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**A Study Of The Methodologies Used In Risk
Management Standards For Dealing With
Risk Attitude, In Decision Making**

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Abstract

This study has been devised to both raise awareness on the topic of risk attitude within risk management, but also to advise practicing organisations on the shortfalls of risk management standards, which may have been consulted in the development of their own individual risk management plans. Within this study, the methodologies outlined for dealing with risk attitude, within three risk management standards; the IRM standard, PRINCE 2 and the PMBOK, are examined. Furthermore the different methods, tools and techniques highlighted by different authors in the field are also amalgamated. From this the critical elements for managing risk attitude are identified and used to determine the effectiveness of the risk management standards in managing risk attitude within decision making. Risk attitude can affect ones decision making both in a positive or negative manner and as all stages of the risk management process are executed by individuals there is need for it to be managed effectively. Moreover many authors have argued that there are significant shortfalls with regards the management of human factors in the risk management process. From this study it was discovered that there is no exact method for managing risk attitude, that none of the standards analysed contain a fully effective means for managing it and that the tools described within the risk analysis stage of the risk management processes may need to be revised. There is a gap highlighted within the literature with regards the factors which affect risk attitude and also questions which require clarification on the tools to be utilised within risk analysis. Organisations which have developed their own risk management plans based on these standards should also be aware of their short comings, as by ignoring them this could result in unfavourable outcomes in a project environment. However by not having access to a full range of factors which affect ones risk attitude in decision making, means that it is very difficult to manage it effectively.

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Glossary of terms

PMBOK- Project Management Body of Knowledge

IRM- Institute of Risk Management

AIRMIC- The Association of Insurance and Risk Managers in Industry and Commerce

ALARM- The Public Risk Management Association

PRAM- Project risk analysis and management guide

OGC-The Office of Government Commerce

PMI- Project Management Institute

APM- Association for Project Managers

AS/NZS- Australia/New Zealand

1.0 Introduction

1.1 Background and problem description

The aim of risk management with regards project management is to reduce the probability of future threats while aiming to maximise the probability of future opportunities. It is a process through which uncertainty is managed to allow for the successful completion of projects (Pana and Simionescu, 2011). As all stages are implemented and over seen by people there is a major human element which can affect this process. This leads us to the main concept behind this paper; risk attitude.

Risk attitude can be defined as “a chosen response to uncertainty that matters, influenced by perception” (Hillson and Murray-Webster, 2005). Furthermore there are various risk attitudes which people tend to conform to which are dependent on a variety of different factors. One of the major problems with risk attitude is that it can adversely affect decision making in the risk management of projects (Wang and Yuan, 2011). For this reason it is a necessity that risk attitude be managed.

Many professional standards have been developed to deal with the subject of risk management. These include those published by the Project Management Institute (PMI), the Institute for Risk Management (IRM) and the Office of Government Commerce (OGC) in the UK. These Standards offer guidance and advice with regards tools, techniques and processes which are generally accepted as good practice (Raz and Hillson, 2005).

Many authors have argued however, that there are significant shortfalls with regards the risk management processes in their ability to manage such human factors (Pender 2001, Thevendran and Mawdesley, 2004, Yaraghi and Langhe, 2011). In recognition of all these factors the following study was devised.

1.2 Aims and Objectives

The aim of this study is to determine if risk attitude can be managed effectively using standards/guidelines as devised by the PMI, OCG and IRM. Its aim is to raise awareness on this issue and to create a deeper understanding, which in turn is expected to add to a more effective risk management process. There are three main objectives which are:

- On the basis of review, identify what elements determine an effective means for the management of risk attitude?
- To investigate how the PMBOK, PRINCE 2 and the IRM manage/deal with risk attitude and the adequacy of their methods?
- To provide recommendations on how these standards could be improved with regards the management of risk attitude.

1.3 Analysis

The data to be used for the analysis will be collected from three standards; the PMBOK, PRINCE 2 and the IRM, but also from techniques/methods identified within the literature. The data from both the standards and literature will relate to the area of risk management and how the subject of risk attitude is managed. Firstly the standards will be segregated using the different stages listed in each one. As there are different stages for managing risk identified in each, a common framework had to be developed to allow for comparisons/contrasts to be drawn. It also allowed for the different methods, tools and techniques used through each stage within the different standards to be distinguished. The second section in the analysis combines all the major methods tools and techniques highlighted by the different authors, within the literature review. These again specifically relate to managing risk attitude. The methods common to all of these are identified, which also provide the headings for the discussions that are held. These discussions revolve around the adequacy of the standards methods for managing risk and areas which require for development.

1.4 Scope and Limitations

This study will focus primarily on risk attitude and how it may affect decision making within the risk management process. The analysis focuses specifically on three management standards; the PMBOK, PRINCE 2 and the IRM's guide. Due to the limitations on content and time, other well recognised standards such as the PRAM and AS/NZS 4360 have not been included. The attitude management techniques described within the literature review also only take into account the perspective of three papers/studies. Although this paper will give recommendations on how these standards might be improved with regards specific areas, tools and techniques, it will not offer a revised risk management framework. All conclusions and recommendations drawn are from a purely theoretical perspective. As it is not possible to review every piece of

literature it should be noted that all conclusions and recommendations which extend from this study are solely based on the authors theories/evaluations identified within the literature review.

1.5 Outline

Both Chapter 2 and 3 make up the literature review. Chapter 2 deals firstly with the concept of project risk, the next section looks at what exactly project risk is, next at risk management through the project lifecycle and after this the critical success factors for effective risk management are identified. The last two sections of this chapter look firstly at the risk management process and then focus on risk management within three risk management standards; the IRM, PRINCE 2 and the PMBOK. Chapter 3 starts by introducing the topic of risk attitude, next the factors which affect ones risk attitude are recognised, while the next section looks at the importance of risk attitude within decision making in risk management. The final section of this chapter looks at the tools and techniques to manage ones risk attitude within decision making in risk management. Chapter 4 is made up of two sections; risk standards and methods for managing risk attitude. Within this chapter the analysis is carried out. Chapter 5-Discussions, is where the contents of the analysis are critically examined. This is done under four headings; raising awareness, tools, monitoring and additional areas for research. The final chapter, chapter 6 highlights all the conclusions and recommendations which can be drawn from this study.

2.0 Risk

This chapter starts by looking at project risk; what is actually meant by the term, the factors which cause it and some of its common features. Next the focus turns to risk management; its importance to risk management, definitions and a brief look at how risk is handled. Next risk management is looked at through the project lifecycle; the importance of the planning phase, the importance of the post planning phases and some conclusions which can be drawn. Thereafter the focus turns to the critical success factors in risk management; how they can be defined and the views of different authors with regards risk management. After this the risk management process is discussed from the point of view of many authors within the field, through the headings; risk identification, risk assessment, risk handling/mitigation and risk monitoring. Finally three risk management standards are introduced; the IRM, the PMBOK and PRINCE 2, some comparisons/differences are drawn and any findings are highlighted.

2.1 Project Risk

One of the main attributes associated with projects is their high level of risk; mainly due to the external environment in which they exist, their uniqueness and their complexity. Risk is evident in all projects, in such a way that it can be never fully eradicated, however when managed effectively, the impact it may have can be mitigated (Nieto-Morote and Ruz-Vila, 2010). Risk can either affect projects in a positive or negative light and can impact on more than one deliverable or objective. Such positives can also be referred to as “opportunities” which may include savings in time or cost etc. Many authors and standards now refer to the use of the project risk process in the managing of both positive and negative as good practice (Hilson, 2009; Cooper et al, 2004, IRM, AIRMIC and ALARM, 2002).

Through the project lifecycle risks can surface as a result of different circumstances and factors, which are only added to by the collaboration of temporary project teams. This is further affected by the political, economic and social conditions where the project is to be carried out (Zavadskas et al, 2010). As originally risks were thought to be mainly negative, definitions did not take into account any possible positive effects. Mark et al (2004) saw risk as the “potential for complications and problems with respect to the completion of a project task and the achievement of a project goal”. While Baloi and Price (2003) saw it as

the likelihood of a negative event occurring in a project. However, more recently definitions tend to also take these opportunities into account. The PMI standards committee (2004) defines risk as “an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one project objective, such as time, cost or quality. While the IRM defines it as “the combination of the probability of an event and its consequences”, but also recognise that in all situations there are “opportunities for benefit (upside) or threats to success (downside) (IRM, AIRMIC and ALARM, 2002).

Although there are many different definitions of risk most share some very common features. These features were recognised by Chia (2006):

- There is the possibility that the event will or will not occur.
- It is an uncertain event that, if it occurs, affects at least one objective e.g. Time, quality, cost.
- The probability of the event occurring ranges between 0 and 100%. This is as, if the probability of the event occurring is 0% it will definitely not occur, while if the probability of the event occurring is 100% it will definitely occur.

