IPMP Journal of Management & Science (IPMP-JMS), ISSN: 2590-9681, Scientific Journal Impact Factor (SJIF): 4.309
Vol 3, Issue 06, June, 2018, Pages 01 -16, Available @ www.ipmp-jms.org

Concerned Projects in Constructions Due to Scarce Risk Administration

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Abstract
The management of construction projects requires knowledge of modern management as well as understanding of the design and the construction process. Construction projects have a specific set of objectives and constraints such as a required time frame for completion. Also they are a costly undertaking so many people, in an effort to reduce the cost, become penny wise and pound-foolish. Change is inherent in construction work. The majority of the projects fail to meet deadlines, cost and quality targets. This is not too surprising considering that there are not known perfect engineers, any more than there are perfect designs or that the forces of nature behave in a perfectly predictable way. Change cannot be eliminated, but by applying the principles of risk management, engineers are able to improve the effective management of this change. In construction projects, each of the three primary targets of Cost, Time and Performance are likely to be subject to risk and uncertainty. Many people, in order to make change in the project with minimum cost, get the project into trouble. The lack of risk management, even an insufficient risk analysis, can put construction projects in jeopardy.

The purpose of this article is to reveal why the construction projects, and generally all projects, fail due to scarce risk management and what are the best practices for the recovery. In addition, the author's goal is to define pre-signals for the failure of a project, because of insufficient risk management and the lack of recovery planning. Projects, by their nature, are unique and many of the more interesting ones are complex. They frequently take place over an extended period of time and demand the engagement of a wide range of resources, including people, finance, facilities, materials and intellectual property. In most circumstances, projects have defined objectives or an end-state that provides those involved in them with a clear vision and specification of their goals.

Projects, by their nature, are unique and many of the more interesting ones are complex. They frequently take place over an extended period of time and demand the engagement of a wide range of resources, including people, finance, facilities, materials and intellectual property. In most circumstances, projects have defined objectives or an end-state that provides those involved in the project with a clear vision and specification of their goal. Risk management assists Project Managers in setting priorities, allocating resources and implementing actions and processes that reduce the risk of the project not achieving its objectives. Risk management facilitates better business and project outcomes by providing insight, knowledge and confidence for better decision-making. In particular, it supports better decisions about planning and design processes to prevent or avoid risks and to capture and exploit opportunities. It provides better contingency planning for dealing with risks and their impacts, it encourages better allocation of resources to risks and alignment of project budgets to risks, and it facilitates decisions about the best allocation of risk amongst the parties involved in a project activity. Together, these lead to increased certainty and a reduction in overall risk exposure. What happens if risk management is ignored?

- *Increased costs*
- *Loss or reduction of profit*
- *Damage to the brand / reputation*
- *In the worst disposal of the business or insolvency.*

Therefore, efficient risk analysis is vital to the successful undertaking and completion of any construction project.

Project Risk Management Risk management is one of the most critical factors in project management practices to verify a project is successfully completed. But, what does "risk" mean? In the last publication of Project Management Book (PMI,2004, p. 238) is given the following definition for the risk: "Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on at least one project objective, such as time, cost, quality". Kaplan (1997, p.410) expressed risk "as a mathematical combination of an accident's event probability of occurrence and the consequence of that event, should it occur". Having defined the meaning of risk, the next step is to determine the meaning of Risk Management process. Risk Management process is a formal process, via which we can achieve identification, analysis and response to risks, throughout the lifecycle of a project, in order to obtain the optimum degree of risk elimination, mitigation and control (Wang and Dulaimi, 2004). Thus, risk management is in direct relation to the success completion of a project. There is a detailed and widely expressed literature about accepted risk management process. A simple, common and systematic approach to risk management, suggested by Turnbaugh (Turnbaugh, 2005), has three basic stages: i. Risk Identification – determining the types of risks, identify, and assess the potential risks in the project. ii. Risk Quantification – the probabilistic characteristics and the degree of the impacts for their impacts. iii. Risk Response and Development Control – defining opportunities for managing changes in risk during the project life cycle. The following figure depicts a Project Risk Management Overview according to PMI organization (PMBOK, 2004).

When dealing with risks, the improvement of a project should also be taken into account; for example to perform the project with fewer resources or to have an advantage from an unexpected window of opportunity. Risks are at the very core of the business: risks and opportunities are linked; there are no opportunities without risks related to them. Thus risks actually raise the value of a project; usually higher risks bring higher opportunities. Since opportunities and threats are seldom independent, they can also be dealt with, at the same time. (Chapman, Ward, 2002). The purpose of the Risk Management process in a wider sense should not solely be to ensure a successful project completion but also to increase the expectations of project goals and objectives (Mills, 2001). It means that project Risk Management should be turned into project uncertainty management (Chapman, Ward 2003).

Risk management is not limited to a few processes, but includes much more in order to have a complete view of the suggested Risk Management process. One of the most crucial decisions in a project relates to the allocation of risks: who carries which risks. Before the decisions of risk allocations are ready to be made, the attitude that Project Managers have towards the risk has to be determined. Before a project starts, every project manager's strategy, as well as the ability to bear and manage risks, has to be known before risks are assigned to them. Besides the above conventional project risk management, which is a procedure of identifying the risks in a project, categorizing them, and planning how to address the most serious ones, there is a new category of risks – called unknown unknown risks- usually known as unk unks. Unknown unknown risks are pertinent to decisions but not included in analysis. You are aware of their existence but you cannot predict them. The more informed one is, the fewer (or more incomprehensible) the unknown-unknowns are.

