

Research Article

The Consequential Problems of Unexpected Events for Human Element and Construction Organizations

¹Amir Khosravi and ²Abdul Hakim Bin Mohammed

¹Faculty of Civil Engineering, University Technology Malaysia, 81310, Johor, Malaysia

²Faculty of Geoinformation Science and Real Estate, University Technology Malaysia

Abstract: Unexpected events are unpredictable or beyond the control of human. The aim of this study was to identify the consequential problems of unexpected events faced by construction managers and project managers. In undertaking this investigation, we used an exploratory semi-structured interview and a questionnaire survey method. The results of this research showed that the consequential problems of unexpected events were frequently wicked, wicked messes and messes types of problems. These wicked, wicked messes and messes problems grew rapidly by high behavioral complexity of human affected environment and high dynamic complexity of interdependent systems in construction projects. We discovered human behavioral problems as wicked kind of problems for human element could lead to noticeable effects on project manager, such as irresponsibility and making a bizarre decision. Also, we identified wicked messes and messes problems, including loss of reputation and litigation, for construction organizations could terminate the viability of organizations and projects. Furthermore, we found out that three most important factors for responding successfully to the consequential problems of unexpected events were: 1) organizations' structure and support, 2) competent project manager and 3) immediate actions. The findings of the study revealed that leadership, communication skills and hard-working were essential attributes of the competent project manager in responding to the consequential problems of unexpected events. Lastly, this research suggests the development of managerial reactive skills and control of behavioral responses through learning practice as key components of the required approach that need further investigations in future researches.

Keywords: Messes, wicked, wicked messes

INTRODUCTION

Any type of incidents in the same way that a noun is described with adjectives is recognized with its characteristics in order to differentiate them from other happenings. These characteristics are reasons that bring about the events and emerging conditions that constitute the nature of subsequent situations. Therefore, our definition of unexpected events is occurrences that influence humans in specific time and environment greatly because we can't predict them due to limitations of our knowledge and experiences or we can't prevent them as their occurrences are beyond the control of human beings.

If subsequent conditions cause significant problems for human beings, they can affect other elements in the environment of the events and thus it's essential to distinguish their consequential problems. Loosemore (1998a) defines a crisis as an unexpected event that threatens organization's life and its valuable resources. Moreover, Reid (2000) maintains that all kinds of organizations face crises to some extent and the size of

companies is not important in experiencing significant harms to resources. Consequently, the occurrences of unexpected events necessitate the understanding of their emerging circumstances in order to control the crises.

Hällgren and Wilson (2008) argue that crises are associated with consequences which precipitate a disaster and part of such consequences is described by Loosemore (1998a) as behavioral, psychological and sociological problems. Indeed, project managers or organizations experience these stressful conditions because they don't have access to any usable technique through risk management approach and thus can't provide an effective response.

In the same way, Perminova *et al.* (2008) by advancing "Perform not simply conform to the plan" emphasize the real need of a continuous approach based on learning and flexibility instead of a planning method as long as project's surroundings are changing ceaselessly. Although contingency plans are developed for some kinds of misfortunes, crises are defined as the events that occur because nature, malicious humans, or

Corresponding Author: Amir Khosravi, Faculty of Civil Engineering, University Technology Malaysia, 81310, Johor, Malaysia, Tel.: +60177186757

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systems catching us unprepared (Olson and Wu, 2010). In fact, these unpredicted occurred risks result in their subsequent uncontrollable risks and then the circumstances become more complicated and serious.

Also, the timing of unexpected events is a crucial factor in studying their peculiarities because not only they approach to projects in a different manner but also their effects grow rapidly in interconnected systems. Hällgren and Wilson (2008) draw our attention to the dimensions of crises consequences by considering the magnitude of consequences as an important factor in studying the crises. They believe that it's not just a tsunami or an earthquake that threatens humans' lives; rather, their consequent disasters cause significant calamities.

Namely, the huge disaster in a nuclear power plant of Japan can be mentioned as the most significant unexpected event in recent time (http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster). While the tremendous earthquake couldn't damage the area and people significantly because they had used risk management approach and designed resistant structures for strong earthquakes, the subsequent tsunami and consequent nuclear disaster affected all the area and forced about 200,000 people to flee because they hadn't predicted or experienced such circumstances.

In particular, Hällgren and Wilson (2008) point out to the great exposure of construction industry to crises. They state that existing uncertainty relevant to unique products in construction industry cause inexperienced and odd events in a daily basis. More clearly, human affected environment and interdependent systems prevalent in one-off and high-cost construction projects make them more vulnerable to unexpected events and their consequential problems. For instance, when unexpected events affect interconnected complex systems which have been directed by human decisions, human should make decisions in order to solve the issue; but influenced human behavior renders circumstances more critical and more potential to failure.

Accordingly, this study investigated the unexpected events of construction projects to identify their consequential problems that worsen the conditions and cause irreversible effects on the components of projects. Although this research is based on the occurred unexpected events of construction industry, this study will be of interest to any project managers and organizations that perform projects in the environments which have potential to experience unexpected events.

LITERATURE REVIEW

Different types of problems and use of risk management: Different created approaches in specific area of knowledge have introduced their required tools and techniques in order to respond to the particular problems of that realm. Project risk management also

deals with potential risks and their pertinent problems throughout projects' implementation or PLC, while components of a single project such as human resources and organizations have special attributes and qualities that make each one susceptible to its specific problems. Since many aspects of risk remain still unacknowledged and these different types of emerging problems can influence the future of projects significantly, it's essential to have a broader perspective on risk management process.

According to Holt (2004), the first type of problems called tame problems are problems describing future for an organization by using linear problem-solving. Tame problems are comprised of different parts and analytical approach by dividing them into its elements and considering scientific methods such as probability theory for the interaction of elements can be used for the solution. This kind of solution is used to predict future for organizations in order to prepare them and match their resources for probable upcoming happenings. As a consequence, it has been used for a long time in risk management process by managers of organizations. In other words, Olsson (2007) mentions tame problems as mechanical or technical problems with predetermined linear solutions.

