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Project management and risk evaluation

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PROJECT MANAGEMENT AND RISK EVALUATION

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I dedicate this work to my family Nadia Andreas Demetris Yiangou and to my Marilena

Very thankful for standing by my side

Chapter 1 Introduction

1.1 Problem Statement. (Risk in Projects, Project failure , Risk management) Most of the times, it is a challenge for contractors involved in project, to estimate the cost and the time, to deliver a good quality project. This relate to many reasons. One of many instances, is the cost of materials and labour have ability to fluctuate, while the price of the offer must be arranged in advance. Sequently the project may turned to a damage/loss for the contractor, or the project will be overestimated, with a result the deal would be cancelled. According to above, there is a need of modern approach in planning strategy, in order to make more accurate estimation of project's objectives, which are cost, time and quality. The present thesis will deal with risks and uncertainties that will face a Project manger during he's performance.

• **Hypothesis.** There are many companies that are deal with business which has a great degree of uncertainty. Those companies are usually in financial or insurance sector, they manage to develop techniques, which deal with uncertainties, evaluate the risks and come out with a profit. The projects are unique, even if they have been done before, still they have a high degree of uncertainty and risk. Hypothesis, is it possible to implement those techniques in project management.

1.2 Aim and objectives

The aim of this research is to investigate the risk management process in construction projects with a focus on influences of the environment. After author graduated from Technological Educational Institute, he started work in a construction company in Cyprus and the thought of researching in depth about managing risk of construction projects through using a case study such as Cyprus, it is not only useful for career in the future but also the results may be effective for others who are working in such environments. Thus, the choice of concept of risk and its management for investigation in order to be able to apply the knowledge to both career and life as they are about making decisions.

Objectives

- To investigate the risks influencing construction projects and their management strategies.
- To examine the current knowledge base regarding the concept of risk and practice of risk management in Cyprus
- To identify the criticality of risks in Cyprus construction projects.
- To assess the role of environment in execution and management of construction projects
- To recognise the interaction between various risks influencing the projects

Contribution to knowledge

The environment (an external source of risk) affects the outcome of any single project immensely, but there are also the influences created through the combination of the

risks that can dictate the inner dynamics of each project. This thesis looks at risks influencing construction projects in Cyprus, and how influences of environment and combination of risks on each project are accommodated using contingency theory for risk management.

Using the concept of contingency theory, the decision-making process is studied. This concept recognises that according to the logic of their situation, managers pursue certain aims and they do this by assessing which is the most appropriate way of achieving these goals within the given situation (focusing on the specific risks which may influence Cyprus more than other countries).

Therefore, this thesis contributes to knowledge by providing a deeper understanding of how contingency theory works in practice and modifying the theory from a conceptual theory to a more tangible and meaningful theory. Moreover, proposed guidelines for managing risk of construction projects may help managers in Cyprus and also other countries with similar conditions, to manage the construction projects according to the situation and mitigate the risks as much as possible.

1.3 Research strategy

The selected research designs for this thesis, is case study and Cyprus has been chosen as the case study. Secondary data and contextual data are used for this thesis, are discussed comprehensively in Chapter 2 (Literature Review) and 3 (Methodology). The research strategy is a mixture of qualitative and quantitative strategies leading to selection of suitable methods for collecting the primary data. Questionnaire and interview have been selected as data collection methods and the participants are project managers with a grate experience in construction section.

Research questions

The overall aim and objectives mentioned above were developed into specific research questions for this thesis through reviewing the relevant literature on risk and risk management and hence related discussion is provided in the next chapters. The questions that need to be answered by the researcher are:

1. What are the processes of risk identification for construction projects?
   Identification and evaluation of internal and external risks
   The nature and strength of interaction between various risks
2. How is the knowledge about construction risks utilised in managing risks in relation with contingency theory?

1.4 Theoretical framework

There are a number of competing complementary theories that can be drawn upon in developing risk management strategies. Among all these theories related to management and risk management, contingency theory was found to be the most appropriate theory for the concept of this thesis as it brings into focus the concept of „uncertainty“ which is deeply associated with construction projects (Noor and Tichacek, 2009). The theory and this thesis both reject the idea that there is one best way to manage

because each management situation is different. When managing projects it should be emphasised that each project is also unique and has got its own specifications which therefore requires suitable management practices according to its situation and specifications. Contingency theory does not ignore the existence of universal principles for management, but highlights the uniqueness of each management situation. Therefore, the theory uses these universal principles together with unique specifications of the current situation and proposes the most appropriate way for managing that situation. Utilising contingency theory is mostly done through organisational learning in order to use the past experiences and apply them to current situations where possible. The focus of this theory is on the relationship between contextual variables and the organisation; stating that these variables influence the organisation and therefore the projects they are implementing. As a result, to manage any project the specific variables associated with it should be considered and evaluated (Gong and Tse, 2009). The external environment has an important influence on how any project is managed, this research is situated geographically and temporally within a specific environment. A comprehensive discussion (social, economic, and political aspects) is provided in Chapter 3 (Methodology) about the solid, distinct difficulties and risks related to Cyprus and reasons why it is selected as the case study of this thesis. According to above, researcher will deploy methodology and threw research strategy convince a reader that project management in Cyprus fits in contingency theory.

1.5 The overall research structure for the remainder of the Thesis

***Chapter two**: Literature Review* – reviews the literature on project and project management; highlights the construction projects as the designated context of this thesis; clarifies the concept of risk in general and in the context of construction projects; defines the risk management process and refers to its sub-processes; underlines the factors influencing the risk management process; reviews related studies and papers undertaken by other researchers; presents various theories about management and risk management and argues for justification of choosing contingency theory as the theoretical framework of this thesis; examines the contingency theory in context of construction risk management;

Chapter three: Methodology – discusses the preferred research strategy deployed for answering the questions of the thesis; defines the adopted research approach; discusses the rationale for the choice of research designs followed by a critical evaluation of the case study design; describes Cyprus and the social, economic, and political aspects of its situation and argues the reasons for selecting Cyprus as the case study of this thesis; distinguishes the research strategies and reviews previous studies, their strategies and data collection methods to justify the chosen data collection methods for this thesis; explains the sample size for the questionnaires and interviews; identifies the data analysis methods used; and finally refers to material facts and ethical considerations of the thesis.

Chapter four: Questionnaire Analysis – Deals with the quantitative data analysis; illustrates the results of different sections of the questionnaire in tables and diagrams and provides explanations for each; and discusses the specifications of environment.

Interview Analysis – as the second part of data analysis deals with qualitative data collected through conducting interviews; analyses the content of questions one by one; shows the coding scheme for each question and presents quotations from participants while discussing their responses

Chapter five: Conclusion – reviews the results of previous chapters and analyses them together in relation to the findings of other authors argued in Literature Review chapter and contextual data about Cyprus discussed in Methodology chapter; answers the research questions; proposes guidelines which may be useful for other countries with volatile situations similar to Cyprus; and finally discusses the results in relation to the contingency theory

Chapter 2 Literal Review

2.1 Contingency theory:

The contingency approach to leadership was influenced by two earlier research programs endeavouring to pinpoint effective leadership behaviour. During the 1950s, researchers at Ohio State University administered extensive questionnaires measuring a range of possible leader behaviours in various organisational contexts. Although multiple sets of leadership behaviours were originally identified based on these questionnaires, two types of behaviours proved to be especially typical of effective leaders: (1) consideration leader behaviours that include building good rapport and interpersonal relationships and showing support and concern for subordinates and (2) initiating structure leader behaviours that provided structure (e.g., role assignment, planning, scheduling) to ensure task completion and goal attainment.

About the same time, investigators from the University of Michigan's Survey Research Centere conducted interviews and distributed questionnaires in organisations and collected measures of group productivity to assess effective leadership behaviours. The leadership behaviour categories that emerged from the University of Chicago were similar to the consideration and initiating structure behaviours identified by the Ohio State studies. The University of Michigan investigators, however, termed these leadership behaviours **relation-oriented behaviour** and **task-oriented behaviour**. This line of research was later extended by Robert Blake and Jane Mouton in 1964 to suggest that effective leaders score high on both these behaviours. They suggested that previous theories such as **Weber's** bureaucracy and **Taylor's** scientific management had failed because they neglected that management style and organisational structure were influenced by various aspects of the environment: the **contingency factors.**

The theory rejects the idea that there is one-size-fit-all method for managing but it proposes that there is „one most appropriate“ approach for each specific situation. According to this, role of a manager is to establish the best possible fit between the organisation, its environment and sub-systems. Gareth Morgan in his book *Images of Organisation ,* describes the main ideas underlying contingency theory:

- Organisations are **open systems** that need careful management to satisfy and balance internal needs and to adapt to environmental circumstances
- There is not one best way of organising. The appropriate form depends on the kind of task or environment one is dealing with.
- Management must be concerned, above all else, with achieving alignments and good fits
- Different types or species of organisations are needed in different types of environments.

A system is commonly defined as a group of interacting units or elements that it consists. From the book Organization in Action of James D. Thomson : States that, in Closed System Strategy variables and relationship are few enough for us to comprehend and that we have control over them or can reliably predict all of the variables or relations. In other words, the system is closed enough, so the outside forces action on it to be predictable. Now if we are responsible for the future state or performance of some system, we are likely to opt for a closed system. The theories that represent

closed system: Scientific management (Taylor, 1911), Administrative management (Gulick and Urwick 1937) and Bureaucracy (Weber 1947). It seems clear that rational model approach uses a closed system strategy. The developers of the several school using the rational model, have been primarily students of performance or efficiency and only incidentally students of organisations.

