CHAPTER TWO

Literature Review & Background

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2-1 Background Theory:-

In recent years, intensive research and development has been done in the Area of project risk management. It is widely recognized as one of the most Critical procedures and capability areas in the field of project management (Vetch, Coffin, and Ansari) found a statistically significant relationship between management support for risk management processes and a reported project success. However, shortcomings and improvement opportunities in this field[3] have been identified. Some of the shortcomings are related to the ever increasing complexity of projects. Subcontracting is expanding since many companies are focusing solely on their core businesses, which results in more complex project networks and greater numbers of project participants. The scarcely studied viewpoint in the project risk management field is related to this complexity. Although the interaction between project actors occurs at many different levels, research done to study how networks act in preventing or mitigating risks is Construction projects are characterized as very complex projects, where uncertainty comes from various sources (e.g. Miller, R., Lesser, D., 2001.) Construction projects gather together hundreds of stakeholders, which makes it difficult to study a network as a whole(Voetsch, Cioffi, and Anbari).

But at the same time, these projects offer an ideal environment for network and risk management research. Additionally, construction projects are frequently used in management research, and several different tools and techniques have already been developed and especially for this type of project. However, there is a gap between risk management techniques and their practical application by construction contractors[6]. This study tries to find reasons for this gap and works to decrease it. Special applications for construction projects are discussed in the literature review (e.g. Miller, R., Lessard, D., 2001.). This study is based on the assumption that by understanding better both the relationships in a project network and risks related to the network structure, project risk management can be more effective. It has already been recognized that a clear understanding of the risks born by each participant leads to better risk allocation.

The objective of the study is to find means of risk management that can be utilized by the network and to make new suggestions on the use of these risk management methods.
It is of a particular interest to find the means to manage those risks that are the most effectively managed with the co-operation of several project actors. Initially however, the relationship between the existence of a network and the existence of risks needs to be established.

2-2 An Overview OF Risk Management:

Risks which have not been identified and managed are undoubtedly considerable overruns in cost and scheduling. For this reason, a systematic approach must be taken to manage risks throughout the development of a project (Mills, 2001). Risk management is a proactive decision-making process, which involves accepting a known risk and/or taking steps to mitigate the impact and likelihood of the occurrence of risks, to minimize the threats and maximize the opportunities (Loose more et al., 2006). Despite numerous risk management processes proposed in the literature (He, 1995; Chapman, 1997; Tah and Carr, 2001; Standards Australia/Standards New Zealand, 2004; PMI, 2004; Loose more et al., 2006), the five main steps in the risk management process are, generally, risk planning, risk identification, risk analysis, risk response and risk monitoring and control.

An effective implementation of a risk management system not only brings a higher level of awareness of the consequences of risk but also focuses on a more structured approach, more effective centralized control and better transfer of risk information between parties. It can reduce long-term loss expenses and project time overruns (Edwards, 1995). Risk management can help assess and ascertain the viability of a project to ensure that it is worthwhile (Smith, 2003). Statistical data concerning past projects can be used to model risks more effectively for future projects (Simister, 1994). However, it does not completely remove all risks from a project. It only reduces the probability of occurrence and induced impacts to ensure that the risks are managed in the most efficient and effective manner (Capper, 1995). Successful risk management should convert uncertainty to risk and convert risk to opportunity. The project and organization would hence achieve more gains by maximizing opportunity, minimizing risk and reducing uncertainty.

2-3 Risk management:

is a structured approach to managing uncertainty related to a threat, a sequence of human activities including: risk assessment, strategies development to manage it, and mitigation of risk using managerial resources.

The strategies include transferring the risk to another party, avoiding the risk, reducing the negative effect of the risk, and accepting some or all of the consequences of a particular risk.

Some traditional risk managements are focused on risks stemming from physical or legal causes (e.g. natural disasters or fires, accidents, death and lawsuits). Financial risk management, on the other hand, focuses on risks that can be managed using traded financial instruments.
The objective of *risk management* is to reduce different risks related to a preselected domain to the level accepted by society. It may refer to numerous types of threats caused by environment, technology, humans, organizations and politics. On the other hand it involves all means available for humans, or in particular, for a risk management entity (person, staff, Organization).