In the second type, a reference to Ackoff (1974) shows that where high dynamic complexity interferes in the distribution of probabilities among the elements of problems, messy problems are formed like complicated composite puzzles. Due to the fact that substantial couplings existing among the separated elements and complexity of the system which includes elements, considering each element separately is not possible for the solution (Perrow, 1999). For this reason, Holt (2004) suggests that system of interactions should be regarded for solution through learning circles and excessive training. He argues that although ongoing risk management method by moving from problem definitions to boundary setting for the systems with the use of much time and effort can resolve the issues of messy to some degree, the essence of problem is forming gradually and determined boundaries are changing continuously.

For the third type, interaction of people and systems contributes to influences of high behavioral complexity in the formation problems and produces the wicked kind of problems (Rittel and Webber, 1973). In fact, not only these problems adapt themselves to interconnected systems but also opposing beliefs and values cause different perspectives and judgments of decision makers. In other words, as long as these complex fundamental realities are inevitable, unlike mental patterns create different strategies (Rittel and Webber, 1973; Rowe, 1987). More clearly, Atkinson *et al.* (2006) explain that different knowledge and

Table 1: Different types of problems and their required strategies (Holt, 2004)

| Problem type | Examples | Characteristics | Required management approach |
|---------------|--|---|---|
| Tame | Lexical ordering, analytical geometry | Structural complexity :linear, self-referential, dialogue | Analytical or algorithmic (available in risk management) |
| Messes | Epidemic control migration patterns, breakdown of on a production line | High dynamic complexity: non-linear interactions, systems analysis, explorative | Iterative, system and evolutionary, excessive training and learning circles (to some degree available in risk management) |
| Wicked | Diversity policy, psychometric testing | High behavioral complexity: non-linear, explorative | Trial and error, no final strategies, discipline from constant testing (not available in risk management) |
| Wicked messes | Urban design, ecological management | High dynamic and behavioral complexity: imaginative, often chaotic and rhetorical | Holistic approach (structural and mental), revolutionary (not available in risk management) |

understanding of the sources of uncertainty result in dissimilar observation of risks related to the objectives of projects and thus divergent strategies in responding to them. Regarding wicked problems that are related to human nature, Thevendran and Mawdesley (2004) state that there is no adequate awareness in identifying or effective process in controlling human risk factors through risk management and contingency responses are not enough to control or even minimize the effects of these intangible risks in construction industry.

In the fourth type of problems, mentioned divergent values and behavioral complexity of decision makers who are reluctant to reconcile and reach an objective perspective make agreement impossible and create what Roth and Senge (1996) called ‘wicked messes’ problems. Indeed, opposing attitudes complexity reliant on different environmental situations and motivations interact in interdependent systems and then generate wicked messes problems. Holt (2004) maintains that risk management approach is not able to deal with these effects of wicked messes problems on people and also interconnected systems. He concludes that risk management process can include tame problems, but it can’t encompass messes fully and wicked and wicked messes problems are beyond the scope of existing risk management. Table 1 describes the types of problems and whether or not their required strategies are available in risk management process (Table 1).

In respect to the use of risk management approach in dealing with different types of problems, Kutsch and Hall (2010) argue that tame problems because of their defined problem statements and objectively similar solutions are considered more in the risk management process. Also, Rothstein (2002) in another context mentions that managers are inclined to consider more understandable risks or easy risks that have similar resolutions. Moreover, Olsson (2007) by investigating opportunities that are frequently arisen from wicked, messes and wicked messes problems verify that risk management is not adequate for opportunity management and thus it can’t cover problems beyond tame.

Kutsch and Hall (2010) state that easily-processed risks don’t have significant impacts on project output and softer behavior of human factor that can influence

project outcome is neglected. They believe that since some issues such as technical risks are easy to consider and solve, managers declare other issues that are outside the scope of risk management as irrelevant or ‘off-topic’. Similarly, Margolis (2003) refers to this issue by pointing out to the fact that specialists usually learn to focus on accessible information based on their experience and knowledge and then disregard other data.

As a matter of fact, Kutsch and Hall (2010) explain untotypical issues by contrasting between off-topic and error concepts. They verify that untotypical subjects are themes in which the required information is not missing or wrong (error); in contrast, project managers interpret the available information as unimportant and managers have considerable control in determining untotypical issues but limited control in making mistakes. Furthermore, Kutsch and Hall (2010) imply ‘taboo’ concept when managers put ethical limitation on what they consider morally incorrect.

In a similar line of thought, Thevendran and Mawdesley (2004) argue that available techniques in the risk management can be used successfully in responding to overt risks such as economic risks or tame problems, but it’s not able to deal with the risks of human factors (latent factors) or wicked problems. In particular, interdependency and complexity of systems participating in construction projects or messes problems and interaction of human element with these interconnected systems or wicked messes problems have not been considered yet in project management practices.

More clearly, Kutsch and Hall (2005) by postulating managers’ difficulties in predicting how each constituent of a project interacts with others (complexity) and calculating the probability how it changes over the time (dynamism) conclude that project management ignores facing these kinds of problems deliberately because surrounding circumstances (complexity and dynamism) impede prediction; as a result, managers don’t consider risks besides the domain of their learned skills. In other words, Chapman (2006) refers to this deliberate ignorance as ‘simplicity inefficiency’ and maintains that most people neglect the types of uncertainty that includes complexity because they don’t have available tools to be prepared for.

With this in mind, Hällgren and Wilson (2008) state that complex associations undergo unimaginable events that endanger projects' stability and firmly coupled systems are more vulnerable to crises. Due to the fact that these problems interfere with the routine processes of systems and disrupt the functions of other pertinent sections, systems are not able to identify these problems and then their widespread consequences deteriorate the emerged situations. Accordingly, project managers are experiencing interdependent complex system of problems and solution can't be achieved by separating of elements (Kutsch and Hall, 2010).

All in all, it can be concluded that although risk management process and conventional project management are useful in dealing with conspicuous risk factors or their subsequent tame problems, the latent risk factors or consequent messes, wicked and wicked messes problems can't be dealt in these proactive approaches. Inasmuch as messes, wicked and wicked messes problems arising out of interactive complex systems and human behavior affected conditions in construction projects make these resource-limited projects more susceptible to unexpected events and their consequential problems, they require extensive investigation and analysis to determine how their impacts can influence the components of construction projects.

Characteristics of crises in construction projects:

Direct human element contributions in construction projects' process makes these projects' success or failure dependent on the considerable effects of human nature. In fact, it's not similar to the factory production in which human role is restricted to the designers who formulate mechanization or operators who oversee the process; in contrast, human performs the job and creates the outcome.