2.2 Risk Management

Project risk management is vital for the success of all projects and is identified as one of the 10 key knowledge areas by the PMI. The overall objective is to reduce the possibility of future problems while aiming to maximise the probability of future opportunities. More than ever now, projects have become affected by risk due to an increase in terms of both their frequency and impact. As a result risk management has also become an increasingly significant part of project management, in order to effectively manage these risks and give a greater guarantee of success to all project stakeholders or at the very least give them notice on factors which may impact the project (Fang and Marle, 2012).

Contradictory to the view that the elimination of risk from projects is of the highest priority, which is actually believed to be inherently impossible, Hilson (2002) felt that the most important task was to ensure that it is reduced to a level that is acceptable to the organisation and is managed effectively throughout. It is also important to note that due to the ever changing environment which projects are based, the process of risk management is a continuous one which is ever changing (Dikmen et al, 2008).

Zavadskas et al (2010) described risk management as the process about defining the root of the uncertainties, assessing the impact of the events, devising strategies to cope with the expected or calculated outcome and based on responses repeat this process throughout the project life cycle. Smith et al (2001) recognised that risk management can be viewed as a tool which enables managers to cope with “the complexities and uncertainties that increasingly surround change and its management”. While Edwards and Bowen (1998) describe it as a systematic approach to dealing with risk. It was their view that a risk management system should contain “an appropriate context; set goals and objectives; identify and analyse risks; influence risk decision making and monitor and review risk responses”.

2.3 Risk Management and the project lifecycle

According to the PMBOK (2010) the project lifecycle can be devised into 5 “process groups” which are; Initiating, planning, execution, monitoring and controlling and finally closing. Although risk management is generally seen as on-going process which continues throughout the full project lifecycle there are those who regard certain stages as more critical than others. Both opinions on the importance of the planning stage and the post planning stage will now be analysed in more detail.

It was the view of Datta and Mukherjee (2001) that many of the risks which are not identified within the planning stages of a project cannot be adequately dealt with once the project has commenced. By having done so, greatly aids the quality of decision making, improves preparedness and also allows for the development of action plans. Similarly Northrop (2007) acknowledged that through risk management in the planning stage information on costs, potential delays, changes in scope and issues with quality may all be identified. Such information can be used to update plans and work statements which would improve understanding on whether the project can be completed within the predetermined constraints (Time, budget and quality).

Contrastingly Stellman and Greene (2007) believed that due to the ever changing environment in which projects exist there are a large range of challenges and variables which will be encountered throughout the project lifecycle. As in today’s world these occur at such a rapid pace it would be impossible to identify them entirely at the start of a project. As a result it is imperative that risk management is an on-going process. Likewise the New York state information office (2001) stated that as a project evolves so do its

risks, which may affect the levels of probabilities, impacts, timelines etc. This gives rise for the importance of constantly updating the risk management plan to ensure the actions chosen are still viable.

From this it is clear that risk management is vital in both the initial planning and throughout the project life cycle and is why it is advised by most major bodies that it be dealt with in all stages (PMBOK, PRINCE 2, PRAM, IRM). With regards the main topic of this paper; risk attitude, it should also be noted that throughout the project life cycle that this can alter immensely. As situational factors can have a major effect on one's risk attitude and so their decision making, depending on the stage of the project this can change dramatically. This topic will be dealt with in much greater detail in chapter 3.

2.4 Critical Success factors in Risk Management

Although there are many standards and bodies of knowledge which guide organisations on the design and implementation of risk management processes there is not yet any globally accepted guideline open to all industries, which allows for “successful” development and implementation (Yaraghi and Roland, 2011). Critical success factors can be defined as “those few key areas of activity which favourable results are absolutely necessary for a manager to reach his/her goals” (Rockart, 1982). By identifying these factors it is believed that the gap can be closed between literature and practice as organisations would be forced to concentrate more of their resources on the elements which highlight the difference between failure and success (Bullen and Rockart, 1981).

Cooke-Davies (2002) in an attempt to determine which factors are in fact critical to project success identified twelve, through answering three distinct questions; “what factors lead to project management success?”, “what factors lead to a successful project?” and “what factors lead to consistently successful projects?”. Out of these twelve factors four relate to risk management:

- The extent to which individuals are educated on the concept of risk management.
- The quality of an organisations process for allocating risk ownership.
- The importance of keeping an up to date and assessable risk register.
- The importance of keeping an up to date risk management plan.

Moreover with regards to the implementation of risk management Hurber and Imfeld, (2011) identified the following factors as essential for success:

- A well-defined risk management framework.
- A well-defined risk policy.
- Objectives for risk management must coincide with company strategy.
- Distinguish risk responsibility clearly.
- Ensure continuous improvement and monitoring of the process.

2.5 Risk Management Process

Many researchers/institutions have developed a variety of risk management frameworks, but typically they possess four steps; risk identification, risk analysis, risk handling/mitigation and risk monitoring (Wysocki, 2009). The first step risk identification deals not only with detection of threats but also the potential opportunities which can emerge. Some risks may be identified prior to commencement while others will be identified during the lifecycle. There are also those of which will be inherent and those which will emerge in the external environment which are not in the control of the project team (Cano and Cruz, 2002). Risk analysis aims to quantify the effects of the identified risks and is usually achieved using a quantitative or a qualitative approach (Mills, 2001). However the APM (2000) advises that both qualitative and quantitative methods be used in conjunction with each other. The qualitative stage should include a subjective assessment of risks, while the quantitative stage should include an objective assessment. Risk handling as its title suggests utilises different techniques to deal with known risks, identifies who owns the responsibility for the risk and gives an estimate of the time and cost to deal with the risk. Risk mitigation methods usually fall into one of four categories; avoidance, control, assumption and transfer (Kremljak, 2010). This view was supported by Akintoye and Macleod (1997) who stated that risks are dealt with using risk retention, risk transfer, risk reduction or risk avoidance. These can be used either individually or in combination with each other. Finally at the risk monitoring stage all risk information is compiled. Continuous observation keeps track of identified risks, helps identify new risks and allows the necessary corrective actions to be taken. Status meetings and risk register updates are also frequent measures implemented (Gajewska and Ropel, 2011).

2.6 Risk Management Standards

2.6.1 IRM

The institute of risk management (IRM) developed its own standard in correlation with a number of risk management organisations within the UK, while also incorporating the

views of other bodies and experts within the field. One of the fundamental attributes of this frame work is that it views risk in both a positive and negative light (IRM, AIRMIC, and ALARM, 2002). Figure 1 shows the IRM’s risk management process. A more detailed overview of the IRM can be seen in appendix A.



Figure 1-IRM Risk Management Process (IRM, AIRMIC and ALARM, 2002)

2.6.2 PMBOK

Risk management is one of the 10 key knowledge areas identified by the Project management institute (PMI) in the PMBOK guide. Within this section their process of managing risk is defined as; plan risk management, identify risks, qualitative risk analysis, quantitative risk analysis, plan risk responses and control risks. Within each of these phases the required inputs, tools and techniques and outputs are all identified which are required to implement each phase successfully. Figure 2 shows the PMBOK’s risk management process and a more detailed overview can also be seen in appendix B.