However, unk unks are critical to innovative projects. The fundamental logic of traditional project risk management does not address the novice project, because in novice projects the project plan is an illusion, a simple draft. Unk unks cannot, by definition, be identified, but the areas where they lie - where knowledge about the project is lacking - can be constrained. Thus, turning them down is a gradual, iterative process of discovering the parts of the project in which knowledge is weakest. Once they are constrained, two methods can be employed for prevailing over them. These are learning and selectionism, respectively. According to Loch (Loch, Meyer, Pich, p.103) "Learning in projects is the flexible adjustment of the project approach to the changing environment as it occurs". It is a repeated practice of asking, "What do we know, what do we need to know, and what might we not know that we do not know" (Loch, Meyer, Pich, p.120). The authors define selectionism as running various error trials in parallel. It is most appropriately used when the environment is so uncertain, that a single trial is unlikely to home in on an improper solution. The

blend of these two above approaches which depend on project complexity and cost structure, may help us to strive with the unk unks risks into a project. But because unk unks are new categories of risks, and the above method is still in development, we will avoid covering these risks.

I. PROJECT RISK OR PROJECT UNCERTAINTY

As we aforementioned, project risk is the combination of probability of an event occurring and its consequences for project objectives, other times positive and others negative (Chapman, Ward, 2003). Risk is not only related to a specific point of actions, but it also relates to future project conditions. Conditions can change during project life cycle and may turn out to be favorable or unfavorable. In addition, it is very difficult to "guess" any change in the future conditions of a project, and so to estimate all the potential risks in the early stages of the project life cycle. Therefore many researchers have suggested replacing the term risk with a more neutral term, such as uncertainty (Chapman, Ward, 2003). Bedford and Cook (2001) characterize risk with two elements: hazard (danger) and uncertainty (quantified by probability). Uncertainty is part of our everyday life, since we are unable to predict the future conditions. An uncertainty can lead project to threats of failure or, equally, opportunities. Same authors believe that risks are caused by lack of uncertainty and that uncertainty is more prevalent in the early project phases. Since, it is very difficult to predict all factors at the beginning of a project, yet to take decisions; there is a risk that the results of those decisions will be different than is expected.

The definition of risk according to Project Management Institute, PMI (PMBOK, 2004) states that risk should consider both the positive and negative effects of a project objective. This is a broad view of risk that includes the terms of threats and opportunities, but is something that can work in theory and fail in practice. Risks and uncertainty could be addressed either as random or epistemic. Random risk means that we can estimate it using probabilities but it still has random outcomes, not predictable. This type or risk can occur because of natural unpredictable variation. According to Pitz and Wallsten (2000, p. 26) "the knowledge of experts cannot be expected to reduce random uncertainty although their knowledge may be useful in quantifying the uncertainty."

An epistemic risk or uncertainty is due to lack of knowledge about the behavior of the system. The epistemic uncertainty can, in principle, be eliminated by sufficient study and, therefore, expert judgments may be useful in its reduction (Oakley and O' Hagan, 2003, p. 123). An epistemic uncertainty is thus an "unknown event from an unknown set of possible outcomes" (Hillson, 2003, p.88). Another and perhaps less complex explanation can be found in the philosophical view of decision theory (Hansson, 1994), which mentions that risk is somewhat calculable, since it has to do with probabilities; whereas uncertainty has no previous history relate to probabilities. Risks and uncertainties are handled every day on a construction project. A dynamic risk is a risk where there is a possibility to gain something in the end, whereas a static risk has only losses in the outcomes. (Flanagan and Norman, 1993). From all the above, we can consider that in the early stage of a project, there is a high degree of uncertainty, which decreases when we have a high degree of background knowledge. It is however essential to mention that a Project Manager should always be aware both of random and epistemic uncertainty, because they both have great impact in the project outcome.

Risk management in construction Most of the organizations have recognized the increasing importance of risk management, and have therefore established risk management departments, in order to control the risks they are, or might be exposed to. The construction industry, perhaps most of all other types of organizations, is plagued to risks (Flanagan and Norman, 1995), but according to Thompson and Perry, (Thompson and Perry, 1983) "these risks are not dealt with adequately due to the poor performance and increased costs and time delays". The construction industry is one of the most dynamic, risky, challenging fields. Risk is inherent in every construction project. Its clients are widely associated with the meaning and the existence of risk management, due to the nature of construction activities, processes, environment, and organization

structure. Risk in construction has been the object of attention because it has direct relation to time and cost overrunning associated with the construction project.

Even though, Porter, Healey, Perry and Hayes (Porter, 1981), (Healey, 1982), (Perry and Hayes, 1986) have regarded risks as an exposure of economic loss or gain increasing from involvement in the construction process; Mason and Moavenzabech (Mason and Moavenzabech, 1976) have expressed this as an exposure to loss only. Bufaied (Bufaied, 1987) describes risk in relation to construction as a variable in the process of a construction industry whose variation has consequences into the three variables of a project; time, cost and quality. It is generally known that those within the construction industry are continuously faced with a variety of unknown, unexpected, frequently undesirable and often unpredictable factors (Fong, 1987).

Ashley, Kangari and Riggs (Ashley, 1977), (Kangari and Riggs, 1989) have all agreed that these situations are not limited only to the construction industry, but in any commercial organization's profit structure and it is a basic feature of a free enterprise system. The need to manage risks into construction industry is related to all professionals and groups (client groups, design teams, project management team, contractors, etc.) in the construction industry which are concerned with cost, time and quality. There are two basic types of construction projects across the world: that of public sector project and private sector project. Generally, the management processes of public sector construction projects have more specific characteristics than those within of the private sector. Public sector projects normally have more complexity than private sector (Splitter and Mc Cracken, 1996). In the same way, there are many differences among the legal environment of public sector construction projects around the world. For instance, in Spain and France, there is legislation about public sector project, in contrast to the United Kingdom, where there are generic regulations, applicable to public and private sector (Flynn, 1997).