Moreover, while the rate of expected profit based on marketing skills, change in customer requirements and satisfactions and competing with other brands frequently are the features of crisis in manufacturing industry, human decisions' implementation and its influences on each sequence of the work through execution of projects until completion of outputs determine the characteristics of construction crises.

In this respect, Loosemore (1998c) argues that construction process because of its little repetition and uncontrollable environment including complex and crisis-prone activities is a human one and thus greatly susceptible to human idiosyncrasies. He indicates that since involved organizations are directed by independent experts with different purposes in temporary project-based conditions of a single project, they have high vulnerability to be harmed by the actions of these people.

In particular, crises appear when the regular uses of processes or contingency plans can't be used to solve

the issue and then interacting several forces cause unexpected change and stress (Loosemore, 1998b). More clearly, not normal causes bring about crises; instead, the involvement of humans' attitudes and feelings in the process by creating unexpected events influence future conditions dramatically. In this regard, Loosemore (1998b) lists characteristics of construction crisis as ineffective communication, insensitivity among projects' groups, common irresponsibility and non-existence of teamwork.

According to Loosemore (1998a, b), these characteristics of crises produces the changes of conditions involving significant social and monetary change in an organization and physical change to the nature of its output; then, these changes often threat project's high priority values and personnel's principles. As a consequence, emerging problems and this level of uncertainty surrounding construction projects' conditions lead to the difficulties that people have in adapting to changes.

In fact, Loosemore (1998a) defines crisis in behavioral terms by pointing out to the causes and consequences of crisis behavior. By monitoring the structure of people's communications, he discovers that insensitivity to the signs of change lengthens the consequent negative period and makes the crisis imminent and serious. Accordingly, he names this situation as spiraling conditions and mentions the reason for these spiraling conditions is the fact that construction contracts processes such as procurement have little incentive for parties to attempt for the success of project for the client.

In this essence, Holt (2004) maintains that these consequent situations conflicting with the self-esteems of people cause anxiety, depersonalization, irresponsibility through upward delegation and avoidance of change. As a result, they resort to previous habits and thought in order to escape from threat and embarrassment. In a similar perspective, Loosemore (1998a) believes that the stress of crises is the result of fundamental challenge to person's belief particularly physical challenge and dislocation of social relations because resultant change requires giving up of past attempts and accepting new status quo with different formal arrangements and divergent values.

Following this, Loosemore (1998c) concludes that the construction crisis is related to dealing with problems that emerge as long as profit-making groups with divergent and opposing interests are directing projects. He urges project managers to the continuous attention for the maintenance of behavioral stability because when instability is started, a negative disposition in human nature creates self-perpetuating feature of crises. That is, this magnified natural interest in money-making opportunities makes projects' parties more resistant to change by producing insensitive, irrational and extreme behaviors. As a result, tactical

conflict between projects' stakeholder for more favorable redistribution of resources misspends parties' energies more towards confrontation and conflict.

With this in mind, Kutsch and Hall (2005) maintain that this behavior and consequent actions are interrupting the processes of risk management predicted by expected utility theory. Indeed, Kutsch and Hall (2010) discredit the effectiveness of risk management processes by interpreting the influence of social and cognitive factors as intervening conditions. So, they insist on an understanding of how and why these behaviors emerge and what are their effects and implications.

On the other hand, Pearson and Clair (1998) mention limited information processing capabilities, tendency for irrational and biased responses, devastated presumption and victimization as the other different kinds of problems that could be experienced by individuals in crisis management, while the full range of information is required for holistic decisions in crises periods (Pender, 2001). Furthermore, Loosemore (1998c) draws our attention to withholding of information as a source of power and emerging patterns of information-sharing as unpredictable characteristic of construction crises. He believes that this unpredictability is the result of conflicts between different interest groups who manipulate communication structures in the favor of their interests.

Regarding to information processing, Perminova *et al.* (2008) by identifying contextual uncertainty as an important part of project management approach state that determining the source and relevance of information (contextual uncertainty) is an intuitive not a rational process because a rational one is disconnected to the surrounding conditions. Interestingly, Kutsch and Hall (2010) name this as hyper rationality of risk management because many effects of managerial behavior and social conditions are not considered in its process. Therefore, this ongoing trend will result in organizations become increasingly susceptible to crises (Loosemore, 1998a, b).

In the same way, Mitroff and Alpaslan (2003) believe that the principles of current risk management are not effective any more because risk management processes are not able to consider crises' situations. Thus, it's a considerable lack in investigating the emerging problems of crises particularly for the unexpected events of construction projects due to the fact that their unpredictable and uncontrollable nature induce unique circumstances and peculiar problems that necessitate required exploration.

RESEARCH METHODOLOGY

Research design: We used a semi-structured interview and a questionnaire survey method in order to investigate the consequential problems of unexpected

events of construction projects. Since the object was to develop an understanding of the description of unexpectedness and perception of its consequential problems, we conducted an exploratory research approach by using semi-structured interviews. Considering the full comprehension of construction professionals and experience of the consequential problems of unexpected events were needed, we selected experienced project managers and construction managers in Johor state of Malaysia to provide in-depth information.

Afterward, we analyzed these qualitative data in order to design the questionnaire survey method. The purpose of designing the questionnaire of the study was to explore wider perspectives of construction practitioners regarding the emerged themes related to the objectives of research. Therefore, we developed the questionnaire of the research based on the categorized emerged themes of the semi-structured interviews in order to obtain more qualitative data and also examine the validity and reliability of the analyzed data by the use of a quantitative approach. The respondents of the questionnaire survey method were project managers and construction managers in construction industry of Malaysia.

Semi-structured interview: This study used a semi-structured interview to inquire different aspects of consequential problems and provide more flexible information from construction practitioners. On account of the fact that our research required construction professionals who had experienced unexpected events to explain their perceived conception on the main issues of subject, we decided to choose the non-random sample. In doing so, we selected project managers and construction managers in the Johor state of Malaysia with experience more than 10 years from different parties of construction industry. The following Table 2 displays the non-random respondents of the semi-structured interviews (Table 2).

We designed the questions in order to elaborate the issue for the respondents and elicit information on the required themes of the research, including following questions:

- What problems you faced when you experienced unexpected events?
- What were the effects of the consequential problems of unexpected events on projects' resources, objectives and organizations?
- Were unexpected events threatening viability of projects and security of organizations? How?
- What were their effects on you as a project manager? (How do they affect project manager's response to unexpected events?)
- What attributes, characteristics and skills are required for the project manager to cope with unexpected events?