In contrast to closed-systems, the open-system **Open System Strategy** has more variables than we could comprehend at one time, or that some of the variables are subject to influences we cannot control or predict, we must resort to a different sort of logic. We can assume that the system is determinate by nature, but that is our incomplete understanding which forces us expect surprise or the intrusion of uncertainty. In this case we can employ a natural system model. Approached as a natural system, the complex organisation is a set interdependent parts which together make up a whole, because each contributes something and receive something from whole, which in turn is interdependent with same large environment. Survival of the system is take to be the goal, and the parts and their relationship presumably are determined through evolutionary process. Dysfunctions are conceivable, but it is assumed that an offending part will adjust to produce a net positive contribution or be disengage, or else the system will degenerate. Central to the natural system approach is the concept go homeostasis or self-stabilisation which spontaneously or natural, covers the necessary relationship among parts and activities and thereby keeps the system viable in the face of disturbances stemming from the environment. Representative theory of open system strategy or a natural system approach is Informal Organisation, here attention is focused on variables which are not included in any of the rational models: sentiments, cliques, social controls via informal norms, stays and status striving and so on.

Organisations involved in construction industry, considered to be open system organisations, as they subjected to be influenced by environment and variables that we could not comprehend at one time, or that some of the variables are subject to influences we cannot control or predict, such as pace of technological change in other sectors of the economy, uncertain finance market and changing client demands following contemporary trends, aspiration and purchasing power. Also, an unstable business environment are characterised by the rapidly changing markets where funding sources shift, government regulations, business life cycle, competition tightens and inflations eats away the company's capital. Due to all these changes, it is becomes more hard to manage the construction business in today's environment. Frequently, construction companies tend to neglect long term planning and usually plan more for shorter period of time, as maximum profit is show prime objectives. In order to survive as well as excel in the constantly changing environments, it is prerequisite for any construction company to be highly sensitive to the environmental changes and it ability to forecast possible conditions and formulate adaptation strategies. Confirming contingency theory, that rejects the idea that there is one-size-fit-all method for managing but it proposes that there is „one most appropriate" approach for each specific situation.

In Cyprus operates two basic types of projects management the Public and Privet Sector. They are totally different in the way they manage in term of concept and the purpose, even employee mentality. In case of privet sector companies, were the projects seen most like investment, so assessment must be made of the business advantages of the project, including various constraints and risks which are involved in. The higher risk, the higher is profit. (Toakley 1989). As it was mentioned above, open system organisations refers to private sector companies.Totally different **a public** sector, were the projects are managed by administration, which consists of civil servant and the purpose they serve it's usually national benefit e.g. national security and defence, or very high cost projects such as infrastructures. The output of the project will be concerned by the financial analysis, rather than the return of the investment. Sequently public companies are more bureaucratic than profit orientated also they follow protocols and rare determine risks because they covered by government. However, public companies are supervised by audits, anticorruption organisations and mass media, in case of law violation there will be radical changes in management and sanctions. Public companies are tend to close system organisation suits more to rational theories described by Scientific management (Taylor, 1911), Administrative management (Gulick and Urwick 1937) and Bureaucracy (Weber 1947). In present thesis, government companies are out of research range.

2.2 Project Risk Management As it was mention before, in order to prevent some adverse situations in project before they appears or in a very early stage, managers and project designers use developed methods based on previous records (logs) and probabilistic methods. These contribute not only to successful project completion, but increase expectations of a project's goals. It can be applied in all stages of the project cycle: design, assessment of strategy, supply, allocation of resources such as human and tangible, deal with subcontractors, operation & maintenance. Also alternatives activities for budgets and business plans and manage overruns and delays in project. The application of active risk management is beneficial to all projects – right from small, one-person projects up to the very large complex projects that were the origin of many of the techniques. Project's risk is a result of high level of uncertainties, because it involve many variables stakeholders-people and organisations that are involved in the project (owners, contractors, suppliers, authorities), which affect directly on objectives of the project. The concept of uncertainty related to projects it is one of the key features, that distinguishes projects from repetitive operations. The consideration of risk is only one aspect on managing uncertainty, on the upside, there are usually opportunities that arise from a project. At the task level, an early finish may result in the opportunity for another activity to start early, or even development of a better way of completing the task. A contemporary project management demonstrated , it is reasonable to think that wherever risk is considered, opportunities should be considered too.

2.3 Troubled risk management in Construction.

A project disaster is when an event has happened that makes it unfeasible to carry on as before and still achieve the objective, in most case project disaster is not equal to total collapse organisation or leads to the careers termination, beside, 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. However, majority of the projects fail to meet deadline, cost and quality targets. It requires knowledge of modern management as well as understanding of the design and the construction process. The reason why a disaster it not so obvious, is political. The organisations firmly protect their image and managers same as politics almost unheard to admit a failure in a project. 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.

1. Owner interference - Unclear goals: Goal setting SMART (Simple, Measurable, Attainable, Realistic, Timetable)
2. Inadequate contractor experience - ignorance. Lack of knowledge or experience may lead to missing the warning signs.
3. Financing and payments-Inadequate resources i. Funding, ii. People, iii. Equipment.
4. Labour productivity
5. Slow decision making: Denial, a false hope that things will fix themselves.
6. Improper planning.
7. Subcontractors-Failures of communication and management.

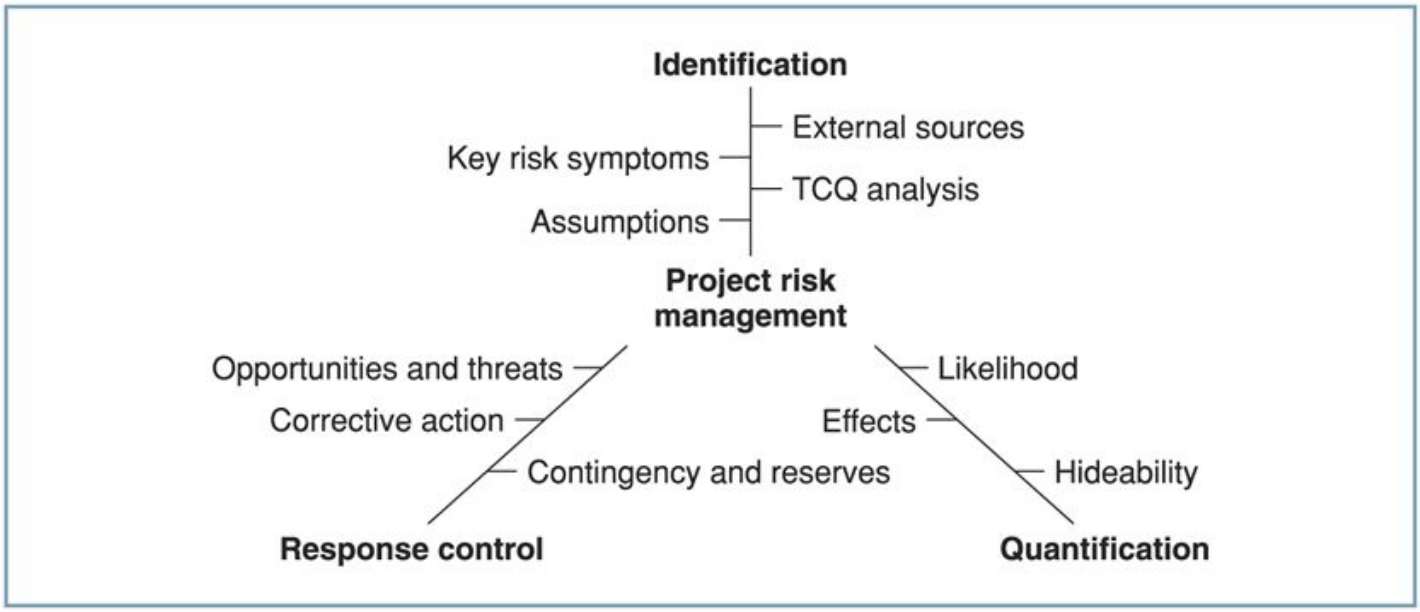
Most project disaster involve more than one cause. The most probable is that a chain of several events led to the viable event and not one solitary cause. So when we try find out the root of project failure, a systematic approach is essential.

2.4 Risk definition: “Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on at least one project objectives, such as time, cost, quality”. Kaplan (1997, p. 410). Also Project Management Institute, PMI (PMBOK, 2004) should consider both the positive and negative effects of risk on a project objective. A good example for risk in business, projects as well, it is Trade-off. Save money on one activity by using a cheaper method of performing that activity. There is an increased risk, the activity will be done in not appropriate way, then it must be redone again, or in case of success, there will be a profit - saved money. The saved money trades off against the increased risk that the cheaper method presents. Indeed, an accepted notion in many aspects of business life is that risk is proportional to return. The greater the risk that you run, the larger the return could be (if all goes well). There is also the personal view of risk, as a project manager has to deal with the consequences of he’s decision. However most treatment of risk is based less on fact but more on partial knowledge and instinct of the project manager and those around them, the sense off risk present in all stages of our life. The optimal is to explore our intuition and married it with some frameworks and tools to help.

According to Donald Rumsfeld, the former US Defence Secretary, there are three main types of risks. The first category of risk that he identifies is the '*known knowns*'. These are what we aware and those are a basis for the planning. The second category is the '*known unknowns*' – those things that we know are uncertain. Example, how long time this task will takes, we know but we cannot predict course of the random outcomes. Finally '*unknown unknowns*'(unk unks) – those things that come from out of the blue and we could not have known about. 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, Framework for risk management can be employed for prevailing over them.

2.5 Risk Management Process.

Risk management process consists of three main areas a.) identification of the risks, then b.) qualification and quantification and finally c.) response control and mitigation.



