

## **Evaluation of Risk Perceptions in Construction**

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### **Abstract**

Client are advised by many different professionals about the level of risk inherent in construction projects, and so there is the possibility of inconsistency in the assessment of similar risks by different professionals if they exhibit different risk perception characteristics. Thus, the main objectives of the study were to evaluate risk perception and explore factors affecting the perception of risk drawn from psychological and strategic management disciplines. This study thus contributes to a finer-grained understanding of what factors affect risk perceptions and how professionals exhibit different perception of risk. It is found that theories from psychology and strategic management are useful in explaining why people have different perceptions of risk. The study indicates that risk perceptions were affected by heuristics and biases, problem framing and risk propensity. The main implication from this study is that combining the risk ratings of different professionals to indicate the significance of particular risk is inadequate and misleading and risk requires further investigation in this direction.

### **Keywords**

Risk, Perception, Professionals, Psychology, Strategic management

### **1. Introduction**

Risk perception is a complex concept that has been widely studied in numerous disciplines, for example: in social science, environmental studies, psychology, strategic management and economics. Little theoretical or empirical work has been done to compare the risk perceptions between different stakeholders which will invariably affect the eventual decision taken to address the risk problems. The above observations stimulated the present study, and the problem is thus whether or not the various professionals in construction exhibit different characteristics of risk perception. The question is that what factors affect the perceptions of risks. Does one's profession make a difference? It should be noted that clients are advised by many different professionals about the level of risk inherent in construction projects. If the evidence from Akintoye *et al's* (1998) study is correct, there is the possibility of inconsistency in the assessment of similar risks by different professionals. This study attempts to apply knowledge from other disciplines and construction management research to explain the different risk perceptions observed in professional groups through evaluating the different characteristics of perception of risk, highlighting the factors affecting people's perception of risk from other theoretical and methodological perspectives.

### **2. Reviewing Risks**

Risk analysis has two components: the riskiness of situations and the risk perception of people. In construction management research, considerable attention has been given to the assessment of the

riskiness of situations quantitatively and management of risk (Akintoye and Macleod, 1997; Baker *et al.*, 1999; Chapman, 1997). Relatively little attention has been devoted to the equally important topic of the risk perceptions of decision makers. It is important to note that the perceptions of decision makers will affect the accuracy of their assessments of the riskiness of situations. Moreover, understanding perceptions of risk is important because of their impact on decision makers' behaviour, leading decision makers to deny uncertainty (Sitkin and Pablo, 1992), to overestimate or underestimate risks (Tversky and Kahneman, 1974) and to exhibit unwarranted confidence in their judgements (Bazerman, 1998), and question their ability to perform under risky conditions (March and Shapira, 1987).

Akintoye *et al.*, (1998) examined the perceptions of clients, contractors and financial institutions towards risk associated with the Private Finance Initiative (PFI). The respondents were asked to rate the level of importance of risk factors on a Likert Scale of 1 to 5, where the index number 5 denotes most important and 1 denotes least important and then the relative importance was calculated. Akintoye *et al.*, (1998) commented that the respondents tended to rate those risk factors which were paramount to their business objectives, as being most important. For the contractors, the most important risks were those threatening their profit, with the design risk ranked as being most important. The highest risks for clients were those threatening timing, with commission risk ranked highest. The highest ranking for the lenders was those threatening their ability to recover their investment and expected interest, with payment risk being the most important. However, similar research had already been carried out by Gallimore *et al.*, (1997), who found that perceptions of risk did not significantly differ among surveyors, financiers, contractors and purchasers in Private Finance Initiative (PFI) projects. Thus, the findings of Gallimore *et al.*, (1997) and Akintoye *et al.*, (1998) appear to be contradictory.

### **3. Heuristics and Biases**

It is necessary to highlight qualitative aspects of the perception of risk and some of the factors that influence people's perception of risk from the perspective of Decision Theory. Empirical evidence will be presented to elucidate the main heuristic and judgmental biases affecting people's perception of risk.

#### **3.1 The Qualitative Approach**

The qualitative approach is mainly concerned with questions about how people perceive risk, the factors which affect their perceptions and how people assess risk. The evidence that exists shows that all people do not perceive risks in the same way. People are very inconsistent in the ways in which they perceive most risks and these perceptions can be irrational and subject to all sorts of bias. This is because subjective assessments of risk rely on the inferences people make about risks. These inferences are based on people's experience and what they remember hearing or observing.