Table 2: Non-random sample of semi-structured interview

| Respondent | Position | Party | Experience (years) | Projects | Approx. monetary value of projects (¹ RM M) |
|---------------|----------------------|------------|--------------------|------------------------------|---|
| Interviewee 1 | Project manager | Contractor | 12 | Residential buildings | 15 |
| Interviewee 2 | Construction manager | Contractor | 14 | Shopping complex | 120 |
| Interviewee 3 | Project manager | Contractor | 11 | Road construction | 38 |
| Interviewee 4 | Construction manager | Contractor | 11 | Residential buildings | 48 |
| Interviewee 5 | Project manager | Contractor | 26 | Residential buildings | 33 |
| Interviewee 6 | Project manager | Consultant | 16 | Shopping complex | 30 |
| Interviewee 7 | Project Manager | Client | 27 | Governmental university | 5,440 |
| Interviewee 8 | Project manager | Consultant | 34 | Road construction | 129 |
| Interviewee 9 | Construction manager | Contractor | 12 | Highway and land reclamation | 1,200 |
| Interviewee10 | Project manager | Consultant | 18 | Highway and land reclamation | 1,700 |

1. 3 RM~1 \$

- What are determining factors for the success of a response to the consequential problems of unexpected events?

Before performing the interview, we made an appointment with respondents via email or phone call and the interviews mostly took more than one hour and half. We started by explaining the goals of the research and a semi-structured interview process in order to discuss and interact with the interviewees in directing the questions as part of the methodology. The important characteristic of the adopted semi-structured interview was clarifying the concept of unexpected events, emerging problems of them and their consequences with interviewees. During the interviews, a tape recorder device was used to record the voices of respondents; seven interviewees permitted recording their voices, while the other three refused.

Next, we used content analysis for both the transcribed and noted responses. During the analysis, we sought the similarities and differences between the different perspectives and perceptions to determine the constructs of each theme. So, we sorted out these qualitative data based on regularities, commonalities and emerging patterns among responses. By determining the components and variables that could affect the processes of each theme, we categorized data based on their relationships to the objectives of the research.

Questionnaire survey method: The purposes of a questionnaire survey method were to collect more qualitative data and also verify the validity and reliability of analyzed data of the semi-structured interview by a quantitative approach. We selected the sample for the questionnaire survey method randomly and distributed questionnaires among project managers and construction managers of Malaysian construction industry.

Twenty-one project managers and nine construction managers responded to the questionnaires: sixteen from contractor companies, followed by 9 from consultant engineering firms and 5 respondents from client party. It should be noted that the big majority of the respondents (77%) had more than 10 years

experience and thus the results of this study could be considered as credible findings in the construction industry.

In the stage of designing the questions, we adopted three approaches. First, we prepared open-ended questions to provide more qualitative data. Second, we set five degree scale questions to determine the degree of importance for each contributing factor of each theme discovered by semi-structured interview. Third, we put yes/no and listing questions to examine whether found relationships of analyzed data could determine the facts regarding the objectives of the study. In the end, we used interpretation of frequencies for five degree scale, yes/no and listing questions and content analysis for qualitative responses.

RESULTS AND DISCUSSION

We identified 32 unexpected events from 40 respondents and then analyzed their mentioned problems, despite the fact that they were using risk management in their organizations. Content analysis of responses revealed that two elements of projects were influenced considerably by the consequential problems of unexpected events. These two elements were:

- Human
- Organizations

Therefore, we sorted out the consequential problems of unexpected events for each element.

Human element: Consequential problems for human: We discovered consequential human behavioral problems of unexpected events from collected data of semi-structured interviews and the questionnaire survey. In doing so, we calculated the number of times that each item was mentioned by the respondents and the percentage of each. Finally, we ranked human behavioral problems based on their percentage. The following Table 3 displays human behavioral problems that construction practitioner's experienced when they faced with unexpected events (Table 3).

Table 3: Human behavioral problems of unexpected events

| Human behavioral problems | Number of times mentioned (of 32) | (%) | Rank |
|---------------------------|-----------------------------------|-----|------|
| Stress | 30 | 94 | 1 |
| Anxiety | 28 | 88 | 2 |
| Frustration | 26 | 81 | 3 |
| Disputes | 26 | 81 | 4 |
| Fear | 25 | 78 | 5 |
| Anger | 24 | 75 | 6 |
| Scolding | 23 | 72 | 7 |
| Shouting | 22 | 67 | 8 |
| Violence | 22 | 67 | 9 |

These human behavioral problems because of their behavioral complexity were wicked kind of problems; however, when they interacted within different systems and organizations of construction projects, they produced wicked messes problems. On the other hand, although wicked problems could be separated by their traits on each affected human, their resulting effects produced accumulative and critical threats for human element.

In particular, stress, anxiety and frustration as inseparable consequences of unexpected events influenced human's feeling and thinking noticeably by leading to depression illness. Then, the significant effects of depression on person's emotions and mind changed his beliefs and following actions. Namely, one project manager who was dismissed from his job because of the recession period mentioned:

"I could have stolen the properties of others because of the need to provide money for my family, or I might have done suicide as a result of depression and frustration." (Interviewee 8)

It should be noted that since these wicked problems influenced the conditions of human's life directly and significantly, they changed faith, thinking and thus the behavior of an affected human:

"Nowadays I consider just money in my job and behave selfishly; e.g., I come late to the workplace and I am chatting with my friends in coffee shops early in the evening." (Interviewee 8)

In this respect, Loosemore (1998a) points out to these circumstances as guarding the status quo and states that preconceived beliefs of people, financial responsibility and the pressure of the situation determine the initial behavioral response to a crisis. We can see how all of these criteria influenced this dismissed project manager's perspectives either toward himself or external world. For example, being selfish was another emerged behavior as a result of new thinking attitude that was noted by the interviewee.