In ideal risk management, a prioritization process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first, and risks with lower probability of occurrence and lower loss are handled in descending order. In practice the process can be very
Difficult, and balancing between risks with a high probability of occurrence but lower loss versus a be mishandled. Risk with high loss but lower probability of occurrence can often Intangible risk management identifies a new type of risk - a risk that has a 100% probability of occurring but is ignored by the organization due to a lack of identification ability. For example, when deficient knowledge is applied to a situation, a

knowledge risk materializes (ispwg01_04B_risk_analysis.doc)**.**
Relationship risk appears when ineffective collaboration occurs. Process-engagement risk may be an issue when ineffective operational procedures are applied. These risks directly reduce the productivity of knowledge workers, decrease cost effectiveness, profitability, service, quality, reputation, brand value, and earnings quality. Intangible risk management allows risk management to create immediate value from the identification and reduction of risks that reduce productivity.

Risk management also faces difficulties allocating resources. This is the idea of opportunity cost.
Resources spent on risk management could have been spent on more profitable activities. Again, ideal risk management minimizes spending while maximizing the reduction of the negative effects of risks.

Genral preamble about the cases and the method followed:
It is clear that any obstacle can face the project life cycle can be avert early on by devising a risk management matrix .the designing and/or client organization need to ensure that at every stage of the project , the risks are identified , assessed quantified and mitigated against . The process is the generally mapped in follows:

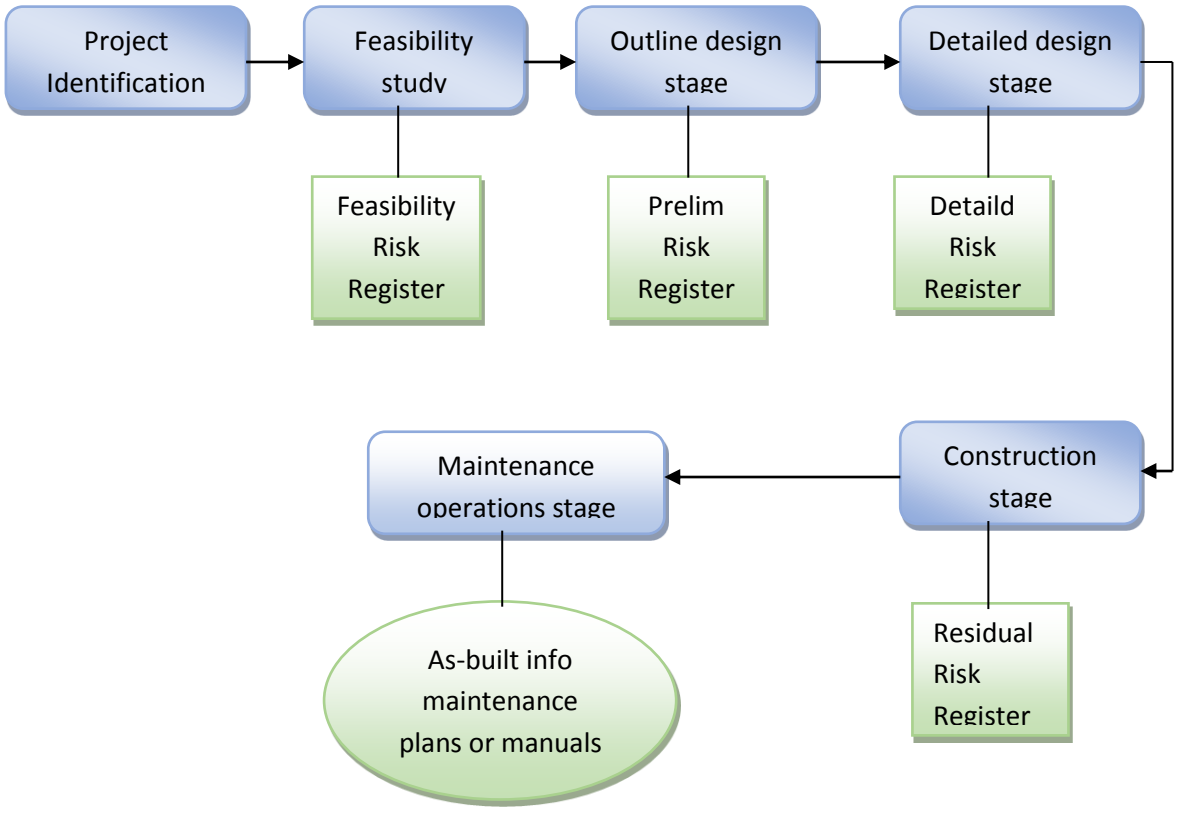


Fig :(2-1) .Risk management during project Stage
Source :(Chapman, 1997; Tah and Carr, 2001).