2.5.1Identification is the first level of risk analysis, it is discovery of fields that are source of potential risk outcomes, the risks and pre-signs of them. Those could be changes from stakeholders, technological problems or staffing changes. Process of identification complete with wide range of techniques: a site visit, interview of someone who have done similar project before, a peer preview, also seek for stakeholders opinion and then brainstorming exercise within a project team. In an al-

ternative, consider how it could be made to go wrong - looking at the behaviour, that would conspire to cause the failure. Some particular aspects to consider are:

- **time** – Identify areas in the critical path where is novelty involved**.** Other key areas to check are time plans for the risky activities that might not even be on the critical path at the start but could easily escalate if there are problems;
- **cost** – the estimates have uncertainty attached to them. How good are they – for instance, if the project is a first-timer?
- **quality** – do we have assurance of all our processes or is a key part of the project (e.g. work being carried out by a supplier or customer) outside our control systems?
- **health and safety** – what are the risks to people or things of activities being carried out by the project?
- **legal** – the level of risk posed by the project to the legal or financial standing of the organisation.
  Although, risks that are found in a very early stages of the project, design or planning impacts of them will appears in construction phase.

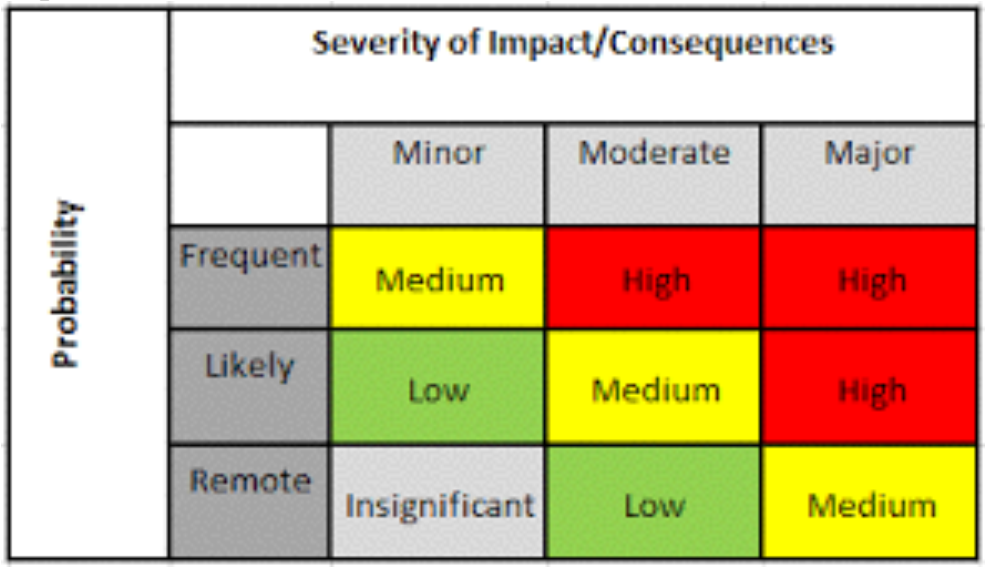
2.5.2.Assumptions

New methods of execution of a certain task in the project assumed to be more efficient from economical view, thus it needs to ensure that it does not simply add the cost somewhere else. Many projects have turned in disaster cause the assumptions of ongoing costs had not been checked. While it is normal to consider physical or technical issues that will cause problems for the project, it is clear from the case that there were considerable wider risks. Some good paradigm, machinery that employs an enterprise proved to be not effective as it was expected or even went out of order. What are the contra-actions from the operation management? Probably, return back to the previous way of task execution. It is essential before apply new techniques, to have in mind some backup, well tested in past methods of cary out the performance.

2.5.3 Qualitative Approaches

After identification of all possible risks that might occurre in the project, next step is risk rating, this is all about qualitative approach. Qualitative approach is gathering peoples' perceptions of the levels of risk involved in a particular activity. The companies such as Lloyds TSB and Rolls-Royce use a **Method of risk matrix** to show the positioning of the risks: high, medium or low. They analyse two dimensions that related to risk: the **possibility** and the **impact**. Evaluation of possibility will be discussed in following paragraph while the impact has direct relation with cost, time & quality, so it could be convert into money. Then they classify risks according to a matrix shown at graph 2.1. Risks rated medium receive more attention than low until the threat in the project is removed. An extension of previous analysis which has been used in industry for many years and is readily applied to projects is **Failure Mode Effect Analysis (FMEA).** This considers three elements of each activity or path through the activities. These are possibility and impact that bee mention above and **hideability**. This is because it is often noted that the reasons for failure of projects are not the mainstream risks that were identified during analysis but ones that have

emerged because their progress was not visible.
Risk Priority Number (RPN) =(likelihood) × (severity) × (hideability).
Although, risks are dynamic meaning that they can change over time, and so can their impact.



graph 2.1

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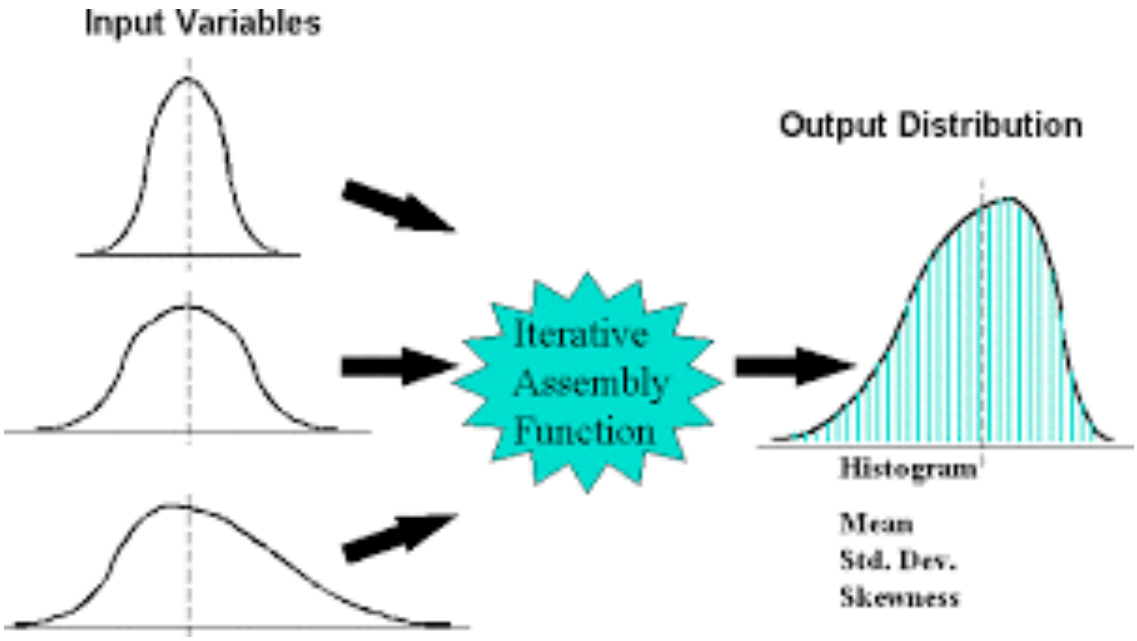
There are two methods to evaluate risk probability: subjective and objective analysis. Subjective method requires intuition based on experience, due to the fact, every personality has different degree of experience and different risk impact, sequently the final evaluation varies. On other hand, there is objective method, that requires probabilities based on historical data. This method is described as quantitative approach in the following paragraph. However, most of times construction projects are unique and it is difficult to find comparable information. Project management use both methods objective as well subjective and struct their plannings, come out from worst case scenario

2.5.4.Quantitative approaches.

The quantitative approach it is a mathematical model that use a database from previous projects in order to predict probabilities of risk. For instance, one organisation needed 80 per cent certainty of delivery within the specified time as a policy requirement for a project to go ahead. Risk quantification techniques that will be discussed here are:

- **Expected value:** It is a basic tool to estimate project as an investment, multiply project revenue by present of chance its success. Say there are two projects require funding – one has a potential return of € 200 million and the other a return of € 150 million. The first has a 50 per cent chance of yielding this, while the second has a 70 per cent chance.First project € 200*0,50= €100, Second project: € 150*0.70= € 105. Second project is more attractive.
- ● **Monte Carlo:** The principles of this technique is instate of values that used for variables, it uses distributions**.** Assume that in order to calculate the profit (P) of an enterprise, need revenue (R), Cost of materials (M) and cost of labour. Sequently the profit will be expressed by equation: P= R-(M+L). The Monte Carlo technique

requires uses a range of values of distribution, rather than single numbers, for time, cost and other estimates, finally, output is the distribution: boundaries and likelihood of the finances (profit P) or other critical project factor, as it shows in graph 2.2