Human behavior as Ward and Chapman (2003) indicate because of its complexity has ambiguity trait not variability; that is, these qualitative changes can't

be measured until their consequences bring about non-compensable harms. This fired project manager was working about two years as a lorry driver after being an architect draftsman for 10 years. Certainly, he could have done anything that was justifiable for him at that time because his feelings, entity, personality, specialty and family were hurt directly and considerably. Arising out of this, he could have committed suicide or revenge as long as he was experiencing these critical circumstances as Loosemore (1998a) argues that these are latent psychological vulnerabilities of persons that are activated and lead to personal insecurities by decreasing the self-confidence of affected people. As experienced events influence our emotions directly and our actions indirectly, our perceptions direct our thinking attitude and then our future motivations, actions and behavior. In other words, Perminova *et al.* (2008) mentions that human being's experiences and ideology constitute each person's different propensities and these propensities determine his interpretation of inexperienced events.

Just as like as this fired architecture who believed that he had been devoting his life for the success of company's projects, but the company behaved him totally different. In this case, it can be seen obviously how human who was directly contributing in construction projects was harmed seriously. That is, it's not like other industry that people affect the process of production indirectly; rather, they do the job and participate in projects directly. Particularly, higher positions such as engineers or project managers must contribute their lives into the projects for the progress of the work as Thevendran and Mawdesley (2004) consider the success or failure of construction projects dependent on human factor contribution substantially. More clearly, Holt (2004) deduction about the divergent quality of these wicked and wicked messes problems is exactly pertinent to this behavioral complexity that is the result of different beliefs, experiences, perceptions, emotions, interpretation of events, emerged behavior and consequent attitude. Indeed, different persons infer same events or information differently owing to their dissimilar knowledge, values, experiences and feelings. In another example, one worker lost his life after falling from the scaffolding of one building project and then this incident affected the morale of all workers in the site for several weeks. The shock of this unexpected event by producing stress, anxiety, frustration, anger and disputes influenced all the other workers of the project. As Mitroff and Alpaslan (2003) describe abnormal accidents with their impacts similar to that of natural disasters (http://www.world-nuclear.org/info/fukushima_accident_inf129.html), these wicked consequential problems affected human element and then people interactions with each other generated wicked messes problems. In such an event, not only the complexity of behavioral aspects but also the dynamism

of interactions contributed in producing the type of problem and increased the consequences.

In another case, diverting the path of a river by a contractor and an unexpected flood destroyed surrounding villagers' houses. Then, a serious fight between villagers and contractor's personnel made the consultant party to resort to the local authority. The project manager of a consultant party said:

"I informed local authority and politicians whom I knew; otherwise, furious villagers could have killed contractor's personnel because they had lost all of their houses." (Interviewee 6)

Again, wicked problems created wicked messes because two groups were involving in the conflict. In this case, stress, anxiety and frustration of villagers appeared as anger and influenced the behavior of other responsible group by producing human behavioral problems as such. Local authority provided temporary shelters for villagers and then the conflict was diminished, but the project was stopped until rebuilding houses period. It should be noted that mentioned wicked human behavioral problems impacted both inside and outside of the construction projects and their accumulative nature and divergent traits of two human systems changed them to wicked messes. In fact, the timely reactive response by the consultant party restricted the consequences of this wicked messes problem; if not, all the systems including human element and organizations could have been paralyzed.

The effects of human behavioral problems: We put the identified effects of human behavioral problems on project managers in a 5-degree scale question of the questionnaire to examine their validity and reliability by a quantitative approach. These identified effects were mentioned by interviewees who had experienced unexpected events and then we asked in the questionnaire the degree of importance that human behavioral problems cause these effects. Taking into account that we couldn't consider human behavioral problems separately, we intended to find out the degree of accumulative contribution of emerging human behavioral problems in leading to identified effects. Table 4 shows the effects of emerging human behavioral problems of unexpected events on project manager (Table 4).

As a whole, making project managers irresponsible as the most important effect was identified and ineffective communicating, monitoring and decision making were classified as other important effects of human behavioral problems on project managers. In this essence, Loosemore (1998a) indicates that increased decision making errors with withdrawal, impulsive and aggressive behavior are behavioral implications of stress. However, it should be noted that

Table 4: The effects of human behavioral problems on project managers (% of respondents)

| Effects | Degree | | | | | Rank |
|---------------------------|--------|----|----|----|----|------|
| | 1 | 2 | 3 | 4 | 5 | |
| Irresponsibility | 0 | 0 | 8 | 24 | 68 | 1 |
| Making bad communication | 0 | 0 | 20 | 24 | 56 | 2 |
| Not good monitoring | 4 | 12 | 10 | 32 | 52 | 3 |
| Disputes and conflicts | 0 | 4 | 20 | 24 | 52 | 4 |
| Making a bizarre decision | 0 | 20 | 33 | 32 | 40 | 5 |
| Interrupted sleeping time | 4 | 12 | 16 | 32 | 36 | 6 |
| Being selfish | 8 | 16 | 16 | 28 | 32 | 7 |
| Losing reputation | 8 | 16 | 24 | 32 | 20 | 8 |

1: Five degree scale: 0 = very low, 1 = low, 2 = medium, 3 = high, 4 = very high

other discovered human behavioral problems such as anxiety, disputes and frustration are important in creating mentioned effects and further psychological investigations are needed to scrutiny the effects of each behavioral problem separately and also all accumulatively.

On the other hand, although the importance of interrupted sleeping time and being selfish were ranked in the last part of the identified effects, these effects with more important effects and discovered behavioral problems are in the same chain. Indeed, these effects are caused by human behavioral problems, but they are linked together and can increase behavioral problems considerably and also they can enlarge bad communication, disturbed monitoring, disputes and conflicts and decision making errors.

The findings of this study showed that participating of different human systems was the factor that converted wicked problems to wicked messes and their effects were magnified through interactions either within or between systems. In fact, these emerging problems spread through interdependent systems of construction projects and affected the whole system. Additionally, non-compensable and irreversible effects of wicked problems either in a personal life or community revealed that how significantly human element could be harmed by experiencing the consequential problems of unexpected events and suffering from their effects.

Construction organizations:

Consequential problems for organizations: Analysis of the qualitative data from exploratory semi-structured interviews and questionnaire of the study revealed that consequential problems of unexpected events affected construction organizations seriously. In particular, these consequential problems had important effects on construction projects' objectives and resources. However, we considered human resources as one element in experiencing unexpected events because of their different nature, sensitivity and importance in construction projects. Table 5 presents the consequential problems of unexpected events for construction organizations (Table 5).