How is risk managed?

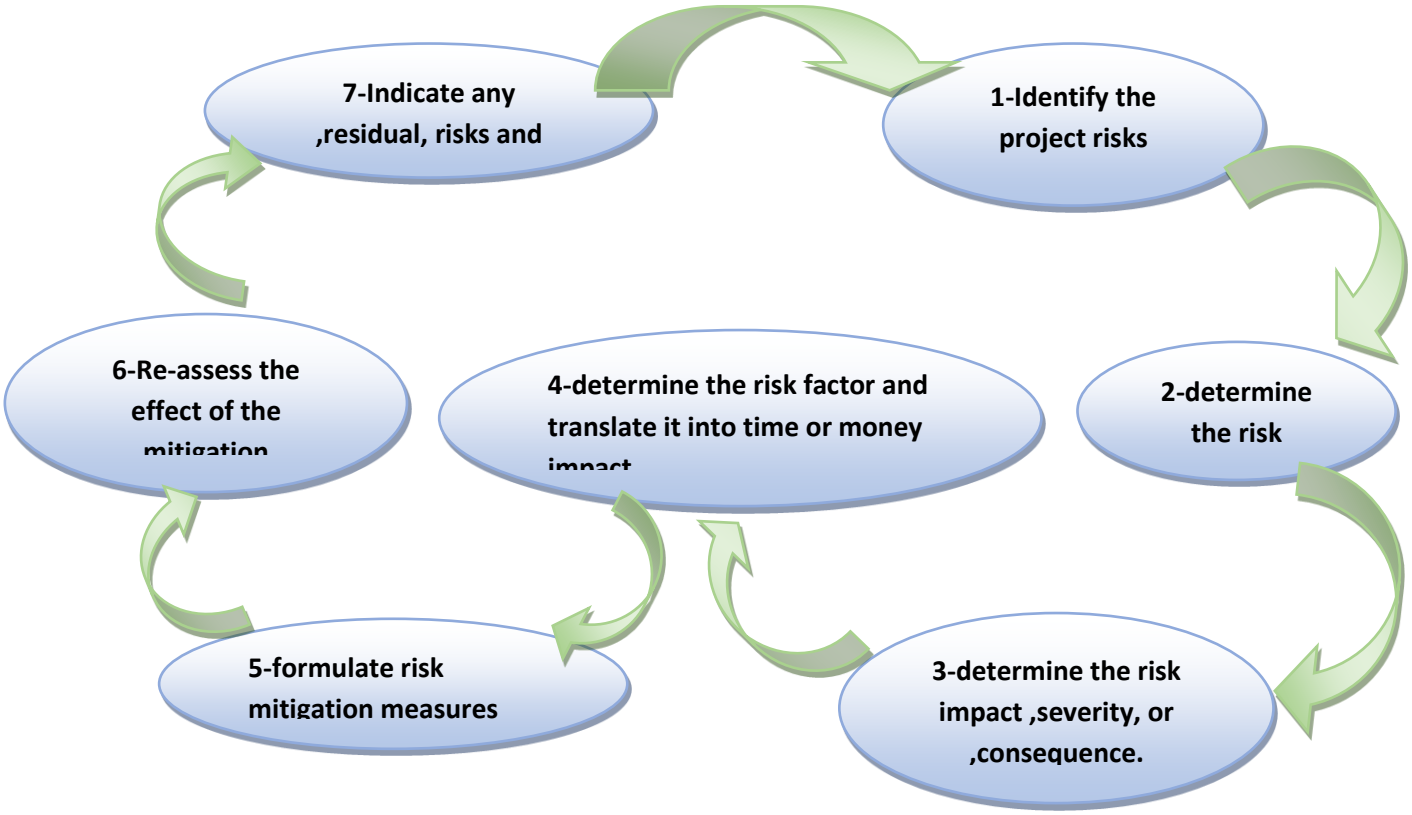


Fig :(2-2) .Risk management process

Source :(Chapman, 1997; Tah and Carr, 2001).