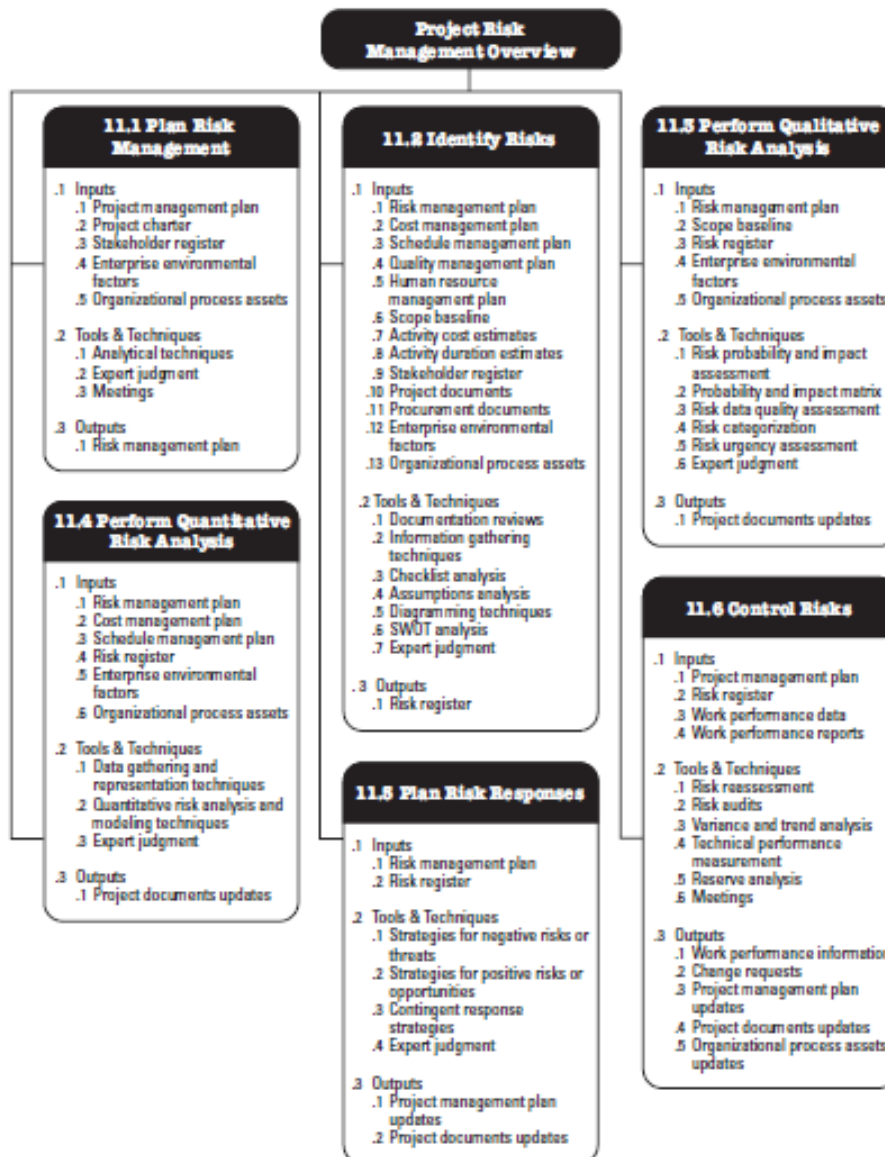


Figure 2- The PMBOK risk management process (PMI, 2012)

2.6.3 PRINCE 2

PRINCE 2 has been developed by the UK Office of Government Commerce (OGC) and acts as a guidance manual in the management of projects. This manual has been broken up into different “themes” which are thought to be aspects of project management which have to be dealt with throughout the lifecycle of a project. Risk is one of these themes.

Prince 2’s risk management procedure contains a five step process; identify, Assess, Plan, implement and communicate. The first four phases follow in series while communicate runs throughout the procedure. Figure 3 shows PRINCE 2’s risk management process and a more detailed overview can be seen in appendix C.

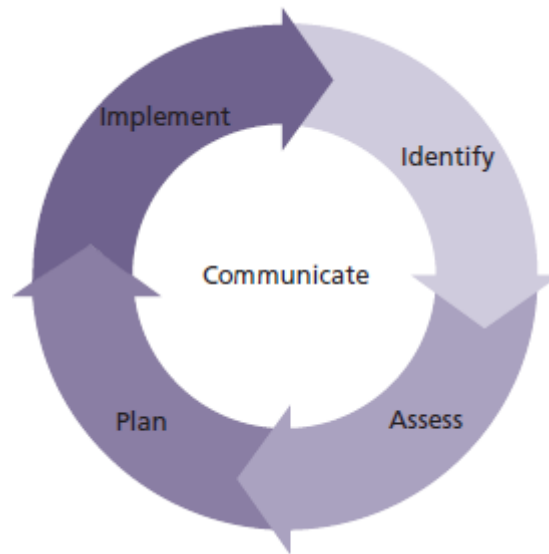


Figure 3- PRINCE 2 risk management process (OGC, 2009)

2.6.4 Comparison of Standards

Although the standards use different terminology/headings to describe their process steps, all follow a common structure; risk identification, risk analysis, risk handling/mitigation and risk monitoring, which was highlighted earlier by authors as typical, to a risk management framework. For example the PRINCE 2 labels a stage assess, while the PMBOK breaks it into qualitative and quantitative risk analysis but both follow a very similar process.

All three frameworks view risk as something which can be viewed as either a threat or an opportunity and incorporate the mechanisms to deal with this through the project life cycle. For positive risks these include exploitation and risk sharing, while for negative risks these include avoidance and transfer. Similarly within the risk assessment stage all three standards seem to break analysis into two further sub-stages; estimation, where the likelihood and impact are determined and assessment, where the risks are assessed and prioritised.

Furthermore with regards to risk attitude it can be seen that all three standards introduce the topic of risk attitude and state that both risk appetite and risk tolerances be pre-defined before project commencement.

However there are also some variations which can be identified. The first can be recognised in the addition of features which go beyond that which are present in the

“traditional” risk management framework. For example in PRINCE 2 one element which has been added is communication, which identifies how information should be distributed both internally and externally with stakeholders. This is not dealt with separately and in nowhere near the same level of detail, in the PMBOK and IRM guides.

With regards to dealing with risk attitude, the PMBOK is the only standard which recommends that the factors which may affect risk attitude should be identified. Moreover PRINCE 2 is the only guide which recognises the importance of triggering an exception report to senior management when risk tolerances are exceeded. In addition the IRM standard appears to totally neglect the topic of risk attitude in the handling and monitoring stages with no mention of mechanisms for dealing with it what so ever.

The identification of such differences with regards how the different standards manages/controls risk attitude, led to the development of one of the main objectives of this paper, which is; To investigate how the PMBOK, PRINCE 2 and the IRM manage/deal with risk attitude and the adequacy of their methods?

3.0 Risk Attitude

This chapter starts by focusing on the term risk attitude; what attitude is, defining risk attitude and how risk attitude can affect individuals differently in various situations. Next it looks at the factors which affect risk attitude; organisational factors, the different categories which they can be divided into and a substantial list of various factors which have been identified in industry. Thereafter the importance of risk attitude to decision making is dealt with; the link between attitude and planned behaviour is established and why its management is critical to project success. Finally the focus is on how risk attitude is managed; some the tools and techniques.

3.1 What is risk attitude?

Before trying to comprehend what risk attitude is, one should look at both terms individually. As risk has already been discussed in much detail in the previous chapter 2 we will now look at attitude and how it affects behaviour. Rokeach (1972) stated that attitude represents peoples evaluations of objects or situations that cause them to act in a certain way. Furthermore Teo and Loosemore (2001) stated that attitude has four dimensions; affective (feelings/emotions), behavioural (intention/actions), cognitive (knowledge/beliefs) and evaluative (values/likes or dislikes).

By combining both terms “risk” and “attitude” Hillson and Murray-Webster (2005) originally defined risk attitude as “chosen state of mind with regard to those uncertainties that could have a positive or negative effect on objectives”. It was later discovered though that this definition neglected a very important factor, namely perception. As a result of this discovery they derived, what they felt to be a more complete definition, which incorporated this. As a result Risk attitude was defined as a “chosen response to uncertainty that matters, influenced by perception”.

Figure 4 shows the risk attitude spectrum. It illustrates that in the same uncertain circumstance different individuals will exhibit different risk attitudes, which is dependent on their perception. As a person’s attitude will affect their behaviour, different individuals will arrive at different conclusions and so will respond differently even in the same situation.

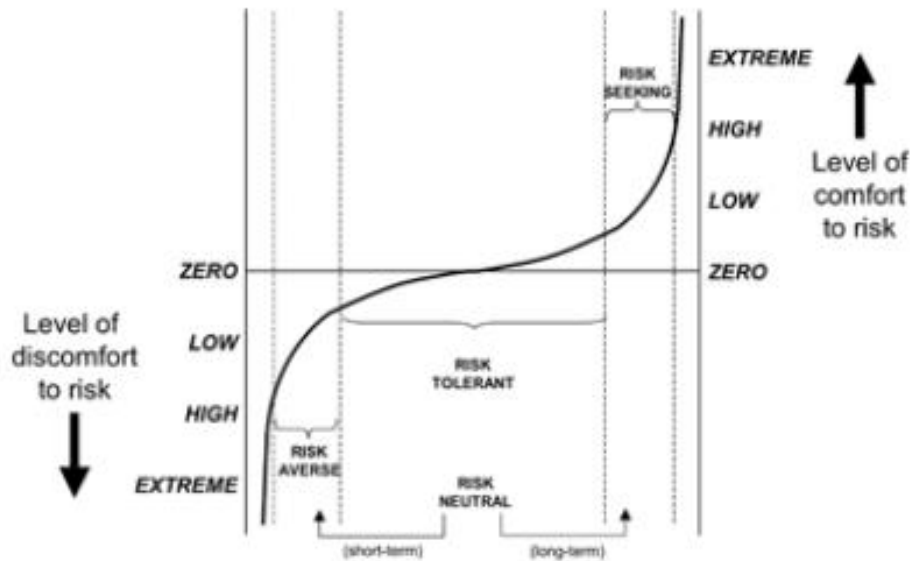


Figure 4- Risk attitude spectrum (Hillson and Murray-Webster, 2005)

Additionally it should be acknowledged that there are various different types of risk attitude which people tend to confirm too. Underwood and Ingram (2010) stated that there are four which authors have come to a consensus on:

- Maximizers- Seek to exploit risk and believe no risk is too large. They see only the opportunity and not the potential loss. They are risk seeking.
- Conservatives- Seek to avoid risk and are very uncomfortable with uncertainty. Taking risks in order to increase profits is less significant than avoiding the potential loss. They are risk averse.
- Managers- Seek to find a medium between potential threats and opportunities. They look for good returns from risks of a reasonably safe nature. Also known as risk neutral.
- Pragmatists- Seek to keep all possible outlets open and so avoid any possible commitments. They are very short term orientated and instead aim to react to changing environments. Also known as risk tolerant.