Table 5: The consequential problems of unexpected events for organizations

| The consequential problems for organizations | Number of times mentioned (of 32) |
|---|-----------------------------------|
| Disputes | 28 |
| Late delivery of the project | 26 |
| Prosecution by the court, litigation process and high associated cost | 25 |
| High costs and cash flow problems interrupting other projects | 24 |
| Replacement, rearrangement and additional work | 24 |
| Loss of reputation in community and society | 22 |
| Termination of a contract | 19 |
| Reorganizing director board, appointing new PM and related costs | 9 |
| Leaving of skilled personnel, direct and indirect cost of changing staffs | 6 |

The importance of a crisis is its consequential problems and effects on organizations as Hällgren and Wilson (2008) believe that a crisis is any event which threatens an organization's security by influencing on its financial situations, relationships, or reputation seriously. We can see in the above Table 5 how responsible organizations for the occurrences of unexpected events were influenced considerably; namely, ruined reputation in community and society either by litigation process or media coverage, cash flow problems and termination of the contract.

For example, one respondent of the questionnaire mentioned that the roof of Terengganu stadium of Gong Badak had collapsed before its completion time in the year 2009 and then the consultant and contractor parties of the project had been prosecuted to the court. Finally, the consultant was sentenced as the guilty party for the roof collapse and its reputation in the construction industry of Malaysia and also common society was destroyed significantly because the case was covered extensively by media such as TV news and news papers.

As a matter of fact, this media coverage of the case influenced the construction industry of Malaysia greatly in the year 2009. Without it, definitely this kind of attention would not have been attracted to the incident and project participants could have experienced much less problems. Following this, the reputation of both the consultant and contractor of the project was affected during the litigation process; however, the responsible party incurred much more expenses finally. This loss of reputation through community and society not only made skilled personnel leave the company after the sentence but also forced the consultant party to reorganize its director board and thus the organization incurred noticeable direct and indirect costs inside of the company. On the other hand, consultant party had to compensate determined loss to the parties, project and all associated expenses of costly litigation processes.

This case demonstrates clearly how emerging problems of unexpected events of construction projects spread throughout interdependent systems and caused

more complicated situations. Indeed, dynamic complexity within the interactions of complex technology and human systems produced the messes kind of problem and then the involvement of behavioral attitude of people changed it to wicked messes. Even though the coverage of incident increased the importance of behavioral responses, construction projects because of their high costs, direct influences in society and considerable human element interactions can't be considered without the contribution of behavioral consequences. Furthermore, the client party and different responsible parties with opposing purposes and interconnected systems are involved in construction projects from the start until the end of one-off outcomes, whereas the customer in manufacturing industry just pays for the products.

In addition to the behavioral influences of community for 25 cases which incurred litigation process, the affected human behavior of organizations' management in dealing with the emerging problems also contributed in converting the messes problem to wicked messes. That is, human behavioral problems influenced management's board directly because they were involved in the litigation process under stressful circumstances; as a result, they behaved passively regarding behavioral aspects of crises and couldn't consider, evaluate and control the on going conditions.

Along with this, as Pearson and Clair (1998) indicate, other effects of human behavioral problems such as reduced information processing abilities and biased attitudes attended in decisions making process and thus affected the consequential problems of crises more considerably. More exactly, these emerging circumstances or in Kutsch and Hall (2010) words 'intervening conditions' as a result of the influences of social and cognitive factors determined the response of management, while these important factors in the management of crises have not been received any attention in risk management process yet.

Considering the fact that the kind of managers' responses depends on their adopted management approach, project managers and organizations suffered significantly because these proactive methods can't be used in responding to unexpected events. In this essence, DeMeyer *et al.* (2002) acknowledge that management's failure in selecting the right approach at the right time frequently cause consequential large problems. Moreover, the extent of misfit between the contingency response and these explained circumstances much better explain project management failure in responding to these wicked messes problems.

In the other example, one respondent of the questionnaire noted that a sexual assault on a secretary of a technical-office in a construction site had terminated their contract and destroyed their reputation significantly. He mentioned that they had lost the large project of government and then they had to change the

name of their company. In Kutsch and Hall (2010) words, this vicious unexpected event came from 'untopical' and 'taboo' issues, since not only these kinds of problems were not considered in construction area but also managers put ethical boundary for their coworkers; conversely, fellow human because of his complex nature of behavior caused this unexpected event. Given this wicked problem happened in a construction project, it was converted into wicked messes type by affecting involved organizations' systems, projects, contracts and reputations.

Regarding wicked problems, Olson and Wu (2010) acknowledge that people commit wicked actions because they have personality defect or they compete immoderately. The point is that unpredictable human behavioral nature regardless of its either justifiable or unjustifiable reasons has been impacting construction projects and their organizations because its consequential problems scatter rapidly over interconnected systems. Indeed, these wicked problems as Kutsch and Hall (2005) describe them by their characteristics such as hidden nature, not sensed effects and numerous variables create ruinous unforeseeable consequences for both affected humans and organizations. Although it was of interest of researchers to investigate the human behavioral problems of this unexpected event and its consequences for affected human element as they were, the victim of a sexual assault was not accessible.

In another case, one interviewee declared that the failure of the roller in welding the biggest tanker of PETRONAS stopped their projects and caused high additional cost and considerable late delivery of their projects, while the most reputable specialist contractor of Asia was employed. He said:

"We terminated the contractor's contract immediately because we couldn't lose any more time; but we were losing money for each day of our projects and we incurred significant costs." (Interviewee 5)

This messes kind of problems was resulted from the interaction of complex technology, construction work and human systems. In respect to this kind of interaction, Perrow (1999) states that serious accidents occur because of interactive complexity and unavoidable minor error and then they become major problems for organizations due to tight coupling and unexpected effects. It should be noted that one-off construction projects have great exposure to messes kind of problems because of their uncontrollable environments that encompass different organizations, coupled systems and interaction of complex technology with human systems.

In addition to the costs of litigation process until the final decree, direct and indirect costs of this unexpected event affected the organization

considerably. For instance, they were forced to start procurement process again in order to continue and complete that project and other directly related projects. On account of the fact that this organization was performing the variety of connected projects, it faced with the system of problems and chaos in its activities. That is, it was not a simple issue to be replaced by another alternative solution; instead, just shipment and installing the roller parts needed one month and non-availability of required resources intensified the consequences. Besides, short-term cash flow problems could have stopped the company's projects and thus the organization would have experienced more critical conditions; however, in this case, wealthy PETRONAS Company suffered just costly expenses.