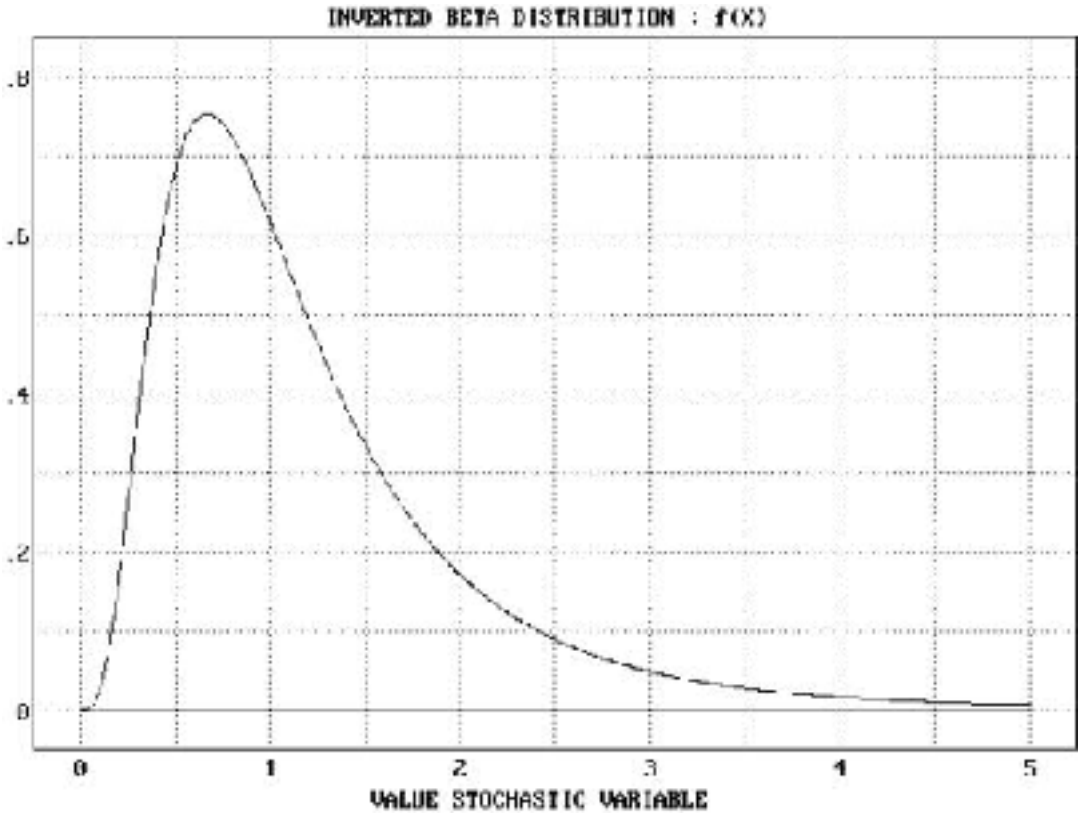
graph 2.2

● **Sensitivity analysis:** the technique is similar to Monte Carlo but instate of distribution, it uses expected value and it's extremes, an optimistic ($-n$ per cent) and pessimistic ($+n$ per cent) .Expected values of the main inputs e.g. costs fo the project are put into calculations of the outcome e.g. profit, same as the previous equation Profit = Revenue-Cost-Materials. The result is nine possible outcomes in below table (graph

Sensitivity Analysis Table

Profit=Revenue-Materials-Labour		**Materials**		
		-10%	**Expected**	**10%**
Labour	**-10%**	Revenue (Materials)-10% (Labour)-10% Profir	Revenue Materials (Labour)-10% Profir	Revenue (Materials)+10% (Labour)-10% Profir
	Expected	Revenue (Materials)-10% Labour Profir	Revenue Materials Labour Profir	Revenue (Materials)+10% Labour Profir
	10%	Revenue (Materials)-10% (Labour)+10% Profir	Revenue Materials (Labour)+10% Profir	Revenue (Materials)+10% (Labour)+10% Profir

2.3). This will show the effect on the outcome of a change in the variable considered and shows where management control attention should be focused.



Graph 2.3

• **Programme evaluation and review technique (PERT):** This technique was developed manly to calculate time that demand an operation to complete, by broken it in smaller activities similar to Activity-on-Node (AoN) and Critical Path Analysis (CPA) networks. The time that needs activity A to complete and start activity B, has three possible values: the optimistic time, the pessimistic time and the most likely time. Those three values were used in equation in order to find **the expected time.** The equation is expressed: **expected time = [*o* + 4*m* + *p*]/6,** were the **o** is for the optimistic time, **p** is represents the pessimistic time and **m** relates to the most likely time**.** The constant **6** comes from statistics, as the optimistic time is upper limit +3σ, where σ is standard deviation and the pessimistic value is the lower limit -3σ, so the range between upper and lower limits equals to 6σ, which represents 99,7% off all possible time values. PERT technique it is not always normally distributed, a Bell shaped distribution, but it is often Beta shape distributed. So in Beta distribution, the mean it is not always in the middle of two extremes, but it has tendency slope to the one or other limit. The tendency is expressed by the constant 4 in the equation.

PERT technique, first was used in late 50s' and due to it success was very popular in next decade, this method is wide spread in many nowadays businesses, useful in a large project in military defence companies.

The objective of the risk analysis is to enable the project manager to include contingencies, that have the most risky elements for the project, in order to put some actions and make sure that the risk is minimised.

2.5.5 Response control/mitigation

Risk response is the process of developing options, and determining actions to enhance opportunities and reduce threats to the project's objectives. Project mangers ensure that either the likelihood is reduced of negative event occurring or the effects managed or mitigated in some way. Every organisation developed technique to handle risk and uncertainty. Moreover, it is often required by company policy or clients formal use of risk analysis techniques and plan for adverse situations. However it is not possible to envisage every possible action or turn that the project might take, but some evaluation of the top 20 per cent of risks (those that are likely to cause 80 per cent of the delays or over-run) is going to be beneficial.

Risk response and Development control.

Avoidance. Chois of alternative actions that eliminates utterly the threat

Transfer. Organisations are not willing to accept risk and outsource it – requiring contractors to take on the risks and uncertainties of projects. Transferring the risk to another party

Assumption. Organisations are aware about the risks, but they don't take any action on them. They decide to accept their consequences or to deal with them when it happens

Prevention Take actions in order to reduce the likelihood of occurrence of a latent problem.

Mitigation. Your aim to shrink negative effect, to lessen impact.

Insurance. Undesirable events may also be the subject of insurance – a common response when an organisation wants to limit its risk in any one project.

Contingency Planning. The plan to deal with a problem when it occurs, it helps to deal with trouble more effective and save precious time, in some plans may require resources that need to be set in advance.

Joint Venture or strategic alliances are techniques that project companies use to reduce their risks (like many other business that involve with risks)

Conduct limited trials A common approach that reduces some of the guesswork in risk assessment is to make a part of the project, to identify difficulties that it face, solve them and go ahead in a large scale of production.

Typical documentation to support this ongoing process includes the use of a **risk register** or **risk log**. These are lists of the identified risks, their occurrence, actions taken to mitigate them and results of the actions taken.As a project progresses, new risks are added to the register, and ones that have passed or expired are removed.

The benefits are considered to be:

- providing a vehicle for improving project plans and better reflecting reality;
- highlighting areas for attention and contingency planning at the planning stage;
- attempting to harness much of the 'gut-feel element' of risk assessment and use this vital intuition as a starting point for further analysis;
- allowing the quantification of risk to build up experience in a structured way and allowing this factor to be traced historically for future benefit in other projects.

2.6 Opportunities management

At this stage, it is worth reconsidering the issue, as it is essential that there is a route not only for threats to the project, as is the negative side of risks but also for the exploitation of **opportunities**.

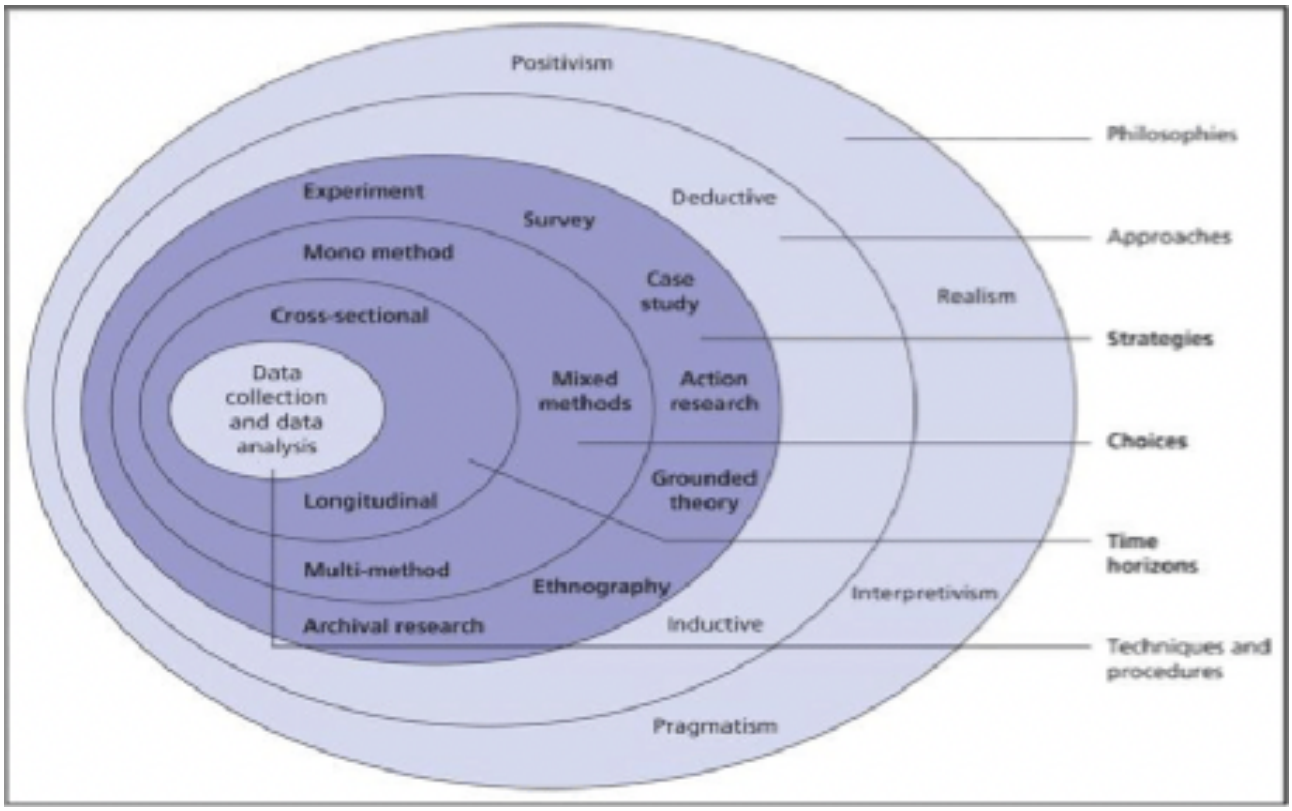
1. Negative to positive – where a risk does not materialise, that is a benefit and can be capitalised on, e.g. where a technology proves it can do more than originally thought, the contingency allocated in case it could do less, could be used to develop it further for other applications. Similarly, if a task takes less time than expected, there should be the opportunity to use that early finish benefit to move the rest of the project on faster
2. Opportunities of response – where a risk is deemed too high and mitigated, this itself presents opportunities.
3. Random good fortune -Be alert for opportunities presented by breakthrough that could not have been expected quantification mitigation

Moreover, proposed guidelines for managing risk of construction projects may help managers in Cyprus and other countries with similar conditions such as all members of European Union, to manage the construction projects according to the situation and mitigate the risks as much as possible.