2-4 Steps in the risk management process

2-4-1 Establish the context:

Establishing the context involves:

- Identification of risks in a selected domain of interest;
- Planning the remainder of the process;
- Mapping out the following:
  - The social scope of risk management,
  - The identity and objectives of stakeholders,
  - The basis upon which risks will be evaluated, constraints;
- Defining a framework for the activity and an agenda for identification;
- Developing an analysis of risks involved in the process;
- Mitigation of risks using available technological, human and organizational resources (ispwg01_04B_risk_analysis.doc).

2-4-2 Risk identification

After establishing the context, the next step in the process of managing risk is to identify potential risks. Risks are about events that, when triggered, cause problems hence, risk identification can start with the source of problems, or with the problem itself.

2-4-2-1 Source analysis

Risk sources may be internal or external to the system that is the target of risk management.
Examples of risk sources are: deficiency in standards or inadequate ENC coverage, or lack of appropriate funding.

2-4-2-2 Problem analysis

Risks are related to identify threats, for example: the threat of accidents and casualties. The threats may exist with various entities, most important with Member States and other stakeholders.
When either source or problem is known, the events that a source may trigger or the events that can lead to a problem can be investigated. For example: lack of participation in a committee or working group may endanger the timely production of standards.

The chosen method of identifying risks may depend on culture, industry practice and compliance. The identification methods are formed by templates or the development of templates for identifying source, problem or event. It is recommended to use both a bottom-up contribute to effective risk management. The process should also identify who should be responsible for managing each risk. .

2-4-2-3Common risk identification methods:

- Objectives-based risk identification:

Organizations and project teams have objectives. Any event that may endanger achieving an objective partly or completely is identified as risk.

- Scenario-based risk identification:

In scenario analysis different scenarios are created. The scenarios may be the alternative ways to achieve an objective, or an analysis of the interaction of forces in, for example, a market or battle. Any event that triggers an undesired scenario alternative is identified as risk (ispwg01_04B_risk_analysis.doc).

- Taxonomy-based risk identification:

The taxonomy in taxonomy-based risk identification is a breakdown of possible risk sources.
Based on the taxonomy and knowledge of best practices, a questionnaire is compiled. The answers to the questions reveal risks.

- Common-risk Checking:

In several industries lists with known risks are available. Each risk in the list can be checked for application to a particular situation.

- Risk Charting:

This method combines the above approaches by listing:
- Resources at risk.
- Threats to those resources.
- modifying factors which may increase or reduce the risk, and Consequences it is wished to avoid.

Creating a matrix under these headings enables a variety of approaches. One can begin with resources and consider the threats they are exposed to and the consequences of each.
Alternatively one can start with the threats and examine which resources they would affect, or one can begin with the consequences and determine which combination of threats and resources would be involved to bring them about.

2-4-2-4 Risk Identification Techniques:

2-4-2-4-1 Brainstorming :

An idea generation group technique is divided in two phases. (i) Idea generation phase, in which participant generate as more ideas as possible (ii) idea selection phase, the ideas are filtered, remaining only those approved by the entire group. (Moreno et al. 2006).

2-4-2-4-2 Delphi Technique:

Delphi is a technique to obtain an opinion consensus about future events from a group of experts. It is supported by structured knowledge, experience and creativity from an expert panel (Wright and Giovinazzo as cited by Moreno et al., 2006).

2-4-2-4-3 Interview/ Expert judgment:

Unstructured, semi structured or structured interviews individually or collectively conducted with a set of experienced project members, specialist or project stakeholder (Moreno et al., 2006).

2-4-2-4-4 Checklist:
It consists of a list of item that are marked as yes or no, could be used by an individual project team members, a group or in an interview. (Morano et al., 2006)

2-4-2-4-5 Influence Diagram:
It is a graphical representation containing nodes representing the decision variables of a problem. A traditional influence diagram is formed by three types of nodes: utility, decision and informational. The causal relationship occurs between utility and chance nodes and represents a probabilistic dependence.