3.2 What factors affect risk attitude?

Before risk attitude can be controlled or managed it is necessary for one to understand how risk attitudes are formed and so the factors which affect them are of great importance. Alexopoulos et al (2009) noted that risk perceptions and risk attitudes are vastly affected by many factors which cause them to act differently in various situations, these include

education, experiences, beliefs, attitude of co-workers and culture. Similarly Renn and Rohrman (2000) from their studies on cross cultural risk perception identified a number of factors including; familiarity with the cause, the ability to control the risk, the impact the risk may have, previous personal experiences, the trustworthiness of the information relating to the risk and cultural biases.

Helliar et al. (2001) identified a number of organisational factors which can influence ones attitude in decision making. These include:

- The Organisations attitude- How risky judgements are rewarded/punished by the firm.
- The Industry- Dependant on the industry itself. For example IT firms tend to be more risk seeking due to the level of innovation within the industry while insurance firms tend to be more risk averse, aiming to identify every little detail.
- Threats to survival- In disastrous situations decision makers tend to be more risk seeking than under more normal circumstances.
- Performance related pay- Decision makers would be more risk adverse where their pay is more likely to be affected, while they would be more risk seeking in situations where pay is to be affected due to low performance levels.
- The financial climate- In a “boom” decision makers tend to be more risk seeking due to the feeling of potentially missing out, while in a recession they tend to be quite guarded in an effort to try and protect what they have.

All of these factors will have a major impact on an individual’s risk attitude and ultimately the decision which would be made.

Murray-Webster and Hillson (2008) determined that factors affecting risk attitude could be separated into three different categories and went on to devise a list of these factors:

- Conscious factors: These include all factors which are visible and measurable within the environment in which a decision has to be made. At both an individual and group level factors such as familiarity, proximity and severity of impact would apply.
- Subconscious factors: Influences such as heuristics and cognitive bias which affect both individuals and groups can impact decision making. Heuristics may include

factors such as intuition, representativeness and availability. Cognitive biases factors may include prospect theory, repetition bias and the illusion of control.

- **Affective factors:** Responses are based on emotions/feelings and usually tend to neglect rational assessments. When individuals/groups are faced with a similar set of circumstances often emotions or affective factors can influence ones actions. These may include factors such as love, fear, joy or hate.

Although it is possible to identify these factors separately they do not tend to operate in isolation. They in fact combine to influence how an individual/group will react in a given environment. A full list of these factors can be seen in figure 5.

Conscious factors (situational and rational)	Subconscious factors		Affective factors (emotions and feelings)
	Heuristics	Cognitive bias	
Familiarity I've/we've done something like this before, or I've/we've never done something like this before Manageability I/we know what to do to manage this, or I/we don't know what to do to manage this Proximity If it happens it will happen soon so we need to sort it now, or It wouldn't happen for ages, we've got time Propinquity If it happens it would really matter to me/us personally, or If it happens it would affect objectives, but it wouldn't really matter to me/us personally Severity of impact It it happens the effect would be huge (or insignificant) Group dynamics and organizational culture The norms of how this particular group behaves	Intuition Feels right, I won't look for any more data Representativeness This must be like this other one I've seen before Availability Most recent data is most memorable. Closely linked to reality traps where 'too much value is attributed to existing situations, blinded by what is, we cannot see what might be if we could disengage from reality' Confirmation trap Undue confidence – selective perception: trust me, I'm a ...? Lure of choice Biased by options that include future alternative judgements – keeping options open Affect heuristic Seeking pleasure, avoiding pain Anchoring Attach illogical significance to available data, first impressions last Group effects, e.g. groupthink We all think this way	Prospect theory A bird in the hand is worth two in the bush, double or quits Repetition bias Undue importance is given to repeated data – it must be true! Illusion of control Exaggerate personal influence, discount luck Illusion of knowledge Some knowledge or relevant experience masks what isn't known, particularly if the person feels they 'should' know Intelligence trap Ability to mentally construct and verbally reason (IQ) means that the conclusions must be correct Optimism bias Delusional optimism driven by cognitive biases and/or perceived organizational pressures and norms Fatalism bias Ignore probabilities, focus on impact of outcomes – always optimistically, that is, the best case will happen Precautionary principle Ignore probabilities, focus on impact of outcomes – always pessimistically, that is, the worst case will happen Hindsight bias Fail to learn – 'I knew it all along'	Fear (dread, worry, concern...) Of the consequences of something happening Desire (excitement, wonder...) Of the consequences of something happening Love (lust, adoration, attraction...) I want it/want more of it Hate (dislike, disgust...) I don't want it/want less of it Joy (happy, carefree...) Life is good, more good things are possible Sadness (depressed, morbid...) Life is bad, more bad things are probable

Figure 5- Factors affecting risk attitude (Hillson and Murray-Webster, 2008)

Furthermore in the field of construction Wang and Yuan (2011) conducted a study which focused on the factors which influenced decision makers risk attitudes in mainland china. By conducting a series of interviews a list of 26 factors were obtained (see figure 6). Although these factors were not divided into categories as previously described there are many comparisons which can be drawn. Factors such as scope of knowledge, time constraints and consequences of decision making may fall into the conscious category. Intuition, judgement ability, values and experience may fall into the subconscious category. While social experience and physiological endurance may be considered as affective factors.

No.	Factors	Descriptions
F01	Education background	Attitudes toward risks within the decision making process may vary greatly, depending on contractors' education background. Generally speaking, contractors with higher education tend to be more rational and cautious, while those who received little education tend to be more fearless and impulsive Chen (2000)
F02	Engineering experience	Equipped with rich engineering and social experience, contractors can be more familiar with potential risks regarding the project, and thus the experience could play a role in assisting in decisions. Therefore, the risk attitude would, to a certain extent, be influenced by the experience
F03	Social experience	
F04	Professional knowledge	Different backgrounds across professional knowledge and scope of knowledge will influence contractors directly while dealing with professional project issues, and result in different risk attitudes
F05	Scope of knowledge	
F06	Physical health	Contractors' physical health influences the pressure they can endure, the degree of their preferences to short-term benefits, and the corresponding ability to confront risks
F07	Social status	Undoubtedly, contractors with different social status hold different risk attitudes, as they consider the same problem from different angles and depths
F08	Character traits	Character means the combination of qualities or features that distinguishes one person, group, or thing from another. Various kinds of character traits have been studied by Wang (2000), who found that different character traits lead to different actions. For instance, contractors with independence traits prefer thinking and dealing with problems independently, and sometimes they may compel their ideas to others; while contractors with obedience traits tend to agree and accept others' ideas, and they are generally of poor adaptability. All these different traits in character result in different risk attitudes
F09	Boldness	Here boldness means the traits of being willing to undertake things that involve risk or danger. Decision makers with this traits always have the ability to determine the right scheme timely and resolutely.
F10	Values	It means people's ideas about what is right and wrong, or what is important in life Li and Liu (2003). Within the same circumstance, attitudes may vary depending on the values, as some contractors are status-and-right oriented while others take money as the priority
F11	Moral values	Moral values is the quality of being in accord with standards of right or good conduct, or a system of ideas that fall into those same categories Liu (1998). As a member of the society, everyone has the unique moral values, which may influence the risk attitude
F12	Decision motivation	With specific decision motivation, the decision is of significant directivity, which results in the fact that the decision activity will move on toward expected direction and objective Wang (2000)
F13	Interest in the engineering	To what degree are decision makers interested in the project can definitely influence the development and innovation within the construction period, and thus influence their risk attitudes
F14	Judgment ability	It refers to contractors' abilities of analyzing and judging problems according to their own knowledge and experience. This ability plays an important role within the decision making process
F15	Intuition	It is the ability that is especially useful while dealing with problems of great complexity. Mostly, the solution obtained based on this may be very close to the optimum scheme
F16	Sensitivity to external information	It refers to that contractors can make quick response and judgment to engineering variations by analyzing different external information
F17	Psychological endurance	It is the ability which enables contractors to endure pressures from variable sources Li and Liu (2003)
F18	Willpower	It is the ability to control the mind and body in order to achieve the goal
F19	Desire for decision objectives	Normally, desire can inspire people's active actions toward particular objectives. Contractors' actions, therefore, can be greatly influenced by the intensity of desires while confronting risks
F20	Consequences of decision making	Contractors may consider the consequences resulted from their decisions, and this in turn may affect their risk attitudes
F21	Time constraints for decision making	In some abrupt cases, quick response and decision making are required, as little time left for thorough discussion and consideration. In these cases, contractors' risk attitudes vary a lot depending on time permission for making a decision
F22	Completeness of project information	Engineering information is vital in making the right decision, and it can, to some extent, enhance contractors' confidence while making the decision
F23	Company's economic strength	Company's economic strength always plays an important role to influence decision makers' risk attitudes. According to an empirical study conducted by Haimlevy Slovic and Fishhoff (1982), decision makers' risk avoiding tendency would decrease along with the increase of company's economic strength
F24	External economic environment	Good external economic environment can contribute to active actions of decision makers when encountering project risks, while bad external economic environment makes decision makers very passive
F25	Policy environment	National or regional policy environment is the basis on which the project lies. Different policies involved during the project period will directly impact the decision choice
F26	Engineering related regulations	It refers to some project related regulations that are promulgated by the local government