Before an organization takes the decision to undertake a construction project, it is essential to develop a proper appraisal of the project. In case of a commercial development, an assessment must be made of the business advantages of the project, including various constraints and risks which are involved in. For a public project, the output of the project will be concerned by the financial analysis, rather than the return of the investment. (Toakley, 1989). For this reason, the conceptual phase of a new construction project is very important, since all decisions taken in this phase, have a significant impact on the final cost of the project. (CIDA, 1995). It is also the phase at which the greatest degree of any potential uncertainties about the future is encountered (Flanagan and Norman, 1993).

Moreover, risk management should play an important role of controlling risks and eliminate their impacts into the project life-cycle. (Toakley, 1989). As we have already mentioned, risk management is a procedure to handle the risks in a project and try to mitigate their effects. (Toakley, 1989). According to Dr. Kerzner (Kerzner, 2003) "a risk management strategy must be established early in a project and that risk is continually addressed throughout the project life cycle". The identification of risks at the conceptual phase of a project is very important, not only because it enables project constraints and appropriate costs to be calculated, but also to focus project management attention on how to control and allocate them. (Perry and Hayes, 1986). A high-quality project risk management process must include the following prerequisites (Abrahamson, 1973):

- Fully detailed specification of the project, and all associated risks
- a clear perception of risks that being born by each party (client-contractor)
- sufficient capability, experience how to handle the risks
- Motivation to manage risks, which requires a clear accountability, responsibility and authority of each party into the project. Handling risks means rewards.

II. FUNDAMENTAL CONSTRUCTION RISKS AND UNCERTAINTIES

The construction business, like any other business, is risky. However, construction business includes more risks due to the involvement of many parties, such as owners, contractors, subcontractors, suppliers and many others. Furthermore, construction projects due to their uniqueness and built, is inherent in many risks. They also involve many people from different cultures, and different countries and though their size and their complexity increase more and more the risk factors. If in this one adds in the political, social and economic conditions where the project is undertaken, there is bigger need to develop a sufficient and adequate risk management plan. Construction companies in order to protect their business and their interests, seek to find methods to which are more effective. Specifically, when they take part in overseas construction projects, where there are numerous uncertainties and risks in a project, they adopt new forms of co operations. One of them is the Joint Ventures and strategic alliances. Although this type of organization reduces some business risk, it also presents others factors that could affect the project performance. Among all these factors, are financial, government policies, economic conditions? To alleviate these risk factors, an efficient risk management process must be developed from the Joint Venture partners (Thompson and Perry, 1983).

In construction business, there are numerous sources risks and uncertainties, many of them are not under the control of project participants (Baloi and Price, 2003). Also, construction project have the reputation to fail in time and cost. For all the above, it is necessary to identify the risk sources firstly. Odeh and Battaineh (2002) studied the most typical construction risks in several countries, including the United States, the United Kingdom, Saudi Arabia and Israel between 1987-1997. "They found seven significant causes of delays: owner interference, inadequate contractor experience, financing and payments, labour productivity, slow decision making, improper planning and subcontractors" (Odeh, Battaineh, 2002, p.50).

A. Risk Identification

This is the first stage in a risk management process. Many people believe that it is the most important stage in this process, because if you don't know the risk, you cannot react efficiently; meaning, either to take the necessary actions in order to deal sufficiently with the threat, or to exploit the opportunity. The goal of the risk identification is to identify exhaustively all significant sources of risk in a project, as well as the causes of them (Bing, Tiong and Chow, 1999). Simply speaking, risk identification is trying to identify "causes and effects" (what could happen and what would be next) or the reverse, "effects and causes" (what outcomes muse be avoided or encouraged).

The process by which risk identification is accomplished is varied between organizations but usually include one or more of the followings: interviews, brainstorming sessions into risk teams, site visits and a large volume of data from previous experience (Akintola and Malcolm, 1997). The risk catalog contains all risks that company has faced in the past, as well, may be presented in the future. In particularly developed organizations, it is possible to meet the methods of confrontation that were used when they had dealt with risk, as also the outcomes of their actions. As we have already mentioned, the risks and the actions are not the same for each project, because every project is unique and a construction company is a dynamic sector, where new risks can be emerged from every project at any time. So, the reliability of those risk catalogs depends direct on how often they update the existent databases.

For this reason, it is very important, the risk identification process to be performed throughout the whole project life cycle (Heerkens, 2002). In the process of risk identification in a project, it is necessary to analyze the different sources of risks present in a project, as well as the different classification of risks. The results of risk identification methods are usually some unstructured lists of dangers, having any relation with the project. In these lists, the potential risks appeared isolated, out of any frame and they don't give the general picture of threats within the project. Such creation of lists will make it easier for the risk manager to visualize risks and to deal with them in a systematic way (Ding, 1996). It is proposed that the risk factors can be categorized in three main groups:

- Internal risks, means things that the project team can control or influence, such as scope of the project, resource assignments, production costs, etc.
- Project- specific risks, means unexpected things during the construction project that leads to time or cost overrunning or in lower level in performance.
- External risks, means things that are beyond the control of the project team, such as financial, government actions or actions of God.