To illustrate the tame type of problems, bankruptcy of a client and stoppage of the work after 2 years can be mentioned. In the same way that the contractor put the case in the litigation process against the client party, tame problems by their determined algorithmic solution can be easily solved in risk management process. By contrast, consequential messes, wicked and wicked messes problems affected involved organizations significantly. In this essence, Olsson (2007) argues that risk management process is able to identify, assess and manage tame problems such as bid or sales phase by analytical methods, but when the interaction with customer or other stakeholders happens, messes type of problems emerge and the risk management process is unable to manage this kind of problems. Admittedly, we can see how PETRONAS Company was affected considerably when it faced with messes consequential problems.

The effects of the consequential problems of unexpected events on construction organizations:

The findings of this study showed that how the consequential problems of unexpected events threatened the viability of projects and security of organizations. In fact, the big majority of respondent (78%) who experienced unexpected events acknowledged that consequential problems of unexpected events had threatened the viability of their projects by influencing the cost and completion time considerably. Moreover, the majority of respondents (72%) declared that consequential problems of unexpected events had endangered their organization's security and reputation through different ways such as litigation process and termination of contract.

In respect to responding to different types of problems, Holt (2004) indicates that tame problems because of their convergent nature can be responded in risk management by predetermined solutions, but messes depending on agreement in systems' boundaries, surrounding conditions and required strategies could be covered in this predictive approach. However, PETRONAS case showed that how

interdependent complex systems existing both in one project and different projects of organizations, which had high dynamic interactions in a daily basis, impeded the determination of systems' borders and needed responses.

Moreover, wicked messes problems owing to the interactions of different systems which had behavioral complexity and high dynamism became more serious and increased the problem's consequential threats. Indeed, these consequential problems scattered over these systems and made the situation more complicated. Meanwhile, owing to non-existence of practical approach through current risk management process in responding to these wicked messes problems, project managers suffered more from emerged behavioral problems in dealing with these growing problems and thus the severity of consequences was increased.

To sum it up, limitation of time, unavailability or limited resources, stressed managerial behavior and actions, contribution of dynamism and complexity in the interactions of different systems and continuously emerging new circumstances magnified the consequences for organizations. As Carmeli and Halevi (2009) state, some organizations were able to cope with unexpected events, while responses from others worsened the situation. Therefore, we must focus on such factors in organizational context that could determine the success or failure of a response by an organization.

Determining factors in responding to the consequential problems of unexpected events: Based on the judgment of respondents of study who faced with the consequential problems of unexpected events, twenty-five of 32 total unexpected events were responded unsuccessfully. Therefore, we asked them to mention the needed factors that could determine the success of a response. Quantitative analysis of data from semi-structured interviews and questionnaire survey method showed that the most important factors that could determine the success of a response to the consequential problems of unexpected events were:

- An organization's structure and support
- A competent project manager
- Immediate actions

Table 6 displays the determining factors for the success of a response to the consequential problems of unexpected events in construction projects (Table 6).

It should be noted that an organization and the project manager are two responsible entities that must respond to unexpected events and thus their characteristics play key roles both in selecting and implementing the effective response. Moreover, immediate actions, team work, control of human behavioral problems and buffer in the budget are factors

Table 6: Determining factors for the success of a response to the consequential problems of unexpected events

| Factors | No. of times | | Rank |
|--------------------------------------|-------------------|-----|------|
| | Mentioned (of 32) | (%) | |
| Organization structure and support | 29 | 91 | 1 |
| Competent project manager | 27 | 84 | 2 |
| Immediate actions | 27 | 84 | 3 |
| Teamwork | 25 | 78 | 4 |
| Control of human behavioral problems | 24 | 75 | 5 |
| Buffer in the budget | 22 | 69 | 6 |

that can restrict the emerging problems of unexpected events in order to control the consequent situation. Since these factors can create an effective response in responding to the consequential problems, organizations and project managers should look over their structures and examine whether or not they are able to produce an immediate response if they experience unexpected events.

For example, in the roof collapse of the stadium, the consultant party didn't react to the issue and then its reputation in the construction industry was destroyed significantly. But if the communication department had been designed for the company or director board of the organization had communicated directly with public and explained the case from their investigations and perspectives, the community could have judged differently regarding the case. In other words, consultant party should have explained the reasons for the occurrence of that event and people could have considered the other relevant factors which had contributed to the occurrence of the incident. With it, the community didn't judge just based on the decree of the court and the problems for the company could have been decreased.

In the other case in which villagers' houses were destroyed, team work and direct involvement of authorities helped affected organizations and the problems were resolved by providing new settlements for villagers. Also, parties by setting up ad hoc groups sympathized with villagers and provided their needs. Indeed, this immediate action shows the importance of a timely response to the consequential problems of unexpected events especially human behavioral problems; otherwise, the problems could have caused significant effects and the situation couldn't be controlled easily. Moreover, it should be concluded that when parties can't provide an effective response to the consequential problems of unexpected events, they should resort to the higher positions or react to the issue by all means they have.

Considering project managers can't predict completely what happens in their projects and communicating with governmental entities can't be set up in a short period, establishing an effective line of communication with local authorities or CIDB departments from the beginning of the project can

increase the reactive capability of the organizations. Lastly, financing the needed money for increasing manpower and work-time for additional procedures and work can be mentioned as the important approach that can implement a timely and effective response. So, organizations should consider buffer in their budgets and look over whether they are able to collect extra resources when they have to increase their speed of job.

The competent project manager in responding to the consequential problems of unexpected events: The emphasis of interviewees on the capabilities and skills of the project manager in responding to unexpected events was the reason for inquiring the required attributes. Then, we set the mentioned attributes in a 5-degree scale question of the questionnaire in order to determine the degree of importance for each one. Table 7 shows the attributes of the competent project manager in responding to the consequential problems of unexpected events (Table 7).

Results of the study revealed that leadership, communication skills and hard-working were essential attributes of the competent project manager in responding to the consequential problems of unexpected events. First ranked attribute, leadership indicates the high degree of importance for the character of the project manager because all personnel need a competent leader to help them in order to react to the consequential problems particularly wicked and wicked messes problems that have high behavioral complexity. Also, communication skills are all the means that the project manager can use in interacting with both affected people whom are needed to react and outside experts whom are required to enter in the events.