Figure 6- Factors affecting risk attitude (Wang and Yuan, 2011)

Although many of the factors which have been identified by the different authors differ, all agree on the fact that understanding the factors which affect ones risk attitude are of vital importance, in comprehending ones decision making behaviour. As a result it can be deduced that understanding the factors which affect risk attitude are critical in managing it, with regards the decision making process. It should also be noted that many authors identified the need for more research to be carried out on the factors which affect risk attitude (Wang and Yuan, 2011, Thevendran and Mawdesley, 2004, Fazli et al. 2012).

3.3 The importance of risk attitude to decision making in risk management

As established thus far risk attitude is affected by a range of different factors, but as all stages of a risk management process are executed by individuals and groups this would imply that the risk management process would be also affected. Ajzen (1993) devised a model which demonstrates the relationship between attitude and planned behaviour and is one which is still held in very high regard today. This model can be seen in figure 7. It shows how factors like beliefs and factual knowledge effects Attitude which in turn, along with subjective norms and perceived behaviour control impacts behaviour intention which sequentially effects actual behaviour.

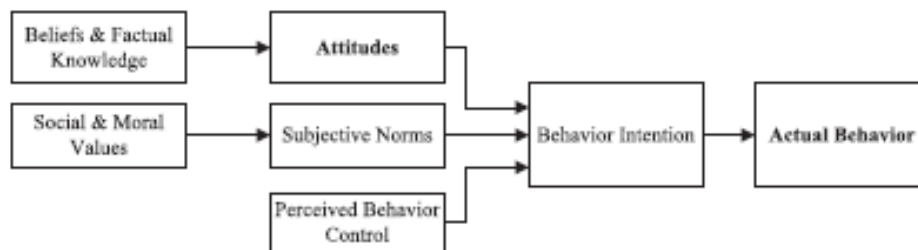


Figure 7- Relationship between attitude and planned behaviour (Ajzen, 1993)

Fazli, Alvandi and Rezaei (2012) highlighted that human resource is critical to risk based decision making and as risk attitudes heavily influence a decision maker's behaviour this is also central to the risk management of projects. Similarly De Camprieu et al (2007) emphasised that during the risk evaluation process many objective and subjective factors can have major effects on the decision making process and added that these factors can also affect the selection of data which is used to validate decisions. Furthermore Kim and Reinschmidt (2011) noted that individuals or groups when faced with uncertainty perceive situations differently due to their risk attitude. As a result questions were raised about the effects this may have on an organisations performance.

Hillson and Murray-Webster (2008) believed that by being able to understand what constitutes the term risk attitude, would enable an individual to discover the key to effective decision making in the risk management process. This is depicted within their model which can be seen in figure 8, which illustrates that being able to understand and manage risk attitude leads to effective risk management.

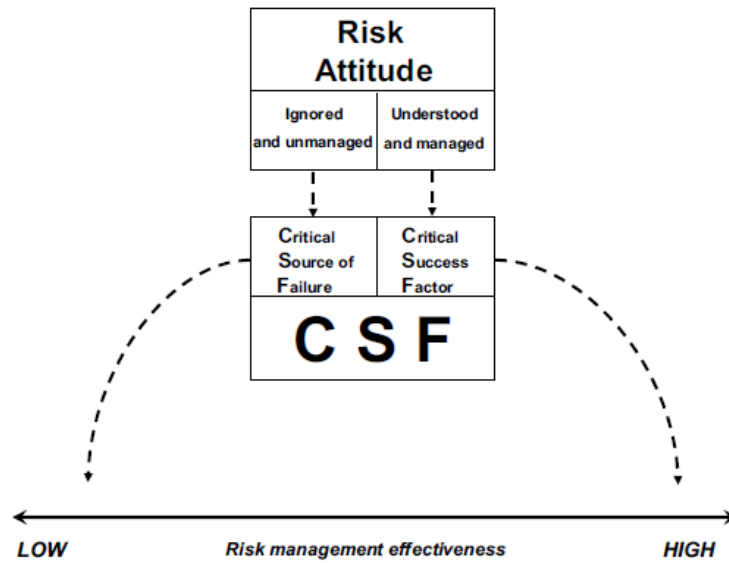


Figure 8- The key to effective decision making in risk management (Hillson and Murray-Webster, 2008)

A clear link can be established between an individual/groups risk attitude and their decision making with regards to risk management. As different people perceive situations in different ways also implies that individuals will inevitably chose different strategies to deal with issues. This is something that can cause major issues especially in the process of risk management where individuals are faced with so much uncertainty. Questions have to be raised on how different individuals or groups would perform given the various degrees of risk attitude. This emphasises the importance of managing risk attitude in a project environment.

3.4 Managing risk attitude

Within the judgement and decision making literature there are many suggestions on how to remove subjectivism and improve the quality of decision making. Firstly this section will focus on some tools which have been identified. Wang and Yuan (2010) highlighted that these include “the expected profit and loss value decision method, the decision diagram method, the matrix decision method, the marginal decision method and the Bayesian decision method”. However they went on to discover that as these are founded on the expected value principle, which in itself requires a repetitive decision making process in the assembly of data, can be flawed as individual’s perceptions can vary depending on a number of factors. As a result of this, in the pursuit of the maximum value, individual’s decision making may vary from case to case, rendering techniques based on the expected value principle unsatisfactory.

Likewise Pender (2001) noted that risk management tools which are based on probability theory have their limitations. This is as probability is based on randomness where actions within projects are usually not random, each project is usually unique which decreases the reliability of statistics obtained through probability theory, the inability of individuals to comprehend and handle the full spectrum of information available and also because probability theory is based on the fact that future states are known, but is not able to incorporate the uncertainty which most projects are faced with. As a result of this a real options approach is highlighted as a possible solution, due to its ability to deal with partial knowledge and as it also adds a temporal dimension.

3.4.1 Motivational, Cognitive and Technological

The remainder of this section will focus on the views of different authors in managing risk attitude, using various techniques. Firstly, it was the view of Larrick (2004) that objective decision making could be achieved using one of three methods; Motivational, cognitive and technological. The first method “Motivational” assumed that by using incentives and holding individuals accountable for decisions that their decision making would improve. However with regards incentives, there is hardly any evidence to support this view (Camerer and Hogarth, 1999). Likewise using accountability appears to have its flaws, as the decision maker can be affected by the pressure to conform to what is expected by the stakeholders. This could also lead to a biased decision and should be used in conjunction with other techniques.

Cognitive methods on the other hand do seem to be more successful but require much effort from the decision maker. This technique draws the decision maker’s attention to factors which may affect their decision making and educates them on the rules of objective decision making. Kirkeboen (2009) focused on two methods of achieving this; take an outsiders view and achieving the opposite.

Taking an outsiders view is based on the perspective that individuals tend to neglect past statistics and to judge new projects on the basis that they are totally unique. This is regarded as taking an inside view. By doing the opposite and adopting an outside view one ignores the case at hand and focuses on cases which had similar statistics and characteristics. It is concluded that there is much evidence to support the fact that better decisions are made using an outside perspective.

In Considering the opposite the decision maker is simply required to ask themselves the question “What are some of the reasons that my initial judgement might be wrong?” it is believed in doing so many factors which affect ones decision making may be reduced significantly. This is as an individual will be required to search for information which will reinforce ones stand point, information which would have been likely to be neglected.

The last method technological differs to the previous two by surpassing the individual and utilising a group method or technologies to aid the decision making process. Firstly with regards the group process Surowiecki, (2004) identified a four stage process for successful implementation; each individual should bring diverse information, individuals must have their own personal opinions which are not affected by the group, individuals must be able utilise local knowledge effectively and finally there must be a convention to amalgamate all of the individual perspectives. The Delphi technique is an example of a mechanism which upholds all these conditions.

The second method, using technologies to aid the process looks at methods such as using simple linear models. In some cases it is unanimously agreed that these can outperform individual/group decision making methods. Einhorn (1972) discovered that although individuals know what data to study, linear models merge this in an enhanced manner in comparison to methods adopted by individuals.