2-4-2-4-6 Flowchart :
Graphical tool that shows the steps of a process. This technique is applied for a better comprehension of the risks or the elements interrelation (Morano et al., 2006)

2-4-2-4-7 Cause-and-Effect Diagrams :
These are also called Ishikawa diagrams or fishbone diagram, illustrate how various factor might be linked to potential problems or effects (PMBOK – PMI, 2008). The diagram is designed by listing the effect on the right sides and the causes on the left sides. There are categorized for each effect, and the main causes must be grouped according to these categories (Morano et al., 2006)

2.4.3. Risk Assessment:

Once risks have been identified, they must then be assessed as to their potential severity of loss and to the probability of occurrence. These quantities can be either simple to measure, in the case of the value of a lost building, or impossible to know for sure in the case of the probability of an unlikely event occurring. Therefore, in the assessment process it is critical to make the best educated guesses possible in order to properly prioritize the implementation of the risk management plan.

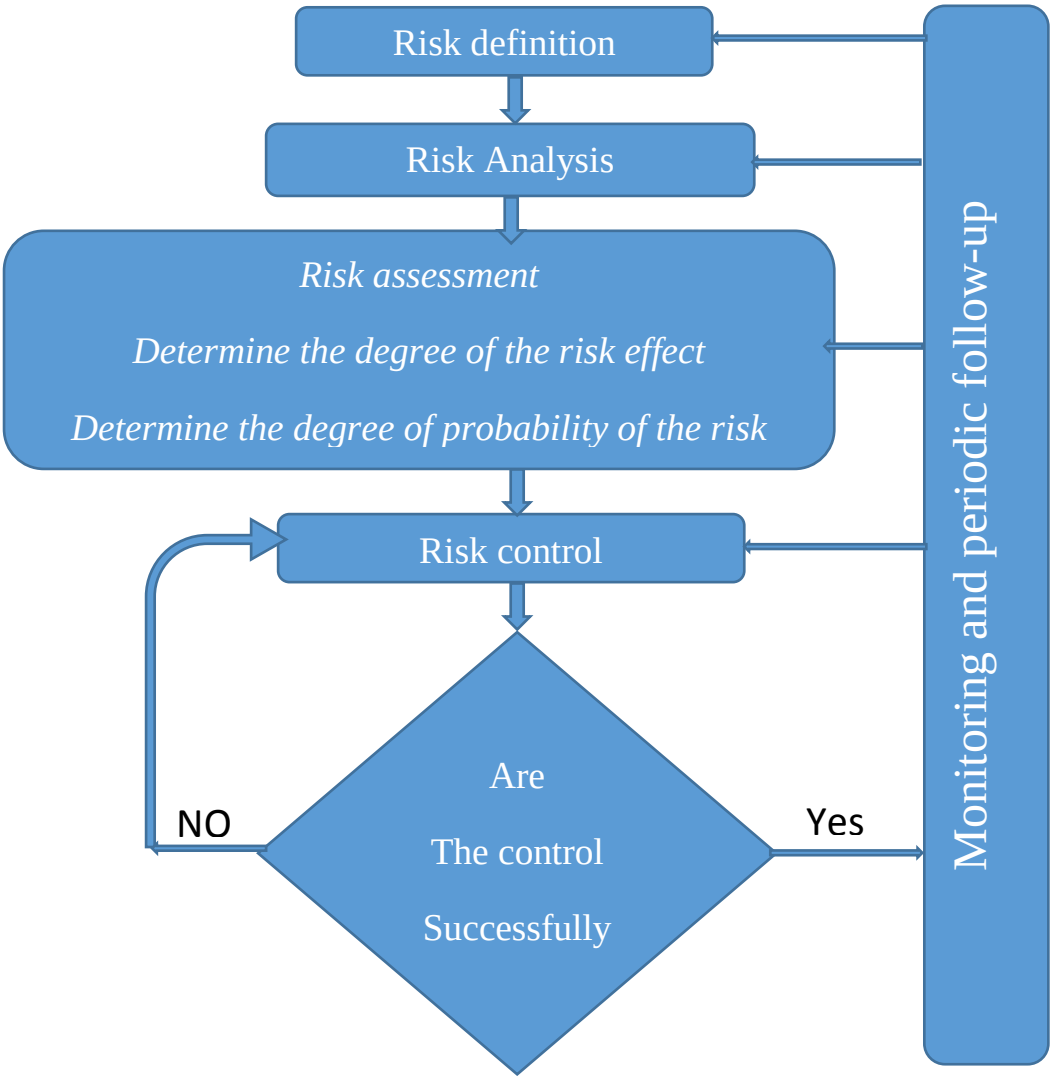
The fundamental difficulty in risk assessment is determining the rate of occurrence since statistical information is not available on all kinds of past incidents. Furthermore, evaluating the severity of the consequences (impact) is often quite difficult for immaterial assets.