i. Internal risks

Aleshin stated that "internal risks are initiated inside the project" (Aleshin, 2001, p.204). The finance category includes payments to contractors. The only source of revenues for the construction contractors is the payment from the owners. When owners delay to pay the contractors, there appears a financial hardship among them. In many cases, mainly of Joint Ventures Company a very critical risk, which affects directly its performance, is the reduction of autonomy and the contribution of under qualified staff. All these factors affect negatively the company and create problems in its operation. As for disagreement among stakeholders, the author refers mainly to the owners. Owners many times intervene improperly in the construction phase of the project; they may require changes due to poor scope of work definition or changes in requirements. All this changes are very dangerous and jeopardize the whole project. If there is distrust among company staff relationship, and especially among the general manager and functional managers, then the project will have problems. The cooperation among all staff in the company is absolutely necessary in order to be efficient, with high performance and all members involved should be allied and not enemies. There is no time and space for personal ambitions, exploiting others. A change in technology is a critical factor for the success of the project. This might occur because of the uniqueness of each project. New technology demands qualified staff. On the other hand, each company exist .mainly for commercial gain, meaning that they are concerned with the completion of the project on time and with minimum cost and not for the use of technologyedge.

ii. Project-Specific Risk Factors

A very critical risk factor is the client's problems. We separate this category in two sub-categories:

i. Problems with cash flow and
ii. Excessive demands from the client.

Concerning the first option, it is the most critical factor for this category of risks. Always, there is the danger of a sudden bankruptcy from the client, so the project should be stopped at the moment. Also, the client may delay to pay, resulting to have serious delays in the schedule of the project. Clients, often impose tight time schedules which are impractical to achieve. Moreover, they try to rush the projects for obvious time and cost reasons. Another critical factor is a poor project relationship. Lack of communication and poor relationships between all parties in a project may expose the project in jeopardize. They should be established a straightforward communication, in order to find solutions in any problem at the moment, and to avoid misunderstandings between parties. As we have mentioned above, large engineering projects, in order to share risks, due to their dynamic environment, they cooperate with subcontractors. This new cooperation lurks new risks, such as technical qualifications, reliability and financial stability. (Akinci and Fischer, 1998). The last risk, considered less critical, but we have to mention, is any potential disagreements in the contract. Contractual risks are usually caused by improper contractual proviso, improper tender documents, or inappropriate types of contracts (Schwartz, 1985).

iii. External risks

The political risk includes threats for war, political volatility, changes in laws and convention, labor strikes and so on. It is considered the most significant risk for this category, because any political dispute and political change can affect the project negatively (Ling and Hoi, 2006). In order to understand how detrimental is for the process of the project, the author will share an example: There is an instruction in UAE that stops construction work for the period of the summer (July and August) from 1 to 3 am. This regulation has affected dramatically the ongoing project, such as Pal Jumeirah project, which has a very

strict and tight time schedule. Economic risk category includes inflation, changes in exchange rates, risks of economic fluctuation. These factors can have serious collision on the revenue or loss margin in each contributor. Any economic slowdown leads to a shrink of the construction sector. Moreover, changes in fluctuation of exchange rates impinge on directly the profitability of the project (Baker, 1997). Another critical factor is the environmental risks. We refer to the actions of God, events that occur as an outcome of nature and are often called natural phenomena. The common risks under this category include physical damages, destruction of facilities, equipment, material, even labor death (Rashid, 1991). Social risk factors include security problems, different cultures, religion, and folkways. These risks are not so critical but we should respect them (Barber, 2005).

B. Risk Quantification

There are many criteria that are used to establish the level of the risk in a construction project, if it is high or low, such as the probability of occurrence, the potential impact or severity and others. According to William (1993), "the risk is broken down into two main criteria: a) the probability, which is the possibility of an undesirable occurrence, and b) the impact, which is the degree of significance and the scale of the impact on other activities if the adverse thing occurs". Using a mathematical formula, a risk can be described as follows:

$$R=P \times I$$

where R is the degree of the risk, within [0,1],
P is the probability of the risk, within [0,1] and
I is the impact, within also [0,1]. Risks are rated at three degrees of urgency:
Low – treated as routine business
Medium – risk can negatively affect or preclude an organization from meeting a commitment
High – risk could preclude delivery or completion of project (Galorath, 2006)

From the above formula, it can be seen that the degree of risk is around 0 if the probability of incidence is little or the impact of the risk is small. In contrast, if the impact of the risk or the probability is high, then degree of the risk will be high. It is important to rate risks because we can study them, prioritize and report them based on their impacts and probabilities. Risks rated as medium receive more attention than low risks until the threat in the project is removed. High-rated risks should be addressed instantly and should be tracked until they can be downgraded. (Brooks, 1975) Furthermore, the risks are dynamic; meaning that they can change over time, and so can their impacts, as we mitigate them, the project conditions may change, as well as probability of their occurrence may change. In a construction project, the classification of risk factors with high impact or high probabilities is not difficult to determine.

Risks with medium probability or medium impact have been neglected from the construction process many times. This is also risky because such degree of risk is considerable and maybe it is significant for the project. Therefore, in order to determine a risk factor precisely, we need to know not only its probability but also its impact in the construction process (William, 1993). There are two main ways in which somebody can evaluate risk probability: subjective analysis and objective analysis. Subjective analysis means to estimate directly the risk factor. But in order to achieve it, it needs skill and inspection. Although construction projects are unique, it is quite often that risks for which there is previous experience. Objective analysis is another method which is used widely to assess the probability of the risk factor. However, in this case, historical data is required. Many times, this application is unfeasible, especially for large and international construction projects, because these are usually unfamiliar and unique, and it is difficult to find comparable information. The following figure shows an overview of project risk assessment

C. Risk Response and Development Control

The above two steps, as we can see, do not actually remove risks. They simply provide us with an organized process for recognizing any potential risk in our project. Thus, the last stage of risk management, risk

response and development control appears to be the most considerable stage in the whole process. According to PMBOK (2004, p.260), "Risk Response is the process of developing options, and determining actions to enhance opportunities and reduce threats to the project's objectives". There are a number of ways to address the high risks in a project.

