A PROCESS APPROACH TO PROJECT RISK MANAGEMENT

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ABSTRACT

This paper is based on research into project managers’ influence upon the project and team structure, and their ability to manage risks. The individual risk philosophies of the team members are considered in light of the effect they may have upon risk management. This paper briefly reviews project management, risk and risk perception and their interrelated effects upon the construction process. It is suggested that just as risk philosophies of individuals affect the decisions made in their lives away from their professional careers, so their perceptions and experiences of risk can affect their professional decisions. The approaches utilised for the research to explore this theory are also discussed within this paper.

Keywords: Process; Project Management; Risk Perception; Risk Philosophy

INTRODUCTION

This research is being undertaken as part of the Process Protocol II project (Cooper et al, 1998), for which the author is responsible for the mapping of the project and risk management activity zones.

There are three related topics covered within this paper: risk propensity, defined as a person’s desire to either avoid or to take risks; risk preference, the perceived level of risk and uncertainty a person is willing to accept in a given situation; and risk perception, the subjective view of the perceived risk associated with a hazard (Adams, 1995). These areas have been largely overlooked by construction management research, which has instead concentrated on the harder issues of risk management, such as risk quantification using statistical analysis and the methods adopted to do this (Edwards & Bowen, 1999).

The terms risk and uncertainty have become interchangeable, and one can often be found in the description of the other. Within this paper risk and uncertainty will be defined and used accordingly as separate issues of the same complex phenomena, that of hazard management, as proposed by Beck (1986).

A person’s risk propensity plays a fundamental role in decision making and risk management procedures, (McGowen, 1999), and as such requires investigation to discover the extent of the influence of individual propensities, especially considering the nature of the construction project and project management.

To date the research into the area of risk propensity, preference, and perception has been established from an extensive literature review in the areas mentioned. The literature review has also incorporated areas concerning the construct of risk, and the author supports the position that risk is a social construct, (Thompson 1980, Douglas 1985,
Douglas & Wildavsky 1982). The research will be furthered by way of case studies to establish the behaviour of project managers at work and the ways in which they affect the project team.

The intention of this research is to establish the importance of the roles of risk propensity, perception and preference, which can be referred to as a persons risk philosophy, and the implications this can have on the behaviour and decision making of project managers in the work place. These three concepts, or risk philosophy, can be described and highlighted using the metaphor of the ‘risk prism’, shown in figure 1, and described later in this paper.

It is expected that the results of the research will be incorporated into the Process Protocol II framework, enabling more efficient risk management procedures to be implemented, taking into account the three areas of risk behaviour and their impact upon the risk management process. It is hoped that a method for assessing the risk attitudes of individuals can be utilised to establish a comprehensive risk profile of employees. This combined with a record of the employees experience and management style could be utilised to enable project teams to be brought together to better suit the nature of individual projects and clients.

**PROJECTS AND PROJECT MANAGEMENT**

Turner (1993) provides an encapsulating definition of a project as; “...an endeavour in which human material and financial resources are organised in a novel way.”

Projects are distinct from operations due to their unique nature. Operations are repetitive, projects are one off endeavours. As with any new venture there is uncertainty. Assumptions are made, as a matter of necessity, by construction management in situations where there is insufficient data or information to continue with a task (Edwards & Bowen 1999).

The risk and uncertainty associated with a venture are managed by the implementation of a risk management process; the objective of which is to reduce risk (Adams, 1995). The project, the unique undertaking, is utilised to afford the client a means by which to achieve a competitive edge within the market in which he operates and is fraught with uncertainty as no aspect of the project environment will be the same as any previously undertaken. Projects have an undeniably inimitable nature which require specialist skills in managing their processes.

The development of Project Management can be traced from it origins in 1930’s America, where it was first initiated by the “…US Air Corps’ and Exxon’s project engineering co-ordination” (Morris, 1994). As a discipline Project Management is a relatively recent introduction to the construction industry, having only existed in its’ present form for approximately twenty to thirty years (CIOB 1996).
WHAT IS PROJECT MANAGEMENT?

The basis upon which Project Management is founded is the separation of the design, management and executory functions. (CIOB, 1996). The Construction Industry Council (CIC, 1996) defines Project Management as “..the overall planning and co-ordination of a project from inception to completion.”

People are the primary ingredient of any project team. The management and motivation of these teams is one of the requirements of the Project Manager (Cleland 1998, Turner 1993). Execution of the clients decisions and the maintenance of effective communication between the parties to the project are seen as primary responsibilities of the project manager by the CIC (1996).