Chapter 3 Methodology

The methodology that developed for the thesis is described in this paragraph. Before to prevent in research, there is a need to determine the following aspects of how the research it will looks in term of nature, approach: whether it deductive or inductive, design and finally a strategy in order to achieve the researcher's goals. The chapter continues with explanations about, data collection methods including a discussion on the sample size, and then evaluates data analysis methods. And finally, explains the material facts which may influence the results and describes ethical considerations.

3.1 diagram



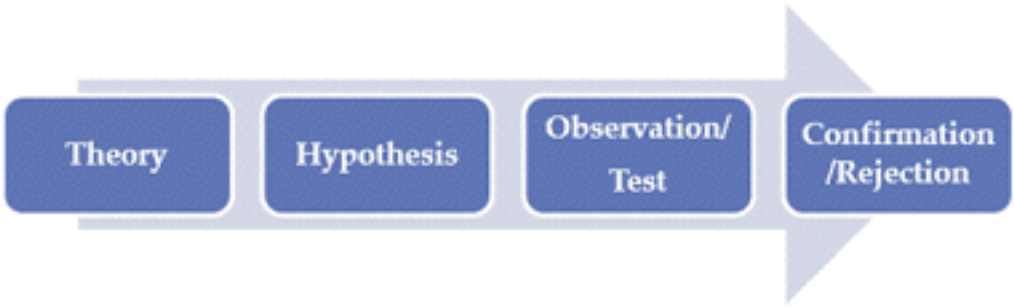
Onion research diagram (diagram 3.1) is highly useful tool for any research, it shows the path that a researcher choose in order to complete he's thesis. The diagram starts from outside layer and moving toward to kernel. So the first layer is philosophical aspect of research, it is quite complex and it is not necessary for present thesis. Moving deeper any one could see **research approach**, here a researcher must choses among two, deductive approach or inductive approach. The deference between those two is, in the first case the researcher starts with known theory and with he's thesis he is able to firm hypothesis, while in inductive approach, research would do opposite, starts with a new hypothesis and finally generalise it in a theory. Next layer is **research strategy**, it is the way that been chosen by a researcher in order to collect data. It could be an experiment, survey, case study, action research, grounded theory, ethnography and finally archival research. The researcher will employs in this thesis survey/interview method to collect data. The interview will be taken from people who have involved in constructions with high level of experience and grate awareness of

risk, also those people have a rich academical background, which is important for this thesis. After all that follows **time horizon**, it could be cross-sectional for a short period of time or longitudinal for a long in order to study a phenomenon development. Final stage is the data evaluation analysis.

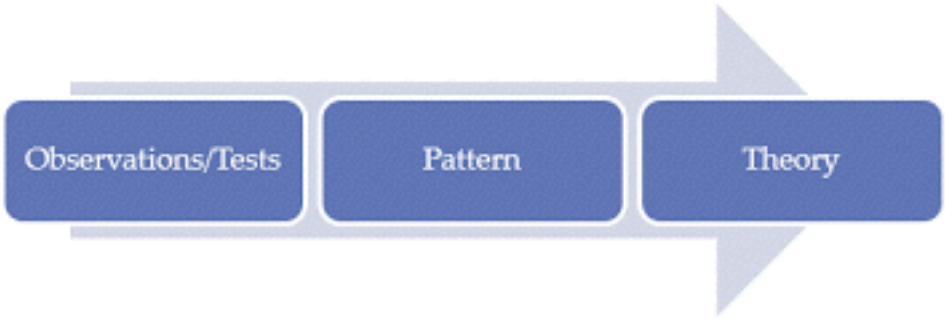
3.1 Research approach it is a method that will bridge two entities the theory and the data, that collected during research. As it was mention before, there is a deductive and inductive approach. In present thesis, author will use **deductive approach,** which is study of previous theory then follows observation and finally author will come out with a statement. In epistemological term, researcher is a scientist who employs surveys, questionnaires, random sampling and other similar data collection methods for testing a theory utilising a deductive approach. The theory that author will base on, is **contingency theory,** contingency theory is described above in literature review .

Deductive approach (3.3 diagram) Vs Inductive approach (3.4 diagram)

3.3 diagram



3.4 diagram



3.2 Research strategy This thesis does not undertake experimental design because it is not going to evaluate the effects of any variation or intervention on other objects under any experiment. The strategy that will be deployed by researcher in order to obtain primary data is questioner and interview, which sound quite appropriate for investigating knowledge, experience and opinion of people involved in construction projects. Qualitative strategy deals with non-numerical data which are in various forms such as words, texts, sound bites, and pictures. This strategy refers to interviews. Whereas quantitative strategy refers to questionnaire-survey, were is all about numbers and numerical data, statistics and graphs. In present thesis will be used both questionnaire and interviews . The questionnaire was designed based on the knowledge obtained from reviewing the literature, available samples and according to the research questions and required data for answering them also previous studies and their data collection methods. It focuses on the identification and evaluation of risks associated with construction projects and their mitigation strategies which is quite similar to the objectives of this thesis. On the other hand, Interview provides researcher with content analysis, is a scientific tool which involves specialised procedures; while analysing the data, this method can be used in comprehensive manners and go into further details. Therefore, it may identify body language and facial gestures in communications for extra investigations on people‟s state of mind and evaluate them from psychological aspects. From ethical point of view, participants were assured that their information is kept confidential, they have the right to withdraw at any time and everything is with their consent, there is no deception and they were informed about every single step.

3.3 Data collection methods.

Primary Data : (Interview, surveys, personal experience) Are set of data obtained by researcher

Chosen data collection methods: Questionnaire and Interview

Data analysis- Interview

Question 1: What is the nature of the projects you are doing and their sizes?

Question 2: What do you consider as ‘risk’ in construction projects?

Question 3: Regardless of the type of the project, what are your broad organisational processes and policy documents which may create risk?

Question 4: What processes does the organisation have for managing/mitigating risks?

Question 5: How do you develop the contingency plans? In which phase?

Question 6: What mechanisms are there for keeping the contingency plans on the review? And who is responsible for evaluation of the effectiveness of the contingency plans?

Question 7: At the end of the project, is there any learning process of what has happened during the project? How?

Question 8: How is your relationship with sub-contractor/consultant/client? Do they also mitigate the risks or all the existing risks will be shifted under your responsibilities?

Question 9: In your questionnaire, you have ranked (... and ...) as the most important risks; what is your opinion about effective mitigation strategies for them?
Question 10: Please feel free to provide me with your opinion about any existing issue in construction industry in Cyprus which was not mentioned in this interview.

Evaluation of the criticality of 25 'Risks'
This questionnaire was found to be very widespread, covering various aspects of construction projects in its statements and was not focusing on any specific country or type of project. Empty table was given in the first page of the questionnaire, asking participants to write the important construction risks

1. approval and permit
2. change in law
3. justice enforcement
4. government influence on disputes
5. corruption
6. expropriation
7. political instability
8. cultural differences
9. human resource
10. cash flow
11. foreign exchange and convertibility
12. inflation and interest rate
13. cost overrun
14. inadequate design
15. low construction productivity
16. site safety
17. late payment
18. inadequate quality control
19. inadequate project management
20. environmental protection
21. public image
22. intellectual property protection
23. force majeure
24. market demand
25. competition.

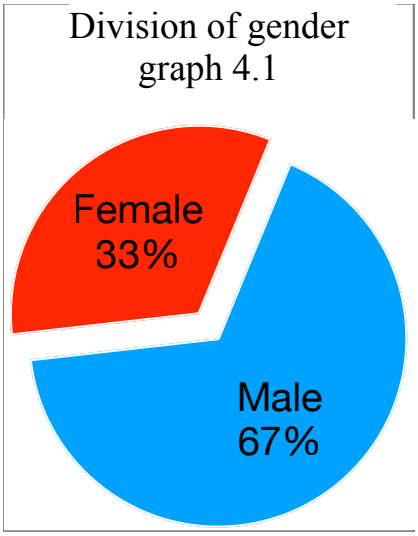
Secondary data (Books, Journals articles, Magazine articles, internet articles on a project management in Construction and Troubled Projects.) Are data that have been collected by others previously and may provide larger and higher-quality databases which might not be possible for an individual researcher to collect on his own. Hance, not always appropriate cause they have been collected for other studies with diverse objectives. Although, Using two different methods, questionnaires and interviews, in addition to analysing secondary data strengthen the research findings. Hart (2001) advocates more reasons for using secondary data namely identification of rel-

evant work already done or in progress which accordingly prevent duplication of previous work done; avoidance of the errors related to previous research; and assistance in finding the gap in existing research which can be led to a unique topic. After collecting the secondary data, previous studies were reviewed in order to select the appropriate methods for collecting the primary data.