The most usual and important are:
Avoidance: In avoidance, you choose a change that eliminates utterly the threat.
***Transfer*:** Transferring the risk to another party, is a very common method to deal with risks in construction projects. It is transformed by the owner to the contractor through the conditions in the contract, or by the contactor to the sub-contractor.

Assumption: In this approach, you are aware about the risks, but you don't take any action on them. You decide to accept their consequences or to deal with them when it happens. This is essential when you deal with risks without serious impacts, or when it is less costly or less hurtful than the effort required to avert them.

Prevention: That means, to take actions in order to reduce the likelihood of occurrence of a latent problem. Firstly, you have to find out the source causes of potential problems, and then you can identify any precautionary measure that could lessen the probability that a given problem will occur.
Mitigation: In this strategy, your aim is to shrink the negative effects of a given problem. You try to take measures to lessen the impact.

Contingency Planning: Contingency plans are specific actions that are to be taken when a problem occurs. Although they're supposed to deal with problems only after they've occurred, contingency plans should be developed in advance. This helps guarantee a matched, effective, and timely reaction. Also, some plans may require endorsement resources that need to be set in advance (Flanagan, 1993). Managerial strategies to handle with risks. There are four major risk-management techniques:

i. Form and mitigate,
ii. Alter and allocate,
iii. Influence and renovate institutions and
iv. Diversify through portfolios.

When risks are endogenous, meaning that they are specific and controllable- the best strategy is to mitigate them using the classical risk management. On the other case, when risks are specific but outside the control of any partner, the most proper strategy is altering and allocating using contracts or financial markets (Miller and Lessard, 2001). When risks are weakly defined and under the control of affected parties, governments, or regulators, renovating them through influence is the way to expand controls. When risks are wide, systematic, but handy, the best way is to diversify through portfolios or other projects (Lessard, 1989).

III. CONCERNED RISK MANAGEMENT IN CONSTRUCTION

Every project manager during his career will deal with a project that for many reasons fails to achieve its preliminary outcome in requisites of time, cost and/or quality. On occasions, the failure, or more accurately, the disaster of a project is a mystery, while all things are going well, something comes from "out of the blue" and upsets the whole picture of the project. In some cases, unforeseen events appear during the project life cycle and scupper it; but at most cases the disaster of the project is due to poor management, poor communication or lack of project definition. (Nickson, Sizzons and Suzy, 1998). Disaster means diverse things to people; one person's hitch is another's devastation. According to Kharbanda (1996) the definition of project disaster is not achieve the major goals of the project to time and budget. There is an old adage that "after project failure, the guilty are promoted and the innocent punished". Perhaps the most famous project disaster in the world hitherto is on Apollo 13 and it is captured in the following exchanges of messages (the times are mission time in hours, minutes and seconds after launch):

55:55:20 – Swigert: "Okay, Houston, we have had a problem here".
55:55:28 – Lousma: "This is Houston. Say again please."
55:55:35 – Lovell: "Houston, we have had a problem.

We have had a main B bus undervolted". This was the point when the people on Earth at Mission Control learnt about the project disaster on Apollo 13. (Lovell and Jeffrey, 2000). The most vital thing that has to be done is a change in the culture of the organization, meaning that it must break the blame culture in favor of an open and "can do" one (Seddon, 2003). To help with this change, we will give a new definition of a disaster: "A project disaster is when an event has happened that makes it unfeasible to carry on as before and still achieve the objective". An important thing we have always to consider is that, in most cases, project disasters is not equal to total collapse organization and rarely leads to the termination of careers. What seems like a disaster, it is very possible, if we approach it in the right way, not only able to survive but also become a new opportunity of success. Most people do not have the willingness to recognize and accept that a disaster has happened.

Also, it is very decisive to cite that a failure should not always be punished. In novel projects, where the outcome can't have a predictable outcome, it is more than certain that a disaster in any new attempt is very probable. If we don't accept this failure, then we strangle the innovation.

A. The main causes of a project disaster

The detection of the most common factors for the disaster of a project, is very significant because after them we can find the ways to remedy them. Also, it is very important to know the causes from the start of the project, in order to develop methods how to avoid them. The most frequent causes for a project disaster are: According to Smallman (Smallman, 1996) there six basic categories for a disastrous project. These include: insufficient information, external events, unclear goals, untested technology, inadequate resources and failures of communication and management. The last two are the outcomes of lack of planning in a project. The old cliché "failing to plan is to plan to fail" is true. Furthermore, it is clear that often there is interaction between these categories, and each project manager should always have in mind that there are two types of project managers: those who have already been involved in a disaster, and those who will be involved in the future.

i. Inadequate information

Although this source could interact with the others causes of failure, we are going to examine it as a separate entry. If the project team doesn't have sufficient accurate information for the project, then they are not able to deliver the project with the desired outcomes. However, there is a limit to what can be known in a project, perhaps this cause of failure is inherent in any human venture. It is scarce to have full details for the project.