The need for learning aptitude and experience of the project manager points out to the fact that the project manager must make decisions in inexperienced circumstances to restrict the consequential problems either the messes kind of problems that scatter rapidly over interconnected systems or wicked problems that require apt attitude, even though they don't know completely the outcome. Indeed, not only he must evaluate, learn and respond to the events but also he must be vigilant and ready to react because these consequential problems become more complicated and serious if they are not constrained.

The over-reliance on proactive approaches such as risk management makes us more vulnerable to the consequential problems of unexpected events because of ignorance to build resilience and dependency on alternatives. In the same way that both learning aptitude and experience are needed for the competent project manager, optimal balance between proactive approach and reactive attitude is required in the way that reactive capabilities outweigh the other side due to the fact that

Table 7: Attributes of the competent project manager in responding to the consequential problems of unexpected events (% of respondents)

| Attributes | Degree | | | | | Rank |
|----------------------|--------|----|----|----|----|------|
| | 1 | 2 | 3 | 4 | 5 | |
| Leadership | 0 | 0 | 0 | 12 | 88 | 1 |
| Communication skills | 0 | 0 | 4 | 20 | 76 | 2 |
| Reactive skills | 0 | 4 | 16 | 12 | 68 | 3 |
| Hard-working | 0 | 0 | 8 | 32 | 60 | 4 |
| Learning aptitude | 4 | 0 | 12 | 24 | 60 | 5 |
| Discipline | 0 | 4 | 12 | 32 | 56 | 6 |
| Experience | 8 | 4 | 20 | 16 | 52 | 7 |
| Negotiation skills | 4 | 20 | 12 | 24 | 40 | 8 |
| Seriousness | 4 | 12 | 20 | 32 | 32 | 9 |

1: Five degree scale: 0 = very low, 1 = low, 2 = medium, 3 = high, 4 = very high

rules are not known and dependency on project managers' prediction ability make projects more susceptible to these incidents and their consequential problems. Particularly, behavioral aspects of human that are complex, unpredictable, qualitative and latent in nature have decisive roles in wicked and wicked messes problems and thus need timely response and reactive capabilities.

CONCLUSION AND RECOMMENDATIONS

This exploratory research investigated the consequential problems of unexpected events and we discovered that emerging human behavioral problems made conditions more susceptible to collapse. Indeed, the contribution of behavioral complexity in the process produced wicked and wicked messes types of problems. Also, interdependency and complexity of different systems participating in construction projects created the messes problems. These wicked, wicked messes and messes problems were not responded by risk management techniques and thus worsened the consequences of unexpected events.

In other words, project managers were confronted by unexpected events in which the contingency responses were irrelevant and then they couldn't produce required responses by their learned methods and available tools. Similar to a reinforced emergency center on a nuclear site of Japan that was unable to use contingency responses due to radioactive contamination, resulting conditions precipitated the crisis in a way that the consequential problems affected the whole system and threatened projects' viability and organizations' security. Accordingly, they couldn't provide any effective response by using the conventional project management or ongoing risk management in dealing with these consequential problems.

More clearly, given risk management doesn't apply both vigilance and velocity factors in its processes and techniques; it has failed in responding to this kind of events and their rapidly emerging problems. In fact, the

most important point in responding to these consequential problems is a time-stress quality of a response, since these wicked, wicked messes and messes problems are increasing and scattering rapidly in construction projects because of contributing factors such as involvement of human behavioral complexity, dynamism of interconnected systems and parties, high cost of projects and interaction with environment and community. Hence, a timely reactive response by the project manager or the organization through helping the affected people whom are needed to react can pilot the project into its best changed way. In fact, organization support and structure with competent project managers are enablers of immediate actions in restricting the problems and controlling the situation.

In particular, competent project managers can control their emotions and cope with stress in order to solve or at least curb the consequential problems and their effects. Taking into account the change of mentality plays an important role in evaluating the new conditions and observing the emerging consequences, we can act intelligently and accordantly in a real time by changing the mind-set and influencing the emotions. Then, we can enter in the events and change the consequences first on ourselves as the most affected element and then on other linked systems and components such as organizations and projects. That is, the leadership attribute as the most needed characteristic of the competent project manager displays the necessity of a leader in these inexperienced circumstances to unite a team by his communication and reactive skills.

Considering the project management is the final entity in organizational context that is accountable for the occurrences of any events and control of resultant situations, the development of managerial reactive skills and control of behavioral responses are essential parts of the required approach that need further investigations in future researches. Therefore, it is essential that researchers focus on reactive managerial strategies in order to enhance the capabilities and resilience of both project management and organizations. Moreover, the empowerment of people in behavioral aspects as a crucial quality of the needed approach should be explored more because this most influenced element in facing with unexpected events can determine the future situation by his actions directly and considerably.

Besides, organizational infrastructure and capabilities are other determining factors that can facilitate or hinder the required processes to create an effective real-time response. Indeed, organizations' structure and support as a decision support system and a complement for the competent project manager should assist him not only in decision making process but also in implementing the decision. So, the development of the organizations' structure and empowerment of project managers should be determined as high priority

goals for each organization. Indeed, organizations by improvement of these two elements can overcome unexpected events by dealing with their consequential problems successfully. In the same way that the emphasis is on the reactive skills for the optimal balance of reactive and proactive skills of the project managers in confronting with unexpected events, the focus of the needed approach should be on learning practice not planning method because these unpredictable consequential wicked, messes and wicked messes problems require the real analysis of rapidly emerging circumstances. Therefore, the empowerment of project managers through exercising learning practice should be considered seriously in organizations' programs in order to increase their reactive skills and make them capable in creating an effective real-time response.

Determining factors for the success of a response demonstrate that immediate actions with teamwork and cooperation of involved parties are essential to overcome unexpected events, while these patterns are quite far from current practice in construction industry. As a result, the emerging problems of unexpected events in construction projects are spreading throughout interdependent systems and cause more complicated situations. So, this disturbing fact explains further the vulnerability of construction projects to the consequential problems of unexpected events and necessitates building resilience by changing quickly and introducing practical strategies and incentives for cooperation of all parties under certain circumstances. Also, this research discovered that when unexpected events happen in construction projects, emerging human behavioral problems could cause significant consequences. These behavioral problems of a human element in the construction industry have not been received appropriate attention in the literature and thus it's needed to conduct more investigations concentrating only on behavioral aspects of human element in order to deal with this important latent risk factor.

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