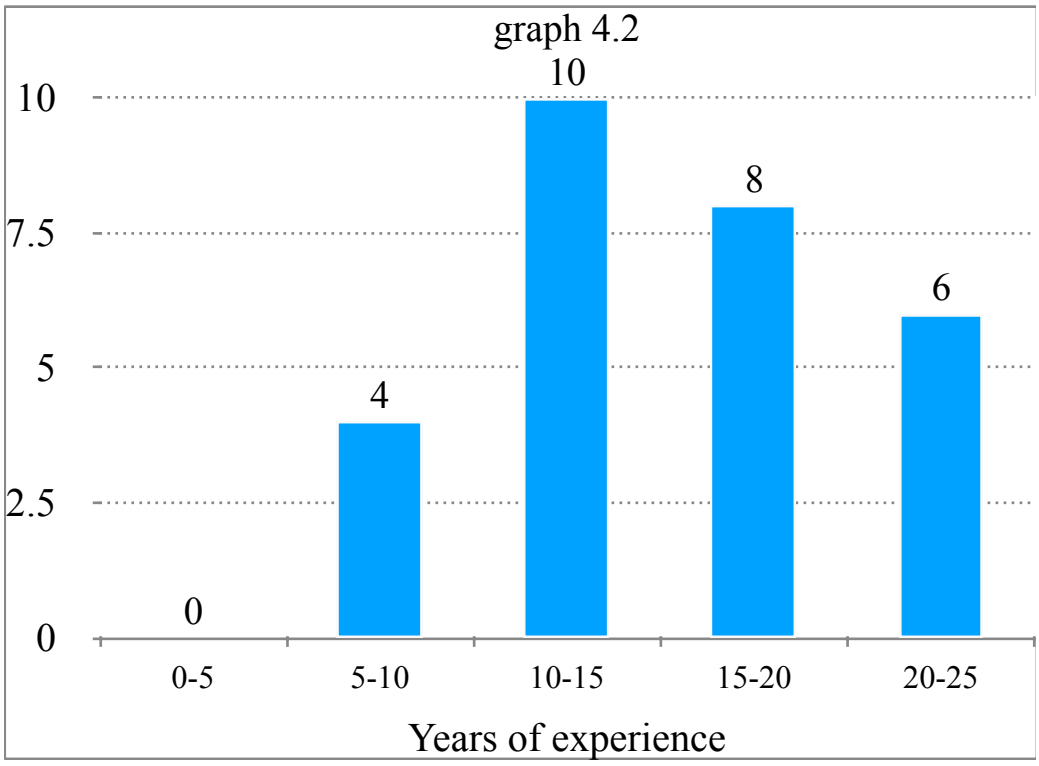
3.4 Cyprus: chosen case study. Cyprus it's a country located in East of Mediterranean sea shearing borders with three continents (country of three continents):Europe, Asia and Africa. Also Cyprus is member of European Union since 2008. This two factors make Cyprus multicultural region, different nationalities live together. This affect every social and business life on island, construction is't exception. Construction industry always was one of the main pylons of economy, the oldest buildings that were found in Cyprus, aged from paleolithic age in the village of Chirokitia, since that time many architectural styles representing their epoch anyone could fine in Cyprus.

Balanced economy, inflation within E.U. around 2% , make construction industry to be attractive in this region. On the other hand the crisis 2008, in past years hits Cyprus economy sequently construction industry suffered. Bank system of Cyprus supports construction industry, it provides individuals and companies with loans for housing and building. But in 2012 lack of liquidity was noted in Cyprus economy and many of the loans turned to ''bad loans'' and this is one of reasons construction decline in Cyprus. However the crisis in past years dropped the prices in country almost in every economy sector, this have result attraction of investors from abroad.

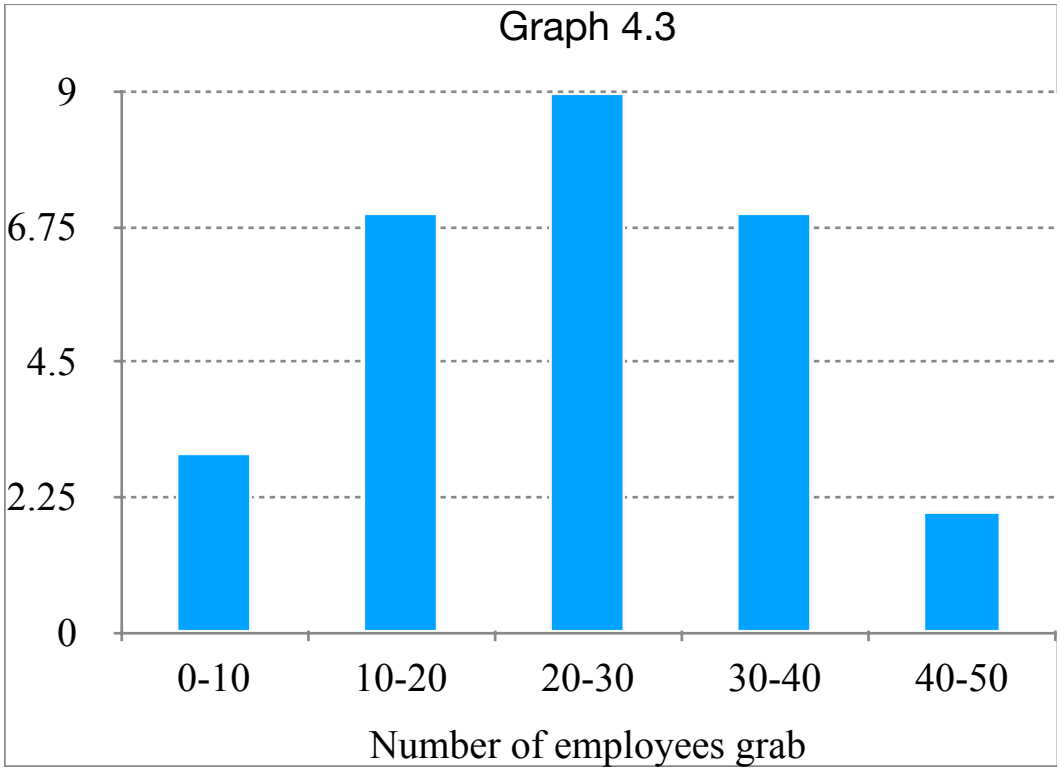
Chapter 4 Data Analysis & Discussion



During the research, were selected personalities that involved in projects in Cyprus. The number of participants were 28 person. They were asked to participate in survey, which included a questionnaire and interview. First part of questionnaire was personal information: name, telephone number, email, company those informations are kept confidential and asked only for the researcher, for a contact with participant if it was necessary. As it shows in graph 4.1 a third of the project managers in Cyprus are women. Next was the question about academic background and if they have studied subject related to risk evaluation and risk control. Note that no one studied similar studies and the knowledge they obtained during their career, also they do not have expert risk managers for their projects in their companies. This represents the existing culture in Cyprus about the concept of multi-functionality where Project manager, Operational manager Site manager and Risk manager in one face. Following two questions were addressed to how long they in business and how many employees they mange in project.



As the graph 4.2 shows, the Project managers have minimum five years of experience in construction, some others even twenty-five. The following graph 4.3 describes a number of employees that involved in projects. As it mentioned there are small projects, size of less than ten employees to the medium size of fifty employees.



4.1 Evaluation of the criticality of 25 'Risks'

Second part of questionnaire was evaluation of the criticality of 25 risks, participants were asked to rate those risks from one to five (1-5), one for not significant and five for significant risk. Before respondents saw 25 risks, they were provided with blanc sheet and asked to write few significant risk that they face in construction, from their experience. The reason behind this was giving the participants time to think independently, before reading the provided list because it would influence their opinion and write whatever they consider as risk in advance and then rank them according to their experience. Sometimes the participants were paraphrasing (referring to the same risk but in different wording) Hence, the content of this blank had to be decoded and related risks were grouped under some general codes. The first three answers from the blanc sheet were identically with other 25 followed.

These 25 risks are listed below and a short definition for each of them has been provided:

Political and Governmental (P&G) - External

1. **Approval and Permit:** Delay or refusal of project approval and permit by government
2. **Change in Law**: Government‟s inconsistent application of new regulations and laws
3. **Justice Enforcement**: Lack of enforcement of legal judgment
4. **Government Influence on Disputes**: Unnecessary and unjust influence by government on court proceedings regarding project disputes
5. **Corruption**: Corrupt government officials demand bribes or unjust rewards

6. **Expropriation**: Due to political, social or economic pressures, government takes over the facility run by the firm without giving reasonable compensation
7. **Political Instability**: Frequent changes in government; agitation for change of government or disputes between political parties or different organs of the state
8. **Intellectual Property Protection**: Former employees, partners and/or third parties steal company‟s intellectual property, commercial secrets or patent details
9. **Competition**: Competition from other investors/developers/contractors

Managerial and Technical (M&T) - Internal

10. **Inadequate Design**: Unanticipated design changes and errors in design/drawings
11. **Cost Overrun**: Unavailability of sufficient cash flow, inadequate measurement and pricing of Bill of Quantities, ill planned schedule
12. **Low Construction Productivity**: Obsolete technology and practices by partners; or low labor productivity of workforce
13. **Safety**: High rate of accidents during construction or operation phases
14. **Inadequate Quality Control**: Partner tolerance of defects and inferior quality
15. **Inadequate Project Management**: Inadequate project planning, budgeting; inadequate project organization structure; or incompetence of project team

Economic and Financial (E&F) - Externa

16. **Cash Flow**: lack of information about partners‟ creditworthiness, client‟s inconsistency for payment
17. **Foreign Exchange and Convertibility**: Fluctuation in currency exchange rate and/or difficulty of converting currencies.
18. **Inflation and Interest Rate**: Unanticipated inflation and interest rate
19. **Late Payment**: Client pay the contractors much later than is specified in the contract
20. **Market Demand**: Inadequate forecast about market demand.

Cultural and Social (C&S) - Internal

21. Cultural Differences: Differences in work culture, education, and values between project partners.
22. **Human Resource**: Facing difficulties in hiring and keeping suitable and valuable employees
23. **Public Image**: Victim of prejudice from public due to different living standards, values, culture, and social system.