Shikrazi et al (1996) consider the design of the project organisation as one of the more critical tasks expected of senior construction management. Each project, as a unique undertaking, operates temporarily within a unique, dynamic environment, not before encountered by the participants to the project. To this end the structure and theory of the temporary project multi-organisation (Cherns & Bryant 1984), must reflect the need to adapt and to satisfy the demands of the project within this unique environment (Root, 2000).

To bring any project to a conclusion requires that the project manager first negotiate the complexity of the project; the cause of which is the uncertainty, inimitability and demands of the project and the project environment, as discussed in the following section.

PROJECT COMPLEXITY

The elements comprising project complexity can be considered in two dimensions, those of organisational complexity and those of technological complexity. (Williams, 1999; Baccarini 1996).

Jones (1993) describes technological complexity within project management as a threefold element; the interdependency of the tasks, the lack of certainty upon which the tasks are based and the variety of the tasks. The interrelationships of tasks has been discussed by Williams (1999) as three differing types of task interdependencies; pooled, sequential and reciprocal. The reciprocal interdependency is the most complicated of the three, and defined as that situation where each elements output becomes an input to another element.

It is when dealing with the reciprocal interdependencies that the project manager may encounter the “wicked problem” where there is no true or false answer, only good or bad, (Rittel & Webber, 1973). The concept of the wicked problem arises with open systems where “The planner who works with open systems is caught up with the ambiguity of the causal webs.”(ibid). The solution to the immediate problem will have ramifications for those operations linked with that solution via the project organisation.
This is becoming increasingly the case where project complexity escalates and it is not possible to adequately define the ramifications of some decisions because of the reciprocal relationships of some of the project elements (Williams, 1999).

“...because the work is unique, it involves a level of risk. Because, it can cost more to eliminate this risk than the potential damage it might cause, it is more effective to manage it than eliminate it. Project management, therefore, becomes the management of risk” (Turner, 1993).

To enable the project manager to manage risk effectively, he must have a strong understanding of the nature of risk, the stakeholders and the construction management team’s perceptions of risk.

DEFINITION OF RISK

Any definition of risk is likely to carry an element of subjectivity, depending upon the nature of the risk and to what it is applied. As such there is no all encompassing definition of risk. Chicken & Posner (1998) acknowledge this, and instead provide their interpretation of what a risk constitutes:

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\text{Risk} = \text{Hazard} \times \text{Exposure}
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They define hazard as “.. the way in which a thing or situation can cause harm,” (ibid) and exposure as “.. the extent to which the likely recipient of the harm can be influenced by the hazard” (ibid). Harm is taken to imply injury, damage, loss of performance and finances, whilst exposure imbues the notions of frequency and probability. It can be argued that hazard is not the “.. way in which ..” rather it is the ‘thing’ its self.

The Royal Society (1983) view risk as the probability “..that a particular adverse event occurs during a stated period of time, or results from a particular challenge.” The Royal Society also state that “as a probability in the sense of statistical theory risk obeys all the formal laws of combining probabilities”. The problem with statistical theory is that it is only ever a guess, or an approximation of what is to occur. There is no certainty involved with any statistical probability; hence the use of the term ‘probability’; which is defined in Collins Concise English dictionary as; “(3.) a measure of the degree of confidence one may have in the occurrence of an event”.

Smith (1999) defines risk as a decision expressed by a range or possible outcomes with attached probabilities. When there are a range of possible outcomes but no assumed probabilities, there is only uncertainty (ibid). Hertz & Thomas (1984) have suggested that “.. risk means uncertainty and the results of uncertainty... risk refers to a lack of predictability about problem structure, outcomes or consequences in a decision or planning situation.” The problem with risk management is that it concerns events that have yet to transpire, which are in turn dependent upon events which may not be knowable at the time of prediction, that are also dependent upon events, and so the cause effect chain continues. To truly predict a hazard an
encompassing holistic view is required of the situation, which will never be totally achievable, even in laboratory conditions.

**A NEW DEFINITION OF RISK**

The Royal Society define ‘hazard’ as a situation which could lead to harm. It is the realisation that a situation may induce ‘harm’ that inspires the recognition of risk in association with the hazard. It can be postulated that risk is the philosophy concerned with the understanding of the nature of harm associated with the hazard.

Risk can be considered as a “systematic way of dealing with hazards” (Beck, 1986). If it is assumed that there is uncertainty associated with any prediction of a hazard occurring, then there is only uncertainty because there is only ever a prediction of the likely occurrence.