Asset valuation is another question that needs to be addressed. Thus, best educated opinions and available statistics are the primary sources of information. Nevertheless, risk assessment should produce such information for the management of the organization that the primary risks are easy to understand and that the risk management decisions may be prioritized. Thus, there have been several theories and attempts to quantify risks. Numerous different risk formulae exist, but perhaps the most widely accepted formula.

- for risk quantification is Rate of occurrence (or probability) multiplied by the impact of the event equals risk Usually, the probability and impact of risks are assessed as very low, low, medium, high or very high where each rating requires a recorded definition (ispwg01_04B_risk_analysis.doc).

Later research has shown that the financial benefits of risk management are less dependent on the formula used but are more dependent on the frequency and how risk assessment is performed.
In business it is imperative to be able to present the findings of risk assessments in financial terms.

Robert Courtney Jr. (IBM, 1970) proposed a formula for presenting risks in financial terms. The Courtney formula was accepted as the official risk analysis method for the US governmental agencies.
The formula proposes calculation of ALE (annualized loss expectancy) and compares the expected loss value to the security control implementation costs (cost-benefit analysis).



Fig(2-3) – Steps of Risk Management

Source : (risk assessment and risk management K -26/1)

2.4.4. Potential risk treatments:

Once risks have been identified and assessed, all techniques to manage the risk fall into one or more of these four major categories:

- **Avoidance** (elimination)
- **Reduction** (mitigation)
- **Retention** (acceptance and budgeting)
- **Transference** (outsource or insure)

Ideal use of these strategies may not be possible. Some of them may involve trade-offs that are not acceptable to the organization or person making the risk management decisions. Another source, from the US Department of Defense, calls these categories ACAT, for Avoid, Control, Accept, or Transfer.

2-4-4-1 Risk avoidanc:

Includes not performing an activity that could carry risk. An example would be not buying a property or business in order to not take on the liability that comes with it. Another would be not flying in order to not take the risk that the airplane were to be hijacked.. Avoidance may seem the answer to all risks, but avoiding risks also means losing out on the potential gain that accepting (retaining) the risk may have allowed. Not entering a business to avoid the risk of loss also avoids the possibility of earning profits (ispwg01_04B_risk_analysis.doc).

2-4-4-2 Risk reduction:

Involves methods that reduce the severity of the loss or the likelihood of the loss from occurring.

Examples include sprinklers designed to put out a fire to reduce the risk of loss by fire. This method may cause a greater loss by water damage and therefore may not be suitable. Halona fire suppression systems may mitigate that risk, but the cost may be prohibitive as a strategy.

Modern software development methodologies reduce risk by developing and delivering software incrementally. Early methodologies suffered from the fact that they only delivered software in the final phase of development; any problems encountered in earlier phases meant costly rework and often jeopardized the whole project. By developing in iterations, software projects can limit effort wasted to a single iteration.

Outsourcing could be an example of risk reduction if the outsourcer can demonstrate higher capability at managing or reducing risks. In this case companies outsource only some of their departmental needs.

For example, a company may outsource only its software development, the manufacturing of hard goods, or customer support needs to another company, while handling the business management development without having to worry as much about the manufacturing process, managing the development team, or finding a physical location for a call center (ispwg01_04B_risk_ analysis.doc) .

2-4-4-3 Risk retention:

Involves accepting the loss when it occurs. True self insurance falls in this category. Risk retention is aviable strategy for small risks where the cost of insuring against the risk would be greater over time than the total losses sustained . All risks that are not avoided or transferred are retained by default.

