicators are few, which make it easy to monitor. At the same time, they improve the performance in the organization and lead to a reduction in effort and cost which are being exerted in monitoring a wide range of indicators.

The successful role of key early warning indicators in crisis management requires certain characteristics. It should be a real indication of the imminent crisis and to measure what was set for it. It should be followed up and monitored by the higher management. It should ensure that the measurements are digital for easy reading and reduce the number of judgments. It should not be read in isolation from the circumstances surrounding it. It need to seek alternative indicators if the original ones cannot be tracked due to the high material cost or impossibility of obtaining correct and accurate information. It need to be monitored periodically and to make necessary updates and adjustments.

7. Conclusion

The study concludes that there is need for key early warning indicators for their effective role in assisting senior leaders in taking proper decisions. The main recommendation in this study is that higher management of the organization should be interested in key early warning indicators. They should select the appropriate and qualified planning team and develop their skills. In addition, higher management should support crisis management and planning team and conduct research on the possibility of using the stable indicators as early warning indicators.

Limitations of the study

This study is limited in its substantive limits on the role of key early warning indicators in crisis management.

Authors contribution

The entire work has been done by the Authors equally. The authors have chosen the topic, design, completed collecting and analyzing references and

interpretation. Also the authors did their best in analyzing the results and revising it critically for significant intellectual content.

Conflicts of interest

No conflict of interest was reported by the authors.

Acknowledgement

References

1. Hermann C. Some consequences of crisis which limit the viability of organizations. Administrative Science Quarterly 1963. 8: 61-82.

2. Ulmer R, *et al*. Effective communication with crisis: transition from crisis to the opportunity. Dar el fajr for publishing and distribution, Egypt: Cairo, 2015.

3. Al Musaadah M. Crisis management: Introductions - Concepts – Operations. Dar althqafah for publishing and distribution, Jordan: Amman, 2012.

4. Al Qarni A. Early warning methods and their impact in the prevention of fire in industrial facilities. Thesis for master degree in science in security sciences, Naif Arabic university for security sciences, Saudi Arabia: Riyadh, 2001.

5. Al Thunayyan A. The strategy of security media in addressing crisis. King Fahad security college, Saudi Arabia: Riyadh, 2012.

6. IFRC. Community early warning systems: Guiding principles. International federation of red cross and red crescent societies, Switzerland: Geneva, 2012.

7. Al Shaalan F. Crisis management: the foundations - the phases –mechanisms (3rd edition), Saudi Arabia: Riyadh, 2009.

8. Al Shahrani S. Management of security crisis operations. Naif Arabic university for security sciences, Saudi Arabia: Riyadh, 2003.

9. Babecky J, *et al*. Banking, debt, and currency crisis early warning indicators for developed countries. Conference paper submitted to the of the European central bank. Germany: Frankfort, 2012.

10. Abo Hayyah S. Effectiveness of early warning methods in the prevention of dangers of floods. Thesis of master degree in Security Sciences, Naif Arabic University for security sciences, Saudi Arabia: Riyadh, 2013.

11. Parmenter D. Key performance indicators, john wiley & sons, inc., USA: New York, 2010.

12. Raddad K. Environmental indicators as part of sustainable development indicators. Paper presented at the second Arab statistical conference, Libya: Sirt, 2009.

13. Nassani A. Indicators of performance measurement in hospitals: Paper presented for the conference on trends in the management of public and private hospitals in the Arab world, Egypt: Cairo, 2002.

14. Al Sheikh B. The extent of the managements of safety and security readiness to meet crisis and disasters. (Master thesis in administrative sciences, Naif Arabic university for security sciences, Saudi Arabia: Riyadh, 2008.

15. Al Twaijri A. Building standards and indicators to measure the field and administrative performance for centers of the commission for the promotion of virtue and prevention of vice in Riyadh. Al Majmaa University , Saudi Arabia: Al Majmaa, 2009.

16. Damanhuri Z. Towards building a system of key indicators to measure performance at King Abdulaziz University. King Abdulaziz University, Saudi Arabia: Jeddah, 2009.

17. ISSTE. Key Performance indicators measuring safety and security in European public service transport, Improving safety and security in public surface transport (ISSPTS), EU Lifelong Learning Program 2007- 2013 Leonardo Da Vinci, European Union (EU), 2007.

18. Greiwe J, Schönbohm A. A KPI based study on the scope and quality of sustainability reporting by the DAX30 companies. Institute of management Berlin at the Berlin School of Economics and Law (HWR Berlin), Jermany: Berlin, 2011.

19. Babecky J, *et al*. Early warning indicators of economic crisis. Journal of Czech National Bank, 2012.

20. Ching S, *et al*. A study on key performance indicators for basic education in Taiwan. National academy for educational research, Taiwan, 2013.