Therefore for a risk to exist there must be a hazard. The perception of hazards is entirely subjective. What one person finds hazardous, his neighbour may not. It is the way in which we feel threatened by circumstance and in turn the opinion we develop by association with the threat or hazard.

This perception of hazard is centred around previous experience, cultural values and to some extent the aspect of specialist training in an area or field of expertise to which the hazard relates.

**RISK PERCEPTION**

Adams (1995) contends that “Everyone is a true risk ‘expert’.”, our expertise is based upon our everyday experiences and the ability to learn from those experiences. The difference between the scientific perception and the non scientific perception is that the scientist will quantify the risk, relying on scientific analytical paradigms to prescribe the method of interpretation, and the lay person will rely on experience and intuition.

Both the scientific community and the laity will arrive at their own notion of objectivity regarding the risk. Again there are similarities in how they will arrive at their decisions. They will both, via dialogue and comparison with peers, agree between themselves; which amounts to inter-subjectivity; or their own group consensus of what is objective reality. It is argued that this happens with great regularity in construction projects.

The lay public are not interested in, nor can they identify with, probabilistic quantification’s of risk. Beck (1986) realises that “.. what becomes clear in risk discussions are the fissures and gaps between scientific and social rationality in dealing with the hazardous potential..”. The chances of not winning the lottery are renowned to be remarkably high, probabilistically speaking; however millions of people each week still gamble on becoming a millionaire.
In addition to this there is also the aspect of the cultural influence upon decision making. “When faced with estimating probability and credibility, they come already primed with culturally learned assumptions and weightings.” (Douglas, 1992). Depending upon the social setting in which norms and related experiences have been established, the notions of risk will differ widely from those of others; our experiences help to construct ‘filters’ through which we view the world (ibid).

It has not yet been established to what extent risk perception affects construction projects. However, risk perception on its own arguably forms only one half of the risk behavioural cycle. Taken in conjunction with risk propensity, that is a persons willingness to either take or avoid risks a more detailed potential impact of an individual may become apparent. If a person is risk averse, i.e. they do not like exposure to risks then they may not be suitable to a project requiring innovative construction or contractual methods. However a project of such a nature overpopulated with risk takers, may not be all that successful having taken one risk too many.

It is now possible to assume that the professionals whom we trust with the tasks of risk management are affected by risks and view risks in the same manner as a lay person, the non ‘expert’.

They are prone to the same influences that shape a persons risk philosophy as the next man, and just as personal perception guides our daily lives so can it guide our actions whilst at work. The risk management software available is still only as effective as the person utilising the data. The perceptions of the individual inputting the information into the computer will naturally bias that information, not only in its raw state, i.e. what is to be included as an uncertainty, but how the manipulated data, i.e. the risk, is to be acted upon.

Therefore, we can assume that risk is a cultural construct (Thompson, 1980), and that the language used to communicate risks has an effect upon an individuals risk perception. It may therefore be possible to develop an ‘organisational buffer’ to mediate in the interpretation of the hazard by the individual, before the hazard is translated into a risk and acted upon.

Figure 1 shows how the risk philosophy of an individual, shown operating as a ‘risk prism’, can refract the persons view of a hazard which implicates its self in the persons behaviour as either an under or over estimation of the actual exposure to the hazard. This subjective estimation, as a result of the individuals risk prism, may not comply with the organisations view of the hazard. Therefore it should be plausible to construct an organisational buffer of culture and language etc, which can be ‘applied’ via education and exemplary behaviour, to the person to alter the ‘refraction indices’ in favour of the organisational view of the hazard.
**METHODOLOGY**

A literature survey has been conducted into the areas of project and risk management to establish background knowledge of these disciplines. This not only provided the most immediately accessible font of information, but also allowed under researched areas of project and risk management to be highlighted. It was from the literature review that the need for further research concerning the ‘softer’ areas of risk management was identified; (areas of perception, propensity and preference and the role they may play within construction projects). The literature reviews also highlights areas of best and better practice concerning these disciplines which may be incorporated within the Process Protocol II process mapping.

Research was also undertaken to establish the lead industry and professional bodies concerned with the disciplines of project and risk management. These bodies have been contacted and the developments they are making within their own discipline are monitored for inclusion within the process maps.

Preliminary interviews were arranged to corroborate some of the information garnered from the literature review and to allow further reasoning of any theories and possible advances within the risk and project management disciplines.

Subsequently, nine full interviews were arranged with project managers and senior management within the construction industry to establish actual project and risk
management processes as applied in practice. Information regarding the Process Protocol were sent to the interviewee in preparation for the interview.