This includes risks that are so large or catastrophic that they either cannot be insured against or the premiums would be infeasible. War is an example since most property and risks are not insured against war , so the loss attributed by war is retained by the insured.

Also any amounts of potential loss (risk) over the amount insured is retained risk. This may also be acceptable if the chance of a very large loss is small or if the cost to insure for greater coverage amounts is so great it would hinder the goals of the organization too much.

2-4-4-4 Risk transference:

Many sectors have for a long time regarded insurance as a transfer of risk. This is not correct.

Insurance is a post event compensatory mechanism. That is, even if an insurance policy has been effected this does not mean that the risk has been transferred. For example, a personal injuries insurance policy does not transfer the risk of a car accident to the insurance company.

The risk still Lies with the policy holder namely the person who has been in the accident.

The insurance policy simply provides that if an accident (the event) occurs involving the policy holder then some compensation may be payable to the policy holder that is commensurate to the suffering/damage.

Means causing another party to accept the risk, typically by contract or by hedging. Insurance is one type of risk transfer that uses contracts. Other times it may involve contract language that transfers a risk to another party without the payment of an insurance premium (ispwg01_04B_risk_analysis.doc).

Liability among construction or other contractors is very often transferred this way. On the other hand, taking offsetting positions in derivatives is typically how firms use hedging to financially manage risk.

Some ways of managing risk fall into multiple categories. Risk retention pools are technically retaining the risk for the group, but spreading it over the whole group involves transfer among individual members of the group. This is different from traditional insurance, in that no premium is exchanged between members of the group up front, but instead losses are assessed to all members of the group.

2.4.5. Create a risk management plan:

The risk management plan should propose applicable and effective security controls for managing the risks. For example, an observed high risk of computer viruses could be mitigated by acquiring and implementing antivirus software. A good risk management plan should contain a schedule for control implementation and responsible persons for those actions.

Risk mitigation needs to be approved by the appropriate level of management. For example, a risk concerning the image of the organization should have top management decision behind it whereas IT management would have the authority to decide on computer virus risks.

2.4.6. Implementation of the plan:

Implementation of the risk management plan implies following all of the planned methods for mitigating the effect of the risks: purchase insurance policies for the risks that have been decided to be transferred to an insurer, avoid all risks that can be avoided without sacrificing the entity's goals, reduce others, and retain the rest.

2.4.7. Review and evaluation of the plan:

Initial risk management plans will never be perfect. Practice, experience, and actual loss results will necessitate changes in the plan and contribute
Different decisions to be information to allow possible made in dealing with the risks being faced.
Risk analysis results and management plans should be updated periodically. There are two primary reasons for this:
(i) To evaluate whether the previously selected security controls are still applicable and effective,

(ii) To evaluate the possible risk level changes in the business environment. For example, information risks are a good example of rapidly changing business environment.

2-5 Concepts OF Risk Analysis and Management:

The concept of risk is multi-dimensional. In the context of construction industry, the probability that a definite factor detrimental to the overall project occurs is always present.

A lack of predictability related to the consequences of a planning situation and the associated uncertainty of estimated outcomes leads to the consequence that results can either be the different definitions of risks, risks can be categorized for different purposes as well. The broad categories of construction risks are external risks and internal risks; while some other categories curtail risks as political, social and safety risk etc.

2-5-1 Project Risk:

Risk management in a project encompasses the identification of influencing factors which could negatively impact the cost schedule or quality objectives of the project, quantification of the associated impact of the potential risk and implementation of measures to mitigate the potential impact of the risk.

The riskier the activity is, the costlier will be the consequences in case a wrong decision is made. Proper evaluation and analysis of risks will help decide justification of costly measures to reduce the level of risk. It can also help to decide if sharing the risk with an insurance company is justified. Some risks such as natural disasters are virtually unavoidable and effect many people. In fact, all choices in life involve risks.

Risks cannot be totally avoided but with proper management these can be minimized.