People's biases are important factors that affect their perception of risk. One type of bias is called *heuristics* or '*rules of thumb*'. People use heuristics when making judgements in conditions of uncertainty. Tversky and Kahneman (1973, 1974) identify biases emanating from heuristics, including representativeness, availability, adjustment and anchoring. When people are making probability assessments, they rely upon heuristics which enable them to simplify difficult mental tasks. Heuristics are relevant to the perception of risk since people probably use them in the same sort of way to judge risks; however, the judgements made, will be subjected to the same sorts of biases.

##### **3.1.1 Availability**

People assess the frequency, probability or likelihood of an event by the degree to which instances of that event are readily "available" in memory (Tversky and Kahneman, 1973). An event that evokes emotions and is vivid, easily imagined, and specific will be more "available" from memory than will an event which is unemotional in nature, bland, difficult to imagine or vague (Bazerman, 1998). Slovic *et al.*,

(1980) use an example in which people think that the risks of sharks lurking in the water near the beaches are higher after seeing the film “Jaws”. Because of the susceptibility to vividness, Tversky and Kahneman (1974) suggest that people are particularly prone to overestimating unlikely events. For instance, if people actually witness a burning house, the impact on their assessment of the probability of such accidents is probably greater than reading about such a fire in the local newspaper. Similarly, Slovic and Fischhoff (1977) discuss the implication of the misuse of the availability heuristic for the perceived risks of nuclear power, and point out that any discussion of the potential hazards, regardless of likelihood, will increase the memorability of those hazards and increase their perceived risks.

Slovic *et al.*, (1981) point out that an important bias of the availability heuristic is that “discussion of a low-probability hazard may increase its imaginability and hence increase its perceived riskiness, regardless of what evidence is provided”. An example is the case where scientists in the field of recombinant DNA research tried to bring to public attention the remote risks of contamination by newly created organisms. Many of the discussions on the subject lost sight of the fact that the risks were only hypothetical and people began to assume that recombinant DNA laboratories were full of contaminated organisms and highly dangerous new mutants.

### **3.1.2 Representativeness**

The representativeness heuristic captures the idea that probability is evaluated according to the degree to which particular event is representative of a class of events. The word ‘representative’ signifies meanings like ‘resembles’, ‘is similar to’, or ‘look like’ (Laibson and Zeckhauser, 1998). Tversky and Kahneman (1974) observed that when people were asked to make probability judgements about the likelihood that two things are related, they usually base their decision on ‘how familiar’ or ‘representative’ one thing was of the other. If one thing resembled the other then the probability of them being related was judged high. If they were not similar to each other, or one was not representative of the other, then the probability of them being seen as related was judged low.

People assess the likelihood of an event’s occurrence by the similarity of that occurrence to their stereotypes of similar occurrences (Bazerman, 1998). For instance, managers predict a person’s performance based on the category of persons that the focal individual represents for them from their pasts. Managers predict the success of a new product based on the similarity of that product to past successful and unsuccessful product types.

### **3.1.3 Anchoring and adjustment**

Anchoring and adjustment is based on the observation by Tversky and Kahneman (1974) that people solve problems by starting from initial guesses or salient starting points which are then adjusted to generate final answers. For instance, managers make salary decisions by adjusting from an employee’s past year’s salary. Frequently, people will realise the unreasonableness of the anchor (for instance, the other firm was paying that employee only \$22,000 a year), yet the manager’s adjustment will often remain irrationally close to this anchor (Bazerman, 1998). In uncertain or ambiguous situations, a trivial factor can have a profound effect on decisions when it serves as a starting point from which adjustments are made (Dawes, 1979). The key conclusion is that regardless of the basis of the initial value, adjustments from the initial value tend to be insufficient (Slovic and Lichtenstein, 1971; Tversky and Kahneman, 1974). Thus, different initial values can yield different risk perceptions from the same events.