Natural (N) - External

24. **Environmental Protection**: Stringent regulation which will have an impact on construction firms‟ poor attention to environmental issues
25. **Force Majeure**: The circumstances that are out of the control of partners, such as flood, fires, storms, epidemic diseases, war, and hostilities.

It is required to emphasize that these categories are not absolutely distinct from each other; they are interrelated and may function interdependently. Therefore, some of the sub- categories may have the potential to be fitted in two of these categories and only because a sub-category has been allocated to one of these main categories it does not mean that it is independent of other categories.

The results of the research are given in table 4.1 Risk Rating Chart and graph 4.4 related to a chart. As it seen from the chart and graph 4.4, most significant risks in construction industry in Cyprus are Cash Flow and Late Payment, then followed by Low Construction productivity and Intellectual Property Protection. Finally Cost Overrun and Inadequate Design. All above risks are sub-categories of Economic and Financial (E&F) - External, Managerial and Technical (M&T) - Internal and to some extend Political and Governmental (P&G) - External. The table also determines that external risks are influencing the construction projects equal to internal
The other risk are not so critical influence projects in Cyprus, however, they will be discussed in following paragraphs.

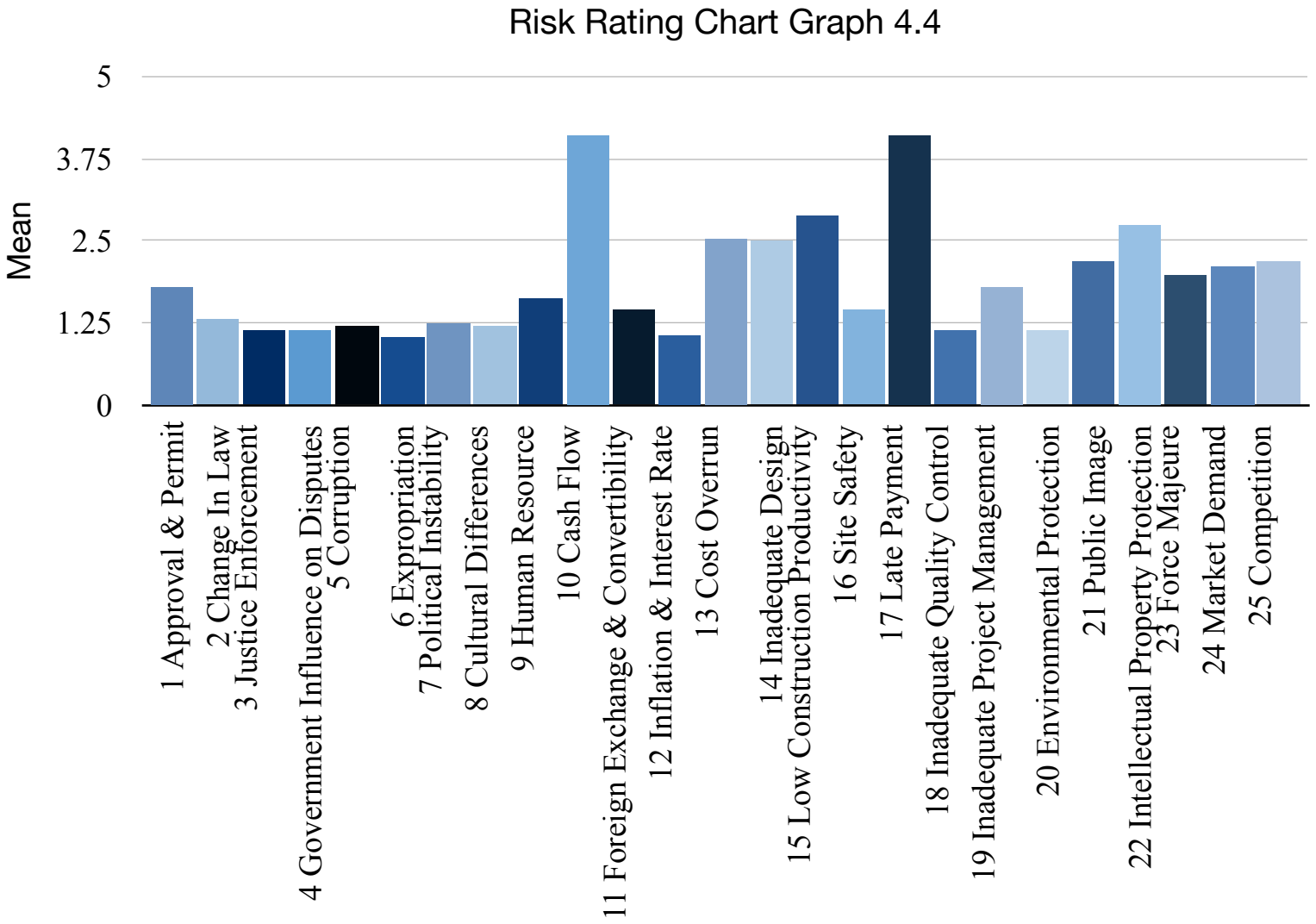


Table 4.1 Risk Rating Chart

		Mean	Standar Deviation
1	Approval & Permit	1.79	0.96
2	Change In Law	1.32	0.61
3	Justice Enforcement	1.14	0.45
4	Government Influence on Disputes	1.14	0.45
5	Corruption	1.21	0.50
6	Expropriation	1.04	0.19
7	Political Instability	1.25	0.52
8	Cultural Differences	1.21	0.57
9	Human Resource	1.61	0.79
10	Cash Flow	4.11	0.79
11	Foreign Exchange & Convertibility	1.46	1.07
12	Inflation & Interest Rate	1.07	0.26
13	Cost Overrun	2.54	0.96
14	Inadequate Design	2.50	0.69
15	Low Construction Productivity	2.89	0.69
16	Site Safety	1.46	0.69
17	Late Payment	4.11	0.74
18	Inadequate Quality Control	1.14	0.36
19	Inadequate Project Management	1.79	0.74
20	Environmental Protection	1.14	0.36
21	Public Image	2.18	1.39
22	Intellectual Property Protection	2.75	0.89
23	Force Majeure	1.96	0.84
24	Market Demand	2.11	1.03
25	Competition	2.18	0.82

4.2 Analysis of Risks and discussion

Each risk in the questionnaire had a scale of 1 to 5 for its criticality. While analysing, numbers in this scale have been grouped together in order to make the understanding of the results easier:

Table 4.2

1 Not critical at all	Not critical
2 Slightly critical	Not critical
3 Somewhat critical	Intermediate
4 Critical	critical
5 Very critical	critical

1 Approval & Permit: this risk was ranked 1.79 mean and standard deviation is 0.96. The risk could be assumed as not critical, but because of high st. deviation it has potentiality to escalate to intermediate or even to a critical. However this risk affect project in a very early study, when it still on paper and do not affect economical issues.

2 Change In Law: this risk was ranked 1.32 mean and std. deviation is 0.61. The risk considered as not critical, this is due Cyprus has got sable Law system and they do not change very oftenlly.

3 Justice Enforcement: this risk was ranked 1.14mean and st. deviation is 0.45. The risk is classified as not critical, that is because the court of Cyprus is independent power and decision of court are grounded by evidence .

4 Government Influence on Disputes: this risk was ranked 1.14 mean and st. deviation is 0.45. The risk is classified as not critical for the same reason as above.

5 Corruption: this risk was ranked 1.21 mean and st. deviation is 0.50. This his was evaluated as not critical, Cyprus have relatively low level of corruption. According the organisation Transparency International in 2019 Cyprus get a score 58/100 and ranks 41 position of 180 countries.

6 Expropriation: this risk was ranked 1.04 mean and st. deviation is 0.19. This risk considered as not critical. The reason is Cyprus government protects private property and in case of expropriation, the government compensate fairly.

7 Political Instability: this risk was ranked 1.25 mean and st. deviation is 0.52. This risk estimated as not critical, because Cyprus is democratical state and political power transfer is smooth.

8 Cultural Differences this risk was ranked 1.21 mean and st. deviation is 0.57.

This risk appreciated as not critical, although the Cyprus multi cultural island, because it geographical location and Cyprus is a member of EU.

9 Human Resource: this risk was ranked 1.61 mean and st. deviation is 0.79. This risk is assessed as not critical, Cyprus has got developed technical high schools, polytechnic institutes and buisness schools, so it is not issue for PM to fine trained staff.

10 Cash Flow: this risk was ranked 4.11 mean and st. deviation is 0.79 This risk is estimated as critical. Constructions are costly projects, so cash flow is essential to keep going on.

11 Foreign Exchange & Convertibility: this risk was ranked 1.46 mean and st. deviation is 1.07. The risk is classified as not critical, Cypriot currency is a Euro, it is stable currency and relevant to British Pound or US dollar it has not significant fluctuation.

12 Inflation & Interest Rate: this risk was ranked 1.07 mean and st. deviation is 0.26 This risk estimated as not critical, As it was mentioned above, Cypriot currency is a Euro and its annual inflation rate is around 2%

13 Cost Overrun: this risk was ranked 2.54 mean and st. deviation is 0.96. This risk is assessed as intermediate, as it depend on human factor and ability to mange cash and goods.

14 Inadequate Design: this risk was ranked 2.50 mean and st. deviation is 0.69. This risk considered as intermediate, Inadequate Design is most common reason fore a changes in project, changes in project are costly, dependent on how early they will be. (if changes complete during design, then is almost cost free)

15 Low Construction Productivity: this risk was ranked 2.98 mean and st. deviation is 0.69. This risk is assessed as intermediate, generally productivity is complicate issue, it includes various aspects such as leadership, HR and motivation.

16 Site Safety: this risk was ranked 1.46 mean and st. deviation is 0.69. This risk estimated as not critical, construction is not safety place, it is second in rate of injuries after road accidents. However, PMs are obligated by regulations to provide all safety necessary and supervise the employees to follow safety rules.