A semi-structured interview format was adopted, allowing greater depth of questioning where required, whilst also allowing flexibility in regards of the direction of interviewing and areas covered. Tape recordings and written notes were made by the interviewer of the entire interview.

Interviews were then transcribed; the information was collated; commonalities identified amongst definitions and practices established. (Provisional maps of the processes were then drawn, as shown in figure 2).

![Figure 2. Process Map](image)

The mapping techniques evolved over nine months through discussion and workshops involving senior members of the academic staff and researchers at both Loughborough and Salford universities, taking note of experience from Loughborough universities’ mapping on the ADEPT project. The mapping software tool VISIO professional was identified as the most suited for the task.

A generic mapping lexicon and methodology were also established, enabling comparative mapping to be undertaken at both universities.

Academic staff then critiqued the maps, which were revised taking account of the comments and feedback. Workshops were arranged to allow industrial partners to comment on the maps and processes. Again the feedback was incorporated within the maps and a second workshop arranged to allow for any ‘fine-tuning’.

The industrialists were provided with copies of the maps prior to the workshops to allow them the opportunity to make notes and prepare. At the workshop the industrialists were divided into two groups, each containing academics, with a nominated ‘chair’ for each who would order the ensuing open discussion and debate.
At the mid point of the workshops group members were interchanged to allow ideas and issues to be exchanged between groups, and to prevent discussions from becoming ‘stale’. At the conclusion, the two groups were brought together and the ideas, suggestions and comments from both were summarised in a presentation.

All participants had individual process maps upon which they could make adjustments etc. throughout the workshop. These were collected, rationalised and combined with notes taken by the academics. The mapping and processes were then revised and reissued for further validation at the second workshop.

The maps from all activity zones will be validated in the same manner, before being combined to form the completed Process Protocol II map.

**Risk Methodology**

Harriss (1998) postulates that all our observations are interpreted using information and experience, and therefore the interpretations are subject to influence from theories. These are our; “... preconceived notions and our background beliefs.”. He states that there has to be some generalization of circumstance, some theory, that will enable us to understand the world. That is how people learn. By generalization and by galvanizing these generalizations into ‘life skills.’ (ibid)

Therefore the methodology adopted to investigate risk perception will differ from that of project management, in so much that risk and the perception of risk is a social construct. It is something that must be observed within the workplace and can not be objectively measured, mapped or implemented as a matter of organisational policy. Therefore a multi-paradigmatic approach has been chosen as the best way forward for this research.

Preliminary interviews have been undertaken with two project managers, one senior planner, one chief engineer and two risk consultants, one of whom is the chair of the APM SIG concerned with risk management and co-editor of the PRAM guide. These interviews allowed the researcher the opportunity to further investigate the need for the research, consolidate the preliminary findings of the literature review and to plan for the case studies which will comprise the next stage of the research.

The case studies will test the theories realised from the literature review and the preliminary interviews. Case studies allow phenomena to be observed and recorded within a true to life environment and context.

It is hoped that once a suitable project has been found and permission is obtained to conduct the case studies, the activity and behaviour of construction management personnel can be recorded and observed. These observations will then assist in either establishing or refuting the validity of the hypothesis that risk perceptions have an effect on the decision making behaviour of construction management.
Only one project need be identified for the case study, as it is the construction management personnel who will be the individual actors observed; their interactions with each other and the project environment and how they establish decision making criteria and arrive at courses of action to be taken.

Prior to the case studies, a risk and management style profile will be compiled, utilising a method similar to that method preferred by Greenwood (1999).

This will allow the comparison of the measured, expected behaviour of the manager, as established by the profiling, to be compared with observations in the field. Cross analysis of the effects of inter personnel communication can be ascertained by observation and corroborated with the profiles to establish the impact of leadership style on risk perceptions and decision making.

These results can then be generalised to assist in the establishment of a risk perception theory relating to leadership style and decision making within construction management.

**CONCLUSIONS**

This research is striving to assess the existence and impact of the ‘risk philosophies’ of construction management personnel on the construction process. This area of risk management has in the past been under researched within construction management. There is a genuine need for the construction industry and for the project management profession to realise the potential impact of the individual risk propensities of management personnel if risk management methodologies are to have any future and be taken seriously (Hillson, 1999).

The contribution of the research will be the explicit consideration of risk philosophy as an adjunct to existing risk and project management processes. This will include a process, and a proposed recognised method, by which risk attitudes can be assessed.
REFERENCES