## **4. Risk Perception – A Psychological Perceptive**

Risk is a concept we all understand but is not easily defined (Coyle, 2002). It may associate with the possibility that something harmful or damaging could occur if things go wrong, or it may relate to taking a chance or a gamble, where the outcome could either be favourable or adverse, or it may link to the fact that the actual outcome of an event could differ from what has expected or planned for. Perceptions are

cognitive processes. Any decision about risk will be affected by the attitude of the person or organization making the decisions (Flanagan and Norman, 1993), and therefore it is essential to examine risk from a psychological perspective in order to understand why people have different perceptions of risk.

## 4.1 Normative Approaches to Risky Choice

### 4.1.1 Expected utility theory

Expected Utility Theory has dominated the analysis of decision making under risk; has been generally accepted as a normative model of rational choice (Keeney and Raiffa, 1976); and has been widely applied as a descriptive model of economic behaviour (Arrow, 1971). Thus, it is *assumed* that all reasonable people would wish to obey the axioms of the theory (Von Neumann and Morgenstern, 1944), and that most people actually do, for most of the time (Kahneman and Tversky, 1979). The expected utility rule is a simple transformation of the expected value rule. It is still a summation of probabilities multiplied by their values. The difference is that the values are *subjective* values called *utilities*, rather than the actual monetary values (Shapira, 1995).

A person's utility function serves as a measure of that person's risk attitude. In general, a *linear function* describes a *risk-neutral* person; a *concave* function, a *risk-averse* person; and a *convex* function, a *risk-seeking* person. The Utility Function is shown in Figure 1.

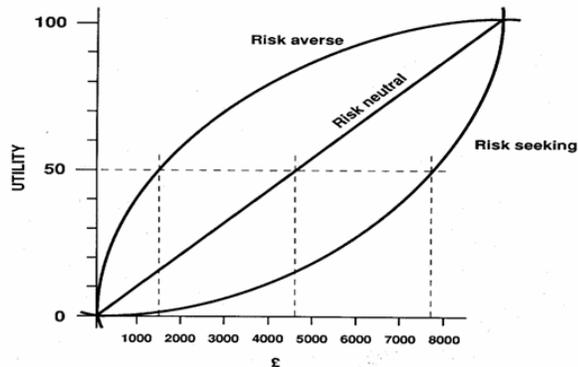


Figure 1: Expected Utility Function Curves (Raftery, 1996)

The seminal work on “**Game Theory**” by Von Neumann and Morgenstern (1944) provides a good example of the Expected Utility Function. Consider the flip of a fair coin where, if a person correctly guesses the outcome, he gets £10 and if he guesses incorrectly, he gets nothing. The two outcomes are of equal probability, as the chance of getting a ‘head’ or a ‘tail’ is each 50 per cent, so the expected value of the gamble is £5 (£10 x 50%). The expected value is also considered to be the value of the gamble if a person were to bet on it. Suppose that someone is offered the choice of playing this game *or* receiving a sure payment of £5 without gambling. If the person is indifferent between the gamble (whose expected value is £5) or the £5 payment, the person is defined as *risk neutral*. People who prefer a certain £5 payment over a gamble with a similar expected value are called *risk averse*. Conversely, those who prefer a gamble with a certain expected value over a sure payment that is equal to the expected value are called *risk seeking*. The Expected Utility principle has been proposed as the optimal criterion for choice uncertainty, because it takes into account individual risk attitudes (Von Neumann and Morgenstern, 1944).

## 4.2 The Descriptive Approaches to Risky Choices

#### 4.2.1 Prospect theory

Kahneman and Tversky (1979) developed a model of choice under risk that accounts for paradoxes such as the one by Allias (1953) presented earlier. Consider the following problems adapted from Kahneman and Tversky (1979):

Situation I:

Gamble A: Sure win of \$500 (84%)  
Gamble B: 50% chance of winning \$1,000 or  
50% chance of winning \$0 (16%)

Situation II:

Gamble C: Sure loss of \$500 (31%)  
Gamble D: 50% chance of losing \$1,000 or  
50% chance of losing \$0 (69%)

In Situation I, people tend to choose A over B. In Situation II, most people tended to choose D over C. In Situation I, people tended to be risk averse concerning gain. In Situation II, people tended to be risk seeking concerning loss.