3.4.2 Behavioural Risk Management

The Behavioural risk management approach was devised by Goto (2007) as a means of controlling subjective biases and judgemental risk. This method accepts the impact which such factors can have on the decision making process and aims to confront them as opposed to trying to mitigate their impact. The main principal of this approach aims to make decision makers aware of the different attitudes and factors which can impact decision making in risk management, but also the effects they can have. It is believed by doing so that the decision makers behaviour can be altered.

Within the risk identification and assessment stage the first step is to conduct a study to determine what factors affect the team members attitudes in a given project situation. This is believed to give the stakeholders a good understanding of what drives risk attitude. Next risk should be categorised in terms of how clearly its probability can be assessed and the degree of difficulty in assessing the state which it exists (situational). This allows risks to be classified into 3 categories:

- Conditions where probability is given.
- Conditions where states can be simply constructed but probability cannot be calculated.
- Conditions where states cannot be simply constructed.

Depending on the category which a risk falls into will determine the most appropriate way of managing this risk. For the first category highlighting the significance of using objective data is sufficient as probabilities are known. In the assessing stage using the method of Bayesian statistics is also prescribed but care should be taken as time progresses and additional data surfaces that decision making is not impacted (become subjective).

For the second category where probability cannot be calculated, using the method of case based decisions is recommended. This is due to the fact that individuals have the ability to draw similarities between past projects and the case in hand, where similar effects are expected from similar situations. However the ability of an individual to compare situation to situation may be affected by attitude and so guidelines which determine relevance must be established. It is also recommended that this method is completed in a group setting where different views, knowledge and experiences may be considered.

For the final stage, where states cannot be simply constructed, a real options analysis (ROA) approach is advised, as opposed to other methods such as discounted cash-flow or net present value analysis. Effectively there are a series of decision points set, where updates/corrections are to be made based on new information being acquired. Within this method decisions are only made for as long as required and there are no long term commitments. Again it is advised that a standardised methodology of achieving this be constructed. This model would minimise the subjective element.

As the environment changes through the project lifecycle it is also likely that one's perception would also change which highlights the importance of monitoring risk behaviour. It is suggested that risk limits are set below the pre-defined level of risk appetite which will give the organisation time to react if gaps between the two are seen to be quite large or small. These limits will again be evaluated using the three categories that were already defined. In the event of irregularities being detected between the level of risk appetite and the limits an immediate analysis should be carried out.

3.4.3 Emotional Literacy

Hillson and Murray-Webster (2006) described emotional literacy as a method of managing risk attitude. As risk management is executed by people they acknowledged the fact that every stage of the process would be affected by different biases and attitudes. Were these affect risk management and its performance it is acknowledged that emotional literacy can be utilised as a means to stimulate and manage attitudinal modification.

They defined emotional literacy, in the field of risk management as a means of “understanding and managing emotions that matter”, those which may affect the process in either a positive or negative manner. They also maintained that risk attitudes can be chosen, contradictory to the common belief that they are inherent and unalterable. It is suggested that due to repetition of a certain choice, it can become so embedded in an individual’s behaviour that they do not realise there is a choice. The aim of emotional literacy is to train people how to evaluate each situation and then to select whatever risk attitude is most applicable with regards achieving a projects objectives. This requires two major elements; awareness and action.

Figure 9 illustrates this model in which an individual’s/groups risk attitude can be evaluated but also altered if required. The steps in this process are sequential where one moves onto the next step every time the question relating to the stage is answered. The model is designed in such away which raises self-awareness and fosters self-modification.

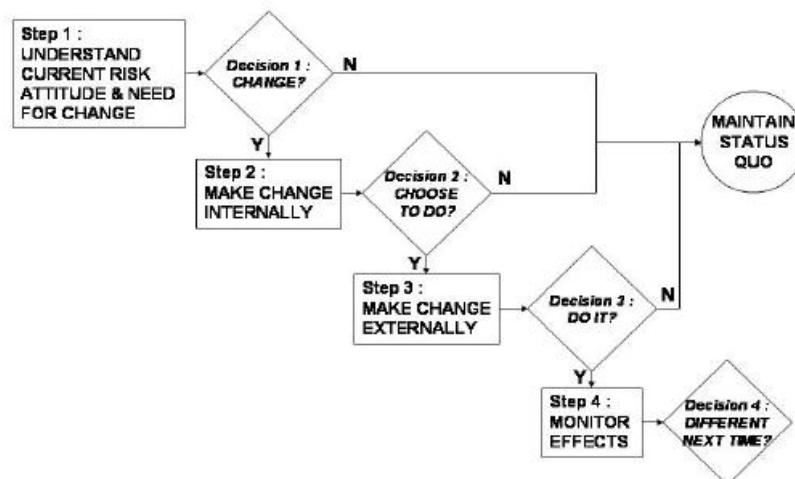


Figure 9- Emotional literacy model (Hillson and Murray-Webster, 2008)

It can be seen that both the behavioural risk management technique and the emotional literacy technique would fall into the categories of cognitive/technological and cognitive as

described by Larrick (2004), respectively. Similarities in the techniques devised by the authors would include the importance of raising awareness on the topic of risk attitude and also the requirement of a monitoring process throughout. In saying this there are also many differences including, classifying risks into categories as a means of determining the best method of management, using technologies such as linear models and relying solely on the decision maker to alter their own state of mind. As a result of these differences one of the main objectives of this paper was formed, which is to identify what elements determine an effective means for the management of risk attitude?

4.0 Analysis

This chapter is split into two sections; risk standards and methods for managing risk attitude. The first will analyse how the PMI's, OGC's and IRM's methodologies differ in dealing with risk attitude, while the second will analyse the different methods for managing risk.

4.1 Risk Standards

As previously stated, this section will investigate how the PMI's, OGC's and IRM's methodologies differ in dealing with risk attitude. This will be achieved by comparing how each standard deals with this subject through each of the phases in their risk management process. The table below illustrates the framework, through which this will be achieved.

	IRM	PMBOK	PRINCE 2
Identification	Identification	Planning and Identification	Identification
Assessment	Analysis and Evaluation	Qualitative and Quantitative Analysis	Assessment
Handling	Reporting and Treatment	Plan Responses	Planning
Monitoring	Monitoring and Review	Control Risk	Implement

The stages identified within the respective risk management standards will be analysed under the headings which are common to most risk management procedures; Identification, analysis, handling and monitoring. How the concept is introduced will be also analysed under the heading, introduction. Under each of these headings tables will be formulated outlining the tools, theories and concepts which are described within the respective standards.

Introduction	
IRM	<ul style="list-style-type: none"> • Risk management policy should identify its appetite for risk.
PMBOK	<ul style="list-style-type: none"> • Introduces the topic of risk attitude.

	<ul style="list-style-type: none"> • Identifies risk appetite, risk tolerance and risk threshold as the three themes which can affect ones attitude. • Highlights the factors which can affect risk attitude. • Recommends that risk attitude be managed.
PRINCE 2	<ul style="list-style-type: none"> • Risk management policy/strategy which includes information on, risk appetite and risk tolerances. • When risk tolerances are exceeded an exception report should be triggered so senior management maybe informed.

Identification	
IRM	N/A
PMBOK	<ul style="list-style-type: none"> • Risk Management Plan should include information on; risk attitudes, thresholds and tolerances highlighting the degree of risk which is accepted. • Describes the use of conducting a risk profile analysis in order to evaluate stakeholders risk appetite and tolerance. • Classifies risk attitude as an enterprise environmental factor which can affect the Identification of risks.
PRINCE 2	<ul style="list-style-type: none"> • Risk management policy/strategy which includes information on, risk appetite and risk tolerances should be consulted at this stage. Also updated. • The use of early warning indicators- risk tolerance

Analysis	
IRM	<ul style="list-style-type: none"> • Tools and techniques such as: decision tree, real options analysis, Probability and Impact matrix, Business impact analysis.
PMBOK	<ul style="list-style-type: none"> • In assessing the priority of risks, risk tolerance is a determining factor • Identifies the need to define probability and impact due to risk attitude • Tools and techniques such as: Probability and impact matrix,

	decision tree, expected monetary value, expert judgement.
PRINCE 2	<ul style="list-style-type: none"> • Risk policy/strategy should be consulted with regards risk tolerance • Tools and techniques such as: decision trees, expected value, Monte Carlo analysis, Probability and impact matrix.

Handling	
IRM	N/A
PMBOK	<ul style="list-style-type: none"> • Use of information within risk register when devising strategies keeping in mind risk tolerance set by organisation. • When choosing a particular response for negative risks keep in mind the threshold limits which were pre-determined.
PRINCE 2	N/A

Monitoring	
IRM	N/A
PMBOK	<ul style="list-style-type: none"> • Evaluating the effectiveness of methods utilised on a constant basis. • Ensuring all document are kept up to date.
PRINCE 2	<ul style="list-style-type: none"> • Any update to policies/strategies with regards risk appetite and tolerances will trigger updates to risk register. • Monitoring to ensure risk tolerances are not exceeded- triggers exception report.