17 Late Payment: this risk was ranked 4.11 mean and st. deviation is 0.74. This risk estimated as critical.

18 Inadequate Quality Control: this risk was ranked 1.41 mean and st. deviation is 0.36. This risk considered as not critical, most products used in construction are certified by ISO and companies follow procedures aligned with regulation.

19 Inadequate Project Management: this risk was ranked 1.79 mean and st. deviation is 0.74. This risk estimated as not critical. Because respondents are project managers.

20 Environmental Protection: this risk was ranked 1.14mean and st. deviation is 0.36. This risk estimated as not critical, Cyprus has got plenty places protected

their natural beauty and archeological sides. If there are issues with environment or archaeology, the project just would not get a permission. So the impact on a project is similar to the risk number 1 above.

21 Public Image: this risk was ranked 2.18 mean and st. deviation is 1.39. This risk estimated as not critical, although it has high standard deviation and there is a grate possibility of escalation to intermediate or even critical.

22 Intellectual Property Protection: this risk was ranked 2.75 mean and st. deviation is 0.89. This risk is assumed to be Intermediate, project management it is about know how

23 Force Majeure: this risk was ranked 1.96 mean and st. deviation is 0.84. This risk was underestimated before covid-19, after covid it slope from category not critical to intermediate risks. However, the term Force Majeure written in all contracts, so if it occurs, the date of project delivery, will be postpone

24 Market Demand : this risk was ranked 2.11 mean and st. deviation is 1.03. This risk is assumed not critical, it has high standard deviation, hence there is grate probability to turn in to intermediate category. Markets are not predictable in Cyprus specially if dealing with new products or implementation of innovative techniques.

25 Competition: his risk was ranked 2.18 mean and st. deviation is 0.82. This risk is considered as intermediate, there is huge completion in construction sector in Cyprus, although it is fair competition that every one win from it.

4.3 Conclusion from analysis of questionnaire

As it shows the analysis, Cyprus has it is risks that could impact a project most critical are are sub-categories of Economic and Financial (E&F) - External, Managerial and Technical (M&T) - Internal. Many of those risk are manageable highlighting of need better Protect management, risk evaluation control.

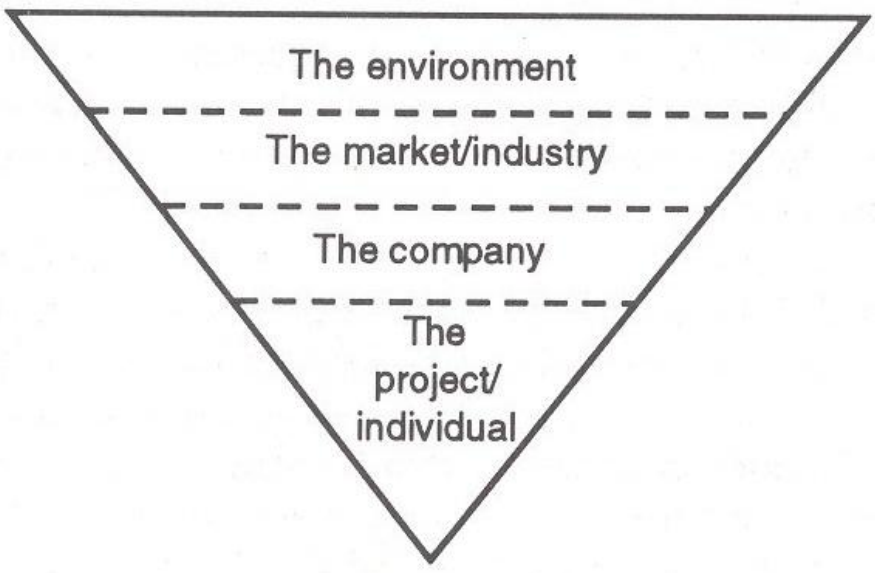
Chapter 5 Conclousion

This chapter, extracts the results of previous chapter and analyse them in relation to the findings of other authors argued in Literature Review chapter and contextual data about Cyprus discussed in Methodology chapter and finally the results are discussed in relation to the **contingency theory.**

Using a case study of Cyprus:
1. What are the processes of risk identification for construction projects?
- Identification and evaluation of internal and external risks
- The nature and strength of interaction between various risks

2. How is the knowledge about construction risks utilized in managing risks in line with contingency theory?

According to the questionnaire most of respondents state that any project is being executed by one or more organizations which are in turn located in an environment. The project, organization and the environment have their own specifications and there is a strong interdependency between them and consequently influence each other. Participants in survey have also provided a hierarchy for the risk in construction project (figure 6.1) with the environment being at the top, followed by the market, the company and finally the project/individual. They believe that risks in each level impact the levels below and emphasize on the intrinsic link between the company risks and the project risks since the outcomes of a risky project must be eventually borne by the company. As the performance of all companies is dependent on the economy. Changes in the money supply, interest rate, exchange rates, taxation, the prices of commodities, government spending and overseas economies affect all companies in varying degrees. This argument is valid in the construction industry."



As it is seen from the results of questionnaires and interviews, the critical risks are mostly sub-categories of Economic-Financial risks and then are Technical-Manageri-

al oftenly they are interconnected, for instance Late payments of client (sub-category of E&F risks) can be considered as another factor lengthening the projects (sub-category of T&M risks) and then again delays result in extra cost (sub-category of E&F risks) due to the strong interaction of these risks, since time and cost are always related, increases in time would increase the costs (sub-category of E&F risks).

Most common risk that face a project managers in Cyprus is a delay to deliver a project, and it s by itself risk for more risks to appear, as the degree of predictability of the risks within the life time of the project is decreasing. According research on identification of the main causes of delay in construction projects of Cyprus are:delay in progress payment by clients, change orders by client during construction and poor site management and supervision, hence dealing with financial issues takes most of P.Ms time and therefore reduces required time for making decisions for other risks, coordinating and managing their companies, employees, and the work being executed.

5.1 How is the knowledge about construction risks utilised in managing risks in line with contingency theory?

Risk perception: according the data, there is difference between the risk evaluations among groups, instance, risk has been stated as „unforeseen event" or „unpredictable event" by various participants. Although there is much overlap between being „unforeseen" and „unpredictable" and these may be used interchangeably; there is slightly difference between them. Unforeseen can be referred to an event which is totally beyond what one can conceive (out of the blue) whereas unpredictable can be referred to an event which its level of predictability cannot be defined in a reasonable range (it can be foreseen) this can be the result of the types of their personality as well as the level of influences of these risks on them.

Looking at the evaluation of the proposed mitigation strategies in questionnaires and also the responses provided in interviews for risk management process; it could be realised that groups of participants have different perspectives. Their differing perspectives and perceptions of risk based on their knowledge and objectives in addition to the level of influences of risk on them consequently may result in different strategies adopted by them for managing risks, some of them are described below.

Organisational Learning (OL) can be considered to be an effective strategy for this risk in order to make more use of previous similar experiences (systematically) for improving risk management. Hence, organisational learning has been recommended for enabling people to learn from the past and make best use of their experience when managing projects. Considering the similarities between the risk management and contingency theory, adaptation in theory mostly happens through organisational learning which increases the decision-making potential through utilising past experiences and applying them to current situations where possible. On other hand some of the interviewees believed that the individuals may obtain experiences automatically via executing projects and so not all the companies had a well-organised process for evaluating the strengths and weaknesses of the projects for utilisation in future projects. Moreover, high volatility and dissimilarities of situation for each project (compared to previous projects) was mentioned as another reason why organi-

sational learning is not being practiced analytically since they consider effectiveness of past experiences relatively low for the very unique new projects. However, as stated by Bernstein (1996, p.57) "the most powerful tool of risk management ever to be invented is the law of probability." so learning process through evaluation of the pro et contra of each project is essential for any Project Manager.

Contingency cost can be considered as one fair way for covering the risks which are likely to result in additional costs and also financial risks themselves which are mostly due to instabilities of economy and subsequent potential price fluctuations. Contractor is involved with estimation of contingency cost more than other parties since they are dealing with execution phase which can be assumed to be the phase associated with the majority of expenditure**.** Moreover, even if they could be predicted to some degree, the required cost for mitigating them could not be included in the price offered by contractors for projects due to competition and this leads to reason for reducing the effectiveness of contingency cost in Cyprus. Many construction companies in Cyprus are aware of ignoring some of the risks, they prefer not to use contingency since they are worried about not getting the work because of contingency inclusion in their price – they want to keep their machinery and employees working.

Many of the Constructors and Project Managers investigate about project‟s specifications, **client and its financial viability** before starting the project. It helps them obtain more specific information about the new project and its risks and plan according to the unique specifications of the project. Constructors and Project Managers try to **work with the same client** if possible for their different projects. Moreover, they maintain good relationship with their clients in order to manage application of clients‟ individual opinions on the execution of the project to a degree also providing after sale service.

Since there may be misalignments between stakeholders, **EPC contract type** may help mitigating some of the risks because of fewer numbers of parties being involved and succeeding improvements in communications, cooperation and decision makings. Finally, **buying the materials as early** as possible in order to be less influenced from price fluctuations.

5.2 Evaluation of contingency theory

Every aspect has its Pro et Contra, the challenge is to suit most appropriate strategy or technique in certain circumstance. As it seen above, various strategies implemented in order to minimise risks, either probabilities, either effect on project also maximise opportunities that might appear, justify why the decisions may differ in each situation. Contingency theory suggests that the management strategies should be appropriate for the situation, by defining the situation it can be realized how the appropriateness would be. Considering the contingency theory in the context of construction projects; by identifying the contextual variables of the situation the theory is being applied to, the appropriateness of management strategies for the situation can be understood to a great extent.

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