ii. External events

These include political, actions of God (natural disasters), change of enterprise's owner, financial crises and so on. Sometimes, these give warnings for their occurrence, sometimes they do not. By their nature, these are causes outside of the organization and the control of the project team.

iii. Unclear goals and requirements

Many projects fail because they have lack of clear goals and requirements. These lead to focus on delivering things right, rather than delivering the right thing. Allied closely to wrong goals are false assumptions. False assumptions give an expansion to delays and costs rather than outright disaster. Insufficient goals in a project are a consequence of unclear requirements. If a project team doesn't know accurately the requirements of the problem to be solved, then the whole project will be led to a disaster. Even when the requirements are accurate when the project starts, it does not mean that they will be the same by the time the project is delivered. For this reason, it is always valuable to ask "what has change • Untested technology
The use of untested technology or top edge technology is a high risk procedure, because firstly, it contains

a large number of unknown elements and secondly it demands the interference of experts in order to use it effectively.

iv. Inadequate resources

Lack of resources in a project is considered as one of the most significant factors for the disaster of a project. Resources for a project are divided in three flavors: funding, people and equipment.

- ***Funding:*** Every project has serious divergences in its outcome and especially to the final costing. If we don't have the money to pay these extra costs, then the project will fail. There are many causes which emerge from this including inaccurate estimation, changes in the project due to external factors, changes in requirements and so forth. Sometimes, the whole project must be completed to understand that the initial financial resourcing was incorrect.

- ***People:*** Having the wrong people in a project has a highly negative impact in the implementation of the project. Furthermore, a fully staffed project team who are unsuitable to work as a team, or they need training in order to be productive, is also negative for the completion of the project. iii. Equipment: Lack of the proper equipment can lead to project delays, but it isn't as critical as lack of people, because it is very easy to plan from the beginning of the project, what equipment we will need for it. However, that doesn't mean that the wrong equipment or the late delivery of them, will not cause serious problem in the project. In general, the lack of equipment is not considered a major factor of project disasters, but it is a sign of poor management and planning.

B. Failures of communication and management.

Failures of communication and management include misunderstandings, failure estimations, poor planning and poor description of objectives. Even though when we have highly experienced teams, it is smart enough to check all the things in the project, even what we believe it is obvious. Also, estimation is a very critical stage of as project, because lack of accurate estimation leads to wrong planning. For this reason, estimation must be carried at by people who have the experience and the knowledge to do it. One of the primary goals of a project manager is to set objectives. It is impossible to have the expectation for people to do a job, if they don't know exactly what they have to do. In order to evaluate the objectives of a project, we use a method called SMART (simple, measurable, attainable, realistic, timetable). If the objectives haven't been clearly defined, we cannot follow the rule SMART and the project will come to grief.

In addition, there are factors that apply to the scale of a project, characterizing it as small or large project. Both of them have different approaches to project disasters. On the whole, small projects are considered to be easier than are the large ones. In a small project every task gets to be on critical path, so the impact of any failure will be considered more significant than the large projects. On the other hand, large projects have two main enemies: complexity and interdependency. The more complex the levels of interdependency are in a large project, the bigger is the chance to lead to the project in failure. We will try to explain it using an example. Let's assume we have a multi-engine aircraft. If we have four engines, we are four times more expected to have one fail than if you have only one engine. However, if you only have one engine, and it fails, you will not complete the journey.

The saving grace is that a failure in a small project is less possible to have significant impact on a business- there are fewer passengers on board. Also, large projects often involve subcontractors – third parties who are in charge of delivering a component of the overall project. But as we have already mentioned, most project disasters involve more than one causes. So, when we try to find out the root cause of a project failure, a systemic approach is essential. The most probable is that a chain of several events led to the visible event and not one solitary cause. It is vital to identify the real cause of the disaster and not just a symptom. For that, we should avoid grasping at the visible cause, and carry on finding the real cause.

C. How to turnaround a project in success

According to Nickson (Nickson, 1994) a project follows the rule of "two out of three". The three objectives of a project are good quality, fast and low-priced. In the real world, you can have two of these together; getting a good quality, fast and low-priced job is like the legendary free lunch. Up to now, we have mentioned only the causes of disasters and how they can influence other parts within the organization. In this chapter, we will try to find guides how we can turnaround the project back in success. It will not always be possible to find a therapy for any project which is on the path of disaster. It is fair to mention, that IT projects undergo more disasters than any other project, so this is a prosperous field of learning. Professor McDermid (McDermid, 2000), an expert in software development, who has seen many projects to be in trouble, recognized five key steps that are necessary to follow in order to turnaround a failing project. These steps are:

- Truthfulness and directness
- Detection of root causes
- Development of a solution
- Remedy action v. Constant management controls.

Although his knowledge and experience is based on IT projects, the above steps are generic and may be applied in any complex project, such as construction one.

i. Truthfulness and directness

The first step is to recognize that there is a trouble and should be truthful and direct about it. This is not always easy, because many people avoid admitting the presence of a problem due to its consequence in their jobs. The dialog between Apollo 13 and Houston Base about "Houston, we've had a problem" conforms the trust and direct criterion. The crew without delay informed Mission Control that something had happened and went about making sure that everything they knew was conceded on. This was the first step of the most famous recoveries from a calamity on record.

ii. Detection of root causes

After identifying the existence of a problem, the next step is to find out the root for it; meaning that you should make a review and focus on the external view of the problem. The purpose is to what has been done, what has not been done, what was planned for or not and so on. When you make the analysis of what has gone wrong, you shouldn't leap on the first possible cause, because most times this is a symptom and not the root cause of the problem.

ii. Development of a solution

In order to turnaround a project in success, there are four key variables: scope, time, resources and quality. When you attempt to find a solution, you have to take into consideration these variables, and most of times there is interaction between them. Scope means that the deliverables must be prioritized having considered the needs of the customer. Time means that the project manager should identify which are real deadlines, which is the critical path, and which are internal milestones, using them as a measure of progress, without considering them critical for the project. There are two different issues, referring to resources; having enough resources and having the right resources. Both of them are very important, otherwise having off beam resources is completely useless as having no resources at all. Also, when the project is in trouble, it is tempting to add more resources, if it's possible.