By exploring the three standards, under these headings, it can be seen that there are many similarities, but also many variances in their methods to dealing with risk attitude. All standards recognise that risk attitude should be acknowledged and introduced within the process, all accept that risk appetite and risk tolerance should be defined and also that tools such as decision trees and matrices should be used to aid risk analysis.

However there are also many variances which can be identified, these include: PRINCE 2 is the only guide which recognises the importance of triggering an exception report to senior management when risk tolerances are exceeded. Additionally PRINCE 2 is the only guide which advises the use of early warning indicators as a mechanism for monitoring

risk tolerance in decision making. Furthermore the PMBOK is the only standard which recommends that the factors which may affect risk attitude should be identified; a step which is of great importance is managing attitude, as established in section 3.2. The PMBOK is also the only guide which advises on the construction of a risk profile analysis in order to evaluate stakeholders risk appetite and tolerance. Most of the tools and techniques which are identified in the IRM are also mentioned within the other two standards but it should be noted that within the handling and monitoring stages there is no reference to risk attitude what-so-ever and no mechanisms for dealing with it.

4.2 Methods for managing risk attitudes

Within this section the different techniques identified in sections 3.4.1, 3.4.2 and 3.4.3 for dealing with risk attitude will be compared. This will be done by firstly looking at all the different stages under each methodology. By doing so the table below was formulated.

Methodology	Stages
Behavioural Risk Management	<ul style="list-style-type: none"> • Raise awareness on factors affecting risk attitude. • Study to determine factors affecting attitude. • Categorise risk- Probability vs. state. • Assessment method- Objective data and Bayesian statistics/Case based decisions with guidelines/Real option analysis (ROA). • Setting early warning indicators below level of risk appetite. • Constant monitoring.
Emotional Literacy	<ul style="list-style-type: none"> • Raise awareness on risk attitude • Understand current attitude and need for change • Decide to make change internally • Show this through actions/decision making • Monitor the effects while always looking for better ways.
Larrick	<ul style="list-style-type: none"> • Motivational- Incentives, Accountability/Monitoring

	<ul style="list-style-type: none"> • Cognitive (Draw attention and confront)- Outsiders view, Consider the opposite • Technological – Group methods or technologies
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The next step involves cross referencing all the different stages to determine the similarities between the three different methodologies. In doing so the table below was devised. This gives a framework for which the three standards can be evaluated, in their effectiveness of dealing with risk attitude.

Similarities
Raise Awareness
Tools
Monitoring

From the methodologies which were analysed, it can be seen that there are 3 major components which are evident in all. Firstly raising awareness is present in Behavioural risk management where it is advised that stakeholders should be made aware of the factors which affect risk attitude, in Emotional literacy where individuals should understand risk attitude and in both motivational and cognitive methods as described by Larrick (2004).

Although the tools used to aid the process may differ, it is still an element which is critical to all. In Behavioural risk management tools such as matrices, objective data, Bayesian statistics, and real options analysis are mentioned, within emotional literacy the staged process which is utilised can be seen as a tool in itself and in Technological (Group and technologies) and Cognitive (Outsiders view and consider the opposite) within Larricks model.

Finally the need for monitoring is highlighted in behavioural risk management through the monitoring of early warning indicators and the process itself, in Emotional literacy by always looking for the optimum solution and, finally in Larricks model within motivational and cognitive.

5.0 Discussions

This chapter will aim to critically evaluate the methods used within the project management standards (PMBOK, PRINCE 2 and IRM) and also on the basis of this provide recommendations for areas which require further development. The elements which have been identified as being present in all of the methods presented by different authors, will provide a framework for which the standards can be critically evaluated. These categories are raising awareness, tools and monitoring. One additional section has also been added to facilitate a discussion on additional methods which may warrant further study.

5.1 Raising Awareness

All of the methods discussed within the various reviews identified raising awareness as a key factor. The IRM incorporated this through identifying the need to define risk appetite within their risk management policy but stopped here. The PMBOK introduced the topic of risk attitude in great detail, defined risk appetite, risk tolerance and themes which can affect ones attitude and highlights the factors which may lead to subjective decision making. It also indicated that information on risk attitude be dealt with in the risk management plan and identified it as an enterprise environmental factor which can affect the identification of risks. PRINCE 2 identified that the risk management policy should include information on how to deal with risk attitude.

It can be seen that all standards incorporated risk attitude into their respective procedures in some shape or form which in itself would raise awareness on the topic. It can also be acknowledged that the PMBOK has incorporated all of the mechanisms and more, which have been identified by the different reviews, on raising awareness. Both the IRM and PRINCE 2 do not inform the manager/decision maker on the factors which may affect their decision making. This is an area which both may need to consider and incorporate.

5.2 Tools

Tools may include any techniques, methods or technologies which are used to aid the management of risk attitude within the risk management process. The IRM recommended within the assessment stage that decision trees, probability and impact matrix, real options analysis and business impact analysis be used. While the PMBOK prescribes the use of a

risk profile analysis to determine the risk appetite and tolerance of stakeholders, similar to that mentioned in the behavioural risk management technique (section 3.4.2). It also advises the use of tools such as probability and impact matrix, decision tree, expected monetary value and expert judgement. Additionally PRINCE 2 outlines the use of methods such as decision trees, expected value, Monte Carlo analysis and probability and impact matrices.

All three of the standards incorporated to some extent, tools which can be used to reduce the level of subjectivism within decision making in risk management. Although some of these differ from standards to standard most are based on probability and expected value theories. However from the literature review (specifically section 3.4) some authors emphasise the fact that these methods are inadequate for dealing with individuals risk attitude effectively (Pender, 2001 and Wang and Yuan, 2010). As a result of these findings a method called real options analysis was highlighted as a possible solution. The use of this tool was advised within risk analysis by the IRM but is not mentioned in either PRINCE 2 or the PMBOK.

All of the authors in some shape or form also acknowledged the importance of training people how to evaluate situations objectively, either by aiming to modify their actions completely or trying to incorporate guidelines to be adhered to in decision making. Although one of the mechanisms identified through the literature of achieving this is raising awareness, which from the last section (5.1) has been recognised as being evident in all three standards, there are no further methods mentioned. Techniques such as “taking an outsiders view”, “considering the opposite” and that described in Emotional literacy are not included in any form.

5.3 Monitoring

The last element which was evident in all of the techniques for managing risk attitude was monitoring. Within the IRM standard there are no mechanisms identified for specifically monitoring individuals or groups risk attitudes. The PMBOK outlines the use of threshold limits, evaluating the effectiveness of methods constantly throughout and updating all documents to ensure all information is current. Finally Prince 2 highlights the use of early warning indicators with regards threshold limits, measures for triggering an exception report, constantly updating documents on risk appetite and tolerance which in turn will trigger updates to risk register and finally constant monitoring of threshold limits.

Although using monitoring as a risk attitude management technique on its own can affect the decision maker negatively, due to pressures to conform to stakeholders expectations, it is still very effective when combined with other techniques. Both the PMBOK and PRINCE 2 appear to incorporate most of the mechanisms advised by the authors. However the IRM should look at incorporating some mechanisms for monitoring risk attitude, due to the fact that the environment constantly changes throughout the project lifecycle and so ones risk attitude is also likely to change.

5.4 Additional areas for research

From the research conducted it was discovered that there is no definite/complete way of managing risk attitude. As highlighted in the literature review all of the methods which were listed by the different authors vary immensely, although there were some similarities which could be drawn. From the literature reviewed it can also be stated that unless there is much more emphasis placed on determining the factors which affect risk attitude it will not be fully understood how it can be managed effectively.

The use of real options analysis is one which has featured many times throughout this paper. Studies as conducted by Pender (2001), Boute et al. (2003) and Goto (2007) all support the view that there are many advantages for its use within project risk management. Furthermore researchers believe that real options analysis would be a more beneficial tool than many of those highlighted in risk management processes, but it is believed that there are cognitive barriers against its use (Ford and Lander, 2011). Although this is an area which extends beyond the scope of this paper, it should be mentioned that first glimpses appear promising and it may be an area which warrants further investigation.

