Optimizing Construction Crises Management by Fuzzy Logic

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***Abstract*—**Construction industry is always subjected to the various crises. Minimizing their harmful threats and maximizing their utile opportunities would be the goals of an optimization process. In this regard, any progress could be of interesting to the construction project managers. Fuzzy logic can improve the quality of project team to evaluate crisis. The mathematical techniques of fuzzy knowledge would be beneficial to achieve the optimization process.

***Keywords*—**Construction, Crisis, Crisis Management, Fuzzy Logic.

I. Introduction

ALL areas of human efforts in a process, including building construction, could be optimized to get better of them. Depending on the type of a system, various approaches may be performed. However, the main objective of optimization is to obtain the best results by maximizing desired factors and minimizing undesired ones.

Building construction refers to the process of combining structure to existent property managed by a construction project manager. When it comes to talk about project, as a temporary undertaken endeavor to produce a unique result (PMBOK), various knowledge areas should be considered. Risk management, in this issue, is a knowledge area of interesting to the experts who are concern with crisis. As a vague and contingent event, risk may create or lead to a crisis which is an unexpected threat to important goals and creates uncertainty. When it comes to deal with the incertitude, this is where fuzzy logic would be of assistance.

Although, fuzzy logic deals with unclear issues, however it is an organized and mathematical method of handling inherently imprecise concepts. Thanks to the fuzzy logic, it is achievable to quantify the effects of uncertain phenomena. This ability could be beneficial, when you are going to analyze issues in crisis management criteria.

II. Construction crises management

At the first, it would be beneficial to describe crisis and crisis management. Generally, a crisis is a situation faced by an individual, a group or an organization, which they are unable to cope with by the use of normal routine procedures [1]. Crises may harm the organization due to unplanned changes. Normally, they are deemed to be negative changes, especially when they happen suddenly without any warning. In this situation, it requires an immediate and decisive reaction while there is not enough and clear information. Here, it should be noted that sometimes crisis leads to positive conditions. The word crisis in Chinese is composed of two characters. One represents danger and the other represents opportunity (A quote attributed to John F. Kennedy) [2].

Wielding such potential contingencies, a plan or process should be designed by organization. Crisis management is a dynamic and continuous process that includes both proactive actions with the aim of identifying the crisis, planning a response, confronting, and resolving the crisis. Such a process should comprise three time intervals which are before, during, and after the crisis. Before the crisis is focused on two items which are issue analysis and early warning systems [1]. In this paper, these two items are of importance to be studied.

One reason so many companies fail to take steps to proactively plan for crises, is that they fail to recognize the possibility of any crisis occurring. Accordingly, first steps of crisis management are issue analysis and formulating early warning systems. This includes recognizing potential causes of crises and their relations [1].

In the field of architecture and civil engineering, construction is a process that consists of the building or assembling of infrastructure. Normally, various experts should collaborate as a project team to accomplish the process of adding structure to real property. Actually, large scale construction is an exploit of multitasking including designing, scheduling, budgeting, safety, procurement, logistics, and many other jobs. Considering all these variety of tasks, skills, knowledge, processes, and materials make it clear that construction is severely subjected to crises. This is why developing a crisis management outline is an important step in construction planning.

In general, construction business is strongly subjected to economical crisis. However, it may also have a situation involving information or technology breakdowns, economic and market impacts, and relationship or management issues [2]. No matter the kind of emergency, a crisis requires action to maximize control over it and minimize its potential impact. When it comes to talk about maximizing benefits and minimizing dangers, optimization process is of great importance.

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III. OPTIMIZATION BY FUZZY LOGIC

Optimization means the design and operation of systems or processes to make them as good as possible in some defined sense. The approaches to optimizing systems are varied and depend on the type of system involved, but the goal of all optimization procedures is to obtain the best results possible subject to restrictions or constraints that are imposed (McGraw-Hill Science & Technology online encyclopedia).

The key step in optimization is to acquire the mathematical description of variables involved in the system to be optimized. Also, it is essential to define the relations between variables. However, crises are unplanned and sudden events introducing harmful results. This issue makes it difficult to quantify variables and their relations to select computational solution. This is where the art of fuzzy logic comes up.