2-5-2 Determination of Risk:

There are two methods to determine risks in a project, namely the qualitative and quantitative approach. The quantitative analysis relies on statistics to calculate the probability of occurrence and the impact of the risk on the project. The most common e of risk way of employing quantitative analysis is to use decision tree analysis, which involves the application of probabilities to two or more outcomes (ispwg01_04B_risk_analysis.doc).

Another method is Monte Carlo simulation, which generates value from a probability distribution and other factors.

The qualitative approach relies on judgments and it uses criteria to determine outcome. A common qualitative approach is the precedence diagramming method, which uses ordinal numbers to determine priorities and outcomes.

List of the processes of a project in descending order, calculate the risks associated with each process and list the controls that may exist for each risk.

2-5-3 Factors affecting Risk:

Several factors expose projects to normal than higher risk.

2-5-3-1 History*:*

Newer projects pose more risk because the process has not been refined with the passage of time. If a project of similar nature has been done many times before, then the likelihood of success with the current project is also enhanced.

2-5-3-2 Management Stability*:*

Management stability means that the whole management team shares the same vision and direction, thereby leading successful achievement of goals If the management is unstable then it can lead to unrealistic and impractical schedules for the project and inefficient use of resources.

2-5-3-3 Staff expertise and experience*:*

In the event that the members of a project team lack the direct working knowledge and experience of the area, there is a likelihood of time delays, estimated cost upsets and poor quality.

2-5-3-4 Team Size*:*

In case of large teams, the probability of problem occurence increases due to the team size. One of the reasons can be the difficulty of communication due to the large team size.

2-5-3-5 Resource Availability*:*

If the availability of resources is easy, the probability of responding to problems in real time also increases. For example, easy availability of

money makes securing human, material and equipment resources easy on as needed basis. However, an abundance
of resources does not provide quarantee against risks, all it does is to equip the project team with the tactics to respond does is to equip the project team with the tactics to respond to risks.

2-5-3-6 Time Compression*:*

In case of highly compressed time schedule, the risks are magnified in the project. When more time is available, more flexibility is present in the impact of occurring risks project and there is an opportunity to mitigate and reduce.

2-5-3-7 Complexity*:*

In case of a highly complex or sophisticated project, the opportunity of a mistake or a problem is also enhanced.

2-5-4 Types of risks:

Can be classification of the risk related by the construction industry into :

2-5-4-1 Physical or human:

-Labor is technically qualified.
-Fluctuate productivity rates for mechanisms and labor.
-Accident because the lack of safety measures.
-Supply invalid materials or non-conforming.

2-5-4-2 Environmental or natural: -

-Weather conditions are very bad and cruel.
-The difficulty of commitment to the law and environmental legislation and cost.
-Environmental disasters (flood, earthquake).
-Work may lead to pollution of the ground.
-The difficulty of access to the site (too far, occupancy hamper access).
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2-5-4-3 Design: -

-Incompatibility between quantities, drawings and specifications.
-Errors in design.
-Mismatch designs (structural, architectural).
-Uncertainty in work quantities.
-The awarding of the design for Office incompetent.

2-5-4-4 Logistics: -

-High competition during presentations.
-Scheduling is not accurate for the project.
-Unavailability of labor or materials and equipment to adequately.
-work Unknown to accurately.
-Poor communication between the site and the headquarters of the contractor.
-The use of modern equipment for first time without training.

2-5-4-5 Finance: -

-Inflation and price swings.
-Delays in the payment of statements according contract.
-Funding cuts unexpectedly.
-Non-cash-flow control.
-Monopoly of materials required for the implementation to result of the closure of factories or unexpected political conditions.
fluctuation Of switching the currency rate .

2-5-4-6 Legal: -

-Legal disputes during the construction phase between the parties of the project.
-Difficulty in obtaining licenses and work permits
-Lack of clarity in the labor legislation.

2-5-4-7 Directly related to the implementation: -

-Difference between the actual and the nodal quantities.
-Changes in design.
-Reduce the quality of work versus commitment of time.
-Delays and technical problems with subcontractors.
-Differences between the required implementation specifications as a result of a misunderstanding of the drawings and specifications.
-Lack of documentation orders to change the field of work.

2-5-4-8 Political: -

-Bribery and Corruption.
-Insecurity and thefts.
-Wars.
-Political and social pressure from the destinations do not have a major interest in the project.
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