The pattern of the above is clearly inconsistent with Expected Utility Theory. Kahneman and Tversky (1979) thus proposed Prospect Theory to account for this pattern of risky choice. Since the inversion of Prospect Theory by Kahneman and Tversky (1979), other theories have been developed following descriptive approaches, which include: Rank Dependent Expected Utility Theory (Quiggin, 1982), Weight Utility Theory (Chew, 1983), Prospective Reference Theory (Viscusi, 1989) and so on.

#### 4.2.2 The framing effect

Tversky and Kahneman (1981) define Framing Effect as referring to “the decision maker’s conception of acts, outcomes, and contingencies associated with a particular choice. The frame that a decision-maker adopts is controlled partly by the formulation of the decision maker” (p. 453). The original Framing Effect demonstrated by Tversky and Kahneman (1981) in their famous Asian disease problem is of this sort:

Imagine that the U.S is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programmes is as follows:

Problem 1: (Gain or Positive Frame)

If Programme A is adopted, 200 people will be saved (72% respondents preferred).

If Programme B is adopted, there is 1/3 probability that 600 people will be saved and 2/3 probability that no people will be saved (28% respondents preferred).

Problem 2: (Loss or Negative Frame)

If Programme C is adopted, 400 people will die (22% respondents preferred).

If Programme D is adapted, there is 1/3 probability that nobody will die and 2/3 probability that 600 people will die (78% respondents preferred).

What are the consequences of couching formally identical problems in different frames? In the gain framed version (Problem 1), a clear majority of respondents preferred A - saving 200 lives for sure (72%), over the option B that offering a 1/3 chance of saving 600 lives (28%). In the loss-framed version, however, most people preferred option D - the 1/3 chance of losing no lives (78%) to option C – the sure loss of 200 lives (22%). Options A and B in Problem 1 are indistinguishable from C and D in Problem 2;

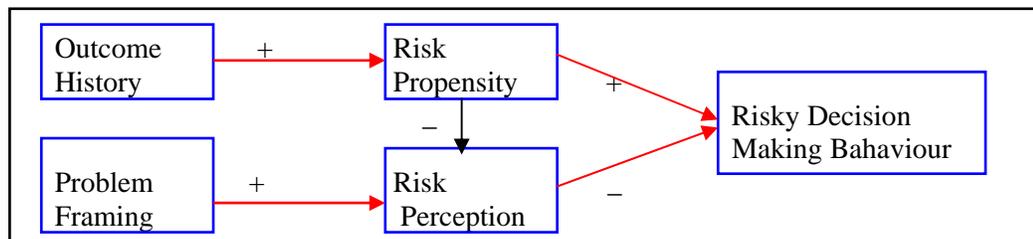
all four options yield either 200 lives for sure or an expected value of lives for the risky options. The consequence of option A is the *same* as option C while option B is the *same* as option D. Thus, there should not be any systematic preference. The findings say otherwise: there seems to be a tendency of risk aversion for gain framed problems, and a general tendency of risk seeking for loss framed problems: this tendency is termed a Framing Effect (Tversky and Kahneman, 1981).

## 5. Risk Perception – A Management Perceptive

In the management perspective, risk perception is defined as an individual’s assessment of how risky a situation is in terms of probabilistic estimates of the degree of situational uncertainty, how controllable that uncertainty is, and the levels of confidence in those estimates (Baird and Thomas, 1985). To understand the factors affecting risk perception of organisations, it is necessary to investigate organisational characteristics such as the risk and return relationships, company performance, and industry performance. The individual characteristics that affect risk perception include, risk propensity, age, educational background, level of management, experience.

### 5.1 Risk Propensity

Sitkin and Weingart (1995) examine model (Figure 2) accounted for the risky decision making behaviour and identify two determinants of risk perceptions are problem framing and risk propensity. Risk propensity has been conceptualised most frequently as an individual’s risk-taking tendencies (Sitkin and Pablo, 1992) and therefore is defined as “the tendency of a decision maker either to take or avoid risk” (Sitkin and Weingart, 1995). MacCrimmon and Wehrung’s (1990) study of executive risk behaviour conceptualises risk propensity in terms of a “measure of willingness to take risks” (p. 425). The manager’s personal propensity toward risk may affect strategic decision making, where those who have higher propensity to take risks are likely to choose more uncertain decision alternatives (Baird and Thomas, 1985).