Performing fuzzy-based evaluation would be the most efficient method to do threat analysis and to improve scenario planning. In my point of view, however, this technique could be a part of an algorithm to plan crisis management. Generally, before any planning, it is necessary to consider potential variables may introduce crisis. In this issue, a brainstorming session is the best method to pull out intrinsic information from professionals. This session may be repeated to consider the widest possible range of variables (It is a main step of issue analysis that should be performed in the "Before the Crisis" time interval).

Now, a list of variables has been created to define possible crises. Some items might be easily perceived by the mind. However, sometimes more than one factor would be considered in crisis management. In this regard, a logical combination of reactions should be defined through a systematic approach. Fig. 1 displays the block diagram of a system which is developed to optimize managerial decision-making. The core of system is an Infer Machine to map verbal data and alert report into fuzzy space. This is necessary to perform mathematical inference. Knowledge base supplies articulated data and information which are polled out of professionals' mind via brainstorming sessions. This knowledge base may be updated on a regular basis.

The output of this system will be a set of comparable numbers indicating the impact degree of each variable. This could be an efficient measure to assist decision-makers in management group. It is clear that a number would be better than a written report to compare and make a precise decision accordingly. In fact, the art of fuzzy logic here is to quantify the influence of different variables in upcoming crises. Some of factors may introduce less impact and some more. Hence, it is achievable to categorize variables in accordance with their impact degree. Now, by minimizing the effect of worst variables as undesired ones, it is possible to optimize crisis management. This is the main role of optimization process.

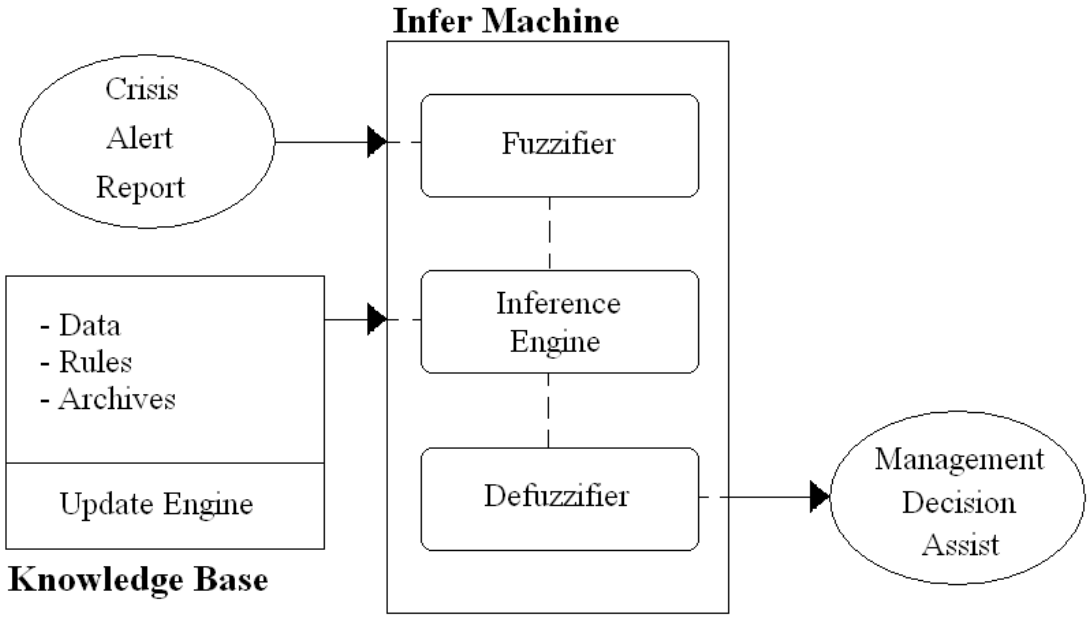

Fig. 1 Block diagram of optimizer system

IV. Conclusion

Every improvement on managerial efforts could be a kind of optimization. Cancelling undesired factors and declining unsought impacts on construction projects will optimize process to attain maximum efficiency. This is achievable using fuzzy logic techniques applicable to prepare quantified results from vague items.

References

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Hamid Shafaei Bejestani was born in Tehran/Iran at 1966. Hamid Shafaei received his B.Sc. in electronic engineering at Ferdowsi university of Mashad in 1989 and master in project management at East Industrial Management Institute in 2005.

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