6.0 Conclusions & Recommendations

- There is no exact/definite method for managing risk attitude within the risk management process acknowledged by authors in the field of project management.
- On the basis of review it was discovered that raising awareness, utilising appropriate tools and monitoring are all critical elements in the managing of risk attitude in decision making.
- None of the standards analysed incorporate all of the vital elements completely.
- In this respect, none of the standards analysed contain a fully effective means for managing risk attitude in decision making.
- The IRM's standard completely overlooks the Monitoring of risk attitude but does incorporate raising awareness and tools. Within the latter two however, both the neglect of the factors which affect risk attitude and the effectiveness of the tools identified are issues which may need to be investigated further.
- PRINCE 2 acknowledges all of mechanisms which are required for successful monitoring. However it disregards the factors which affect risk attitude in raising awareness and also the adequacy of the tools prescribed require further research.
- The PMBOK guide deals with both raising awareness and monitoring effectively. However the tools which are highlighted require further investigation.
- Due to the missing elements in all three of the standards assessed, it can be deduced that neither the IRM, PRINCE 2 nor the PMBOK provide a totally effective means for managing risk attitude.
- Due to the great importance of the factors which affect risk attitude and the lack of complete knowledge within this area, it can be recommended that further research be carried out.
- Real Options Analysis has been highlighted by many authors as an effective tool for risk analysis but has been only included in one of the standards; The IRM. For this reason, it is recommended that further investigations be carried out within this area.

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Appendix A- The IRM Standard

Within the IRM standard the first step is risk assessment. They define this as the process of risk analysis and risk evaluation, which are in line with the organisations strategic objectives. Risk Analysis can then be further divided into three distinct steps; risk Identification, risk description and risk estimation.

The main aim of risk identification is to determine exactly how exposed the organisation is to uncertainty. This activity requires an in depth knowledge of both the internal and external environment. It is recommended that this is approached in a methodical manner to guarantee all major activities have been identified, along with the risks which extend from these activities.

1. Name of Risk	
2. Scope of Risk	Qualitative description of the events, their size, type, number and dependencies
3. Nature of Risk	Eg. strategic, operational, financial, knowledge or compliance
4. Stakeholders	Stakeholders and their expectations
5. Quantification of Risk	Significance and Probability
6. Risk Tolerance/ Appetite	Loss potential and financial impact of risk Value at risk Probability and size of potential losses/gains Objective(s) for control of the risk and desired level of performance
7. Risk Treatment & Control Mechanisms	Primary means by which the risk is currently managed Levels of confidence in existing control Identification of protocols for monitoring and review
8. Potential Action for Improvement	Recommendations to reduce risk
9. Strategy and Policy Developments	Identification of function responsible for developing strategy and policy

Figure 10- Risk Description ((IRM, AIRMIC, and ALARM, 2002)

Within the risk description stage all the identified risks are to be displayed in a coordinated manner. By going into great detail at this stage it is possible to identify the risks which need to be analysed in greater depth. An example of such can be seen in figure 10.

The risk estimation stage can be either qualitative or quantitative but it can also be a hybrid of the two; semi-quantitative. These methods are used in order to determine both the probability of a risk occurring and also the impact which it may have. The IRM suggest a range of risk analysis methods including; Prospecting, test marketing, event tree analysis,

SWOT analysis, PESTLE and Fault tree analysis. The overall aim of this process is to produce a risk profile which allows for prioritisation.

The next phase is the risk evaluation stage where the determined risks are contrasted against risk criteria i.e. loss/gains, stakeholders concerns, social/environmental issues. The purpose of risk evaluation is to make decisions about the risks, which are all reviewed on an individual basis.

Within reporting there are two types; Internal reporting and external reporting. Under internal reporting the IRM risk management standard identifies three main groups which should receive information, but also defines what type of information each group requires. These groups include; The board of directors, the different business units and Individuals. External reporting then outlines the information which should be made available to all stakeholders. This is said to be of major importance in retaining stakeholder confidence.

Risk Treatment is the stage at which it is determined how the risk is to be dealt with but also how these measures should be implemented. Many techniques are highlighted which include risk mitigation, risk avoidance, risk transfer etc. At minimum a risk treatment option should provide:

- Efficient internal control mechanism.
- Must comply with standards and regulations.
- Must not impair the organisations ability to operate.

A monitoring and review structure is the final stage in the process. This stage should ensure that all phases within the risk management process are running effectively.

Reviews/audits should be conducted constantly to identify any possible areas where future improvements can be made. Additionally given how dynamic a project environment is changes may need to be made to the process during the project lifecycle (IRM, AIRMIC, and ALARM, 2002).

Appendix B- The PMBOK Guide

The first step within the risk management process in the PMBOK guide is plan risk management. The aim of this phase is to outline how the risk management activities will be conducted for a specific project/programme. This phase defines the type of risk which is most essential to the success of the project but also ones which are most important to the organisation. A vital step within this phase is to gain the support of the stakeholders involved to ensure the risk management process is implemented effectively throughout. Elements such as roles and responsibilities, budgeting, definitions of probability and impact and risk categories are all set out.

Within the identify risk phase all threats and opportunities which may impact the project, along with their characteristics are identified. From this phase a risk register will be compiled which will be added too later on in the risk management process. From this stage it will contain a list of identified risks and a list of potential responses. This stage informs the project team about some possible scenarios they are likely to encounter, which means they are better prepared. It should also be noted that this is an iterative process as risks may be added through the project lifecycle.

Perform qualitative risk analysis aims to rank risks for further evaluation by gauging both the probability of an event occurring but also the impact it may have. Both these criteria are then combined in order for a risk to be ranked. This allows for the project team/manager to focus on the risks which are of the highest priority. From this stage the main outputs are updates to the risk register in the form of risk ranking or risks requiring further evaluation and also the assumptions log usually located within the project scope statement needs to be revised.

The next phase is performing quantitative risk analysis where the known risks are numerically assessed. The main advantage of this phase is that it produces risk information in quantitative form which can aid decision making. Additional information may be added to the risk register which may include, probability of achieving cost and time objectives, trends may be identified which may affect risk responses and also risks may be re-prioritised as a result of the quantitative risk analysis.

Plan risk responses is the stage where potential options are explored and decisions are made in order to maximise opportunities and to minimise threats. This phase deals with risks as they are ranked in the risk register and so the required resources/activities are assigned accordingly. The outputs from this phase include updates to both the project management plan and the risk register. The risk management plan may include amendments to elements such as the schedule plan, cost plan, the quality plan and also the human resource plan. While risk ownership, responsibilities, response strategies, specific actions and contingency plans are all examples of updates to the risk register.

The final phase is control risks where risk responses are executed, the identified risks are monitored, any new risks are detected, while also assessing the effectiveness of the risk management process for the duration of the project. This stage ensures that the full process is being constantly monitored and also improved, to ensure that the optimum risk response is implemented. Outputs may include change requests, risk register updates, project management plan updates and also organisational process updates (PMI, 2012)

Appendix C- PRINCE 2

PRINCE 2 advises that before its framework is implemented it should be investigated whether there are any organisational policies/processes which need to be adapted. These may be in the form of a risk management policy or even a risk management process. If the project is part of a programme, this may also require further investigation before commencement, as the programme may have its own risk management strategy.

Under the first step; identify, there are two main phases; Identify context and identify risks. Identify context aims to gather as much information as possible so one can understand the project objectives and develop a risk management strategy. This identifies how risks are to be handled throughout the project life cycle and should be review at the end of each stage. The identify risks phase on the other hand aims to identify which threats and opportunities may impact on any project objectives. These will be then recorded in a risk register which is to be continuously updated. It is also imperative at this stage that early warning indicators are prepared on risks and also that stakeholders views are incorporated.

Within Assess there are again two phases; Estimate and Evaluate. The objective of Estimate is to gauge both the identified threats and opportunities in relation to their probability of occurrence and the impact they may have. It is also recommended that the time scale in which these risks may occur be estimated along with the probability of the impact changing over the project lifecycle. The Evaluate phase then amalgamates both the probability and impact of the risk to identify the net effect. As a result the severity of a risk may be identified and also whether this level of risk is acceptable to the organisation.

The plan stage is utilised in order to deal with the identified risks, by aiming to minimise threats and maximise opportunities. This stage reduces the likeliness of the project being taken by surprise and prepares the project team to react accordingly. For each risk a response should be attached along with a contingency plan. In figure 11 an array of different responses which are available for the different types of risks can be seen.

Threat responses	Opportunity responses
Avoid	Exploit
Reduce (probability and/or impact) Fallback (reduces impact only) Transfer (reduces impact only, and often only the financial impact)	Enhance
Share	
Accept	Reject

Figure 11- Risk Responses (OGC, 2009)

The next stage implement is where the planning stage is executed, its effectiveness is censored and the necessary steps are taken where they do not meet the required levels. Assigning roles and responsibilities to members within the project team in order to support the project manager is of the highest priority at this stage. The main roles are identified as; the risk owner and the risk actioner, but PRINCE 2 also accepts that in some cases this maybe the same individual.

The final stage is communicate and is one which runs throughout the risk management procedure. Its main aim is to ensure that information relating to risks (both threats and opportunities) is shared with the necessary stakeholders both internally and externally. Information relating to the project risks are communicated through: checkpoint reports, highlight reports, end stage reports, end project reports and finally lesson reports. Other communication techniques may also include bulletins, briefings or chat threads (OGC, 2009).