There are projects which have too much elaboration in quality, spending a lot of reviews and documents. When a project is in trouble, the best solution is to make a review what quality is considered as minimum in order to support the delivery, even if that means adding work rather than removing it. As a minimum, this includes quality requirements, product descriptions, standards to be used, and some form of measurements and tests. iv. Remedy action Assuming that the causes of the trouble project are known, it's time to find ways to remedy it. That means, having a detailed plan that describes who is doing what, when and how. In this process, negotiation has a significant role. Also, the remedial action must be described

with high probability of success and credibility, because there is no other opportunity if the remedial actions fail.

iii. Constant management methods

When the disaster in the project has been to some extent or entirely recovered, it's time to establish methods in place to prevent it from happening again. It's not enough to have fixed the problem; it is important to find ways to cure the problem, so as not to appear again. So, we have to put some simple measures, which will be understood by a wide audience; otherwise, if we use complex methodologies, it's very possible that a new disaster will take place. Simply, any methods adopted should include the following:

- **Reports:** simple and clear identification of the progress of project. Deliverables and requirements: clearly and understandable objectives of the project
- **Change:** a tool in order to recognize, control and monitor the changes in the project during its lifecycle **Risk:** must support the identification, assessment, planning and monitoring of new/ongoing risks
- **Tasks:** each employee should identify every element of work needed Measurements: there must be ongoing measurement in order to compare with the objectives of project. If you cannot measure it, then you cannot know if it's complete or not. Specific skills and experience is required in order to recover a project from a disaster.

The most useful techniques are the following:

- **Brain-storming:** One of the best approaches when a project is in a mess, is to run a brain-storming meeting. Such types of meetings have the advantage of flexibility and freedom and give the chance to generate ideas and solutions, mainly for novel projects.

- **SWOT analysis:** Another useful technique is SWOT analysis: strengths, weaknesses, opportunity and threats analysis. It is used more in sales and marketing sectors, but it can also be helpful in a project. In simple words, you try to identify what are these for the project, for each of the categories. This method can be used as a complement of brain storming techniques; meaning that when the brain storming has been completed, next step is to score each section, giving it a quantitative measure.

IV. CONCLUSION

Many people have a theory that there are no obstacles in a project, only opportunities. Perhaps the most valuable merit in a concerned project is the chance to learn from it. Unfortunately, people who have been involved in a disaster, prefer to forget it the sooner. This is a terrible waste of experience, because the lessons you'll take can help you to improve your knowledge and can easily help you avoid the next disaster. Any organization who has been involved in a disaster should take a list of lessons learned in the end, including the following parts:

- The causes.
- What was done well?
- What was done badly?
- What could have been done to prevent the disaster?
- What could have been done to improve the results?
- How can it be avoided next time?

It is very important to jog our memory that if we want to learn from a disaster, we must avoid having blame culture inside the organization; otherwise the identification of root causes for the problem will not be attainable. The defensive behavior will not help to discover the truth for the problem. There are four main guidelines in order to recover a project. These are; do nothing, start the project from the beginning, declare crush, assess and carry on. Of course, there is always the alternative of getting it exact in the right place. It is important to mention that all these four strategies are not supported by all projects. In some cases, we

must use other methods to approach the phases of the project. We should keep in mind that just because the project is in concern does not mean that everything in it goes wrong. A common point which applies to all these strategies is to keep away from getting lawyers implicated as a means of resolving a disaster unless if they are considered necessary. As in divorce, once lawyers are actively involved in a dispute, it is implausible to come across a harmonious and victorious ending.

A. Do nothing

Although it is difficult to work, it seems to have been tested in many projects. It generally happens when people believe that the trouble is not happening or because they are too bemused to think of anything. If the project disaster is due to an external event, such as weather conditions, then the most probable is that we cannot do anything.

B. Start the project from the beginning

This means to throw away everything implemented to date, keeping, of course the lessons learned. It is costly, extravagant and requires elastic timetable. It is used mainly, on projects in which are not on the critical path for overall delivery.

C. Declare crush

Accepting the disaster in a project is not as dreadful as it sounds. By accepting the situation, you give the chance to communicate effectively with other people in the project team and find solutions. The main disadvantage is that it is very easy to start blaming everyone here. But all disasters are not someone's fault, and even it is true, as we have already mentioned, it is not an effective strategy to blame someone, or even more to punish them. If you do it, then you lessen the opportunities to build the organization onto lessons learned.

D. Assess and carry on

Assess and carry on means that you can identify any event that is out of control and so you cannot carry on in the same way. This is the best approach, and it is the most used. Also, it gives the capability to combine the advantages of declaring the crush strategy with starting the project from the beginning.

E. Getting exact in the right place

The most important thing for a project is to enter it from the beginning in the right place with a clear knowledge of its requirements. The implementation decisions should be taken by people with previous experience and congruent knowledge. Following this guideline will reduce the number of project disasters. Project disaster is a mixture of command and thinking, where you don't have clearly and effectively defined the goals of it and/or you have put wrong people to handle it.

G. An ongoing risk monitoring

In order to eliminate the possibility for a troubled project, an alternative author's suggestion is to develop an ongoing risk management process embedded into an effective project planning. Effective project planning, besides of the "normal" activities (stakeholders involvement, identification of project objectives and goals, and so on) is consisted of one more activity: The design for the performance measurements of objectives, the development of strategies and the remediation approach, in order to implement, monitor, optimize and shut down remedies. The main difference from the traditional project planning is that this design is practiced throughout the project, and not just in the beginning phases.

The new project planning is iterative process during all the project lifecycle, till the closeout phase. One of the elements of the new project planning design is the ongoing risk monitoring of the project. Simply, each step of the project implementation should be documented. Furthermore, risks need to be monitoring in order to ensure that any possible change in the project do not alter the risk priorities. Finally, risk identification and assessment should be reviewed to ensure that any new or emerging risks are not identified and managed.

To achieve all the above, it requires a risk management assessment applied with a contingency plan in order to accelerate post disaster management. Such plans should be also reviewed and tested frequently. It is obviously that it's needed also documentary updates (eg new procedures, legislation, etc) as well as seminars and workshops. A template of ongoing Risk Management Checklist. Author recommends that the above mentioned Risk Management Checklist should become an integral part and document of any construction Project Plan, be reviewed – negotiated and approved by both the Project Manager and the high-level Management and finally be countersigned by both sides. In this way, Risk Management is brought on a higher level of importance for the Project (in comparison with the classic Risk Management Plan, which is binding only for the Project Team) and is being recognized as a common tool for both the Project Team and the Project Organization. In this way, Risk Management becomes an element of organization philosophy and strategy.

H. What we avoid to do

Up to now we have referred to causes of risk disaster, therapies and recover strategies. In this section we will give more emphasis on the negative, what not to do. These negative approaches are: execute nothing; lie about it; quit; break the contract; charge the subcontractors; and charge the client. You should be careful when you decide to choose one of the above strategies in order to recover the project.

Execute nothing: The "do nothing" approach includes complete inactivity; carrying on the project, as it was planned, and hope it all comes in the right way at the end. It is close to the strategy of avoid accepting the real facts in the project. But, for a Project Manager it is a situation which helps him to transfer bad news to his boss or client. At the point, you are sitting back and wait for everything to be fixed magically. On the other hand, "do nothing" is a perilous approach, because it spends a lot of time till someone accepts the foreseeable and its consequences before corrective action is taken. The longer the problems are disregarded, the harder it becomes to resolve them.

Lie about it: In this strategy, you don't reveal the truth of a problem, and you hope to fix it before it can no longer be hidden and the truth discovered. The pros of this approach is that it absorbs the intensity of the project and gives it a little time interval; this strategy is especially used when we want to avoid a loss of face. On the other hand it is not a good method, because if it reveals before the problem has been fixed, it will then usually destroy working relationships. Also, when bad news is learned, those who had concealed it can never recoup any respect and trustworthiness. Experience shows that it's better to tell the truth to the client together with a plan of how you consider to fix it, rather than not tell them the truth.

Quit: The Project Manager or the senior manager is replaced by others. In cases, this change happens very unexpectedly, within few minutes' decision. This kind of approach is attractive because, you provide a scapegoat for the disaster. Also, it shows towards clients that something is being done; and now we have new faces in the team, so the project will be secure. Nevertheless, this type of approach will not improve or fix the problem in project in the longer term. Especially if the Project Manager is not responsible for the disaster, it is unlikely to be the appropriate solution. Furthermore, bringing new management to the team, will create a negative impact on the morale of people and also it demands a new forming stage in team building, so the performance of the whole team will be decreased significantly.

Break the contract: In simple words, that means to put a stop in the development of the project and let lawyers get on with it. The only effective thing, using this approach, is that if the project was continued it would be devastating for the company. Also, it allows resources to move in other projects; improving their morale, because they can help other projects to achieve their goal. Breaking a contract is not something simple. The only people who are certain to win are the lawyers. Even if the organization gets definitely of the disaster, it will probably break the working relationship with the client. New business with the same client is unlikely in the future. The reputation of the organization may be negatively affected by this strategy

and in the end the cons from this approach are more than the pros. The smartest thing is to take good legal advice before breaking any legal contract.

Charge the subcontractors: It is not a wise decision, rather than admitting your errors, to start involving and blaming the subcontractors or suppliers for that. This strategy is convenient, because you pass the buck to someone else; you allege that it "is not your fault". At least this is the concept. This is a dangerous strategy because dealing with subcontractors is part of the job for every Project Manager. It is rational to claim that any subcontractor can result in project delays, but in any case we cannot allege that this situation can lead to disaster. Furthermore, it is the Project Manager's responsibilities to identify problems and try to take actions to mitigate them, otherwise something is very wrong.

Blame the client: This strategy is similar to charging the subcontractor for the disaster. The disaster is the outcome of the falling client to meet the objectives, he behaved irrationally, the delayed to pay and so on. It is a very risky strategy, which if it works then the disaster is not problem of the Project Manager. It appears everything was done professionally, and the disaster was something inevitable. In this case, the morale of project team remains untouched; they believe that they have done excellent work, as well as the reputation of the organization remains intact. But as we mentioned before, it's a dangerous strategy because there is a doctrine "the customer is always right, even when wrong". As with the subcontractor charging, it can be said that client management is also part of the role of the Project Manager. So, if the project team couldn't control changes or has failed to monitor or control change, then this is not a client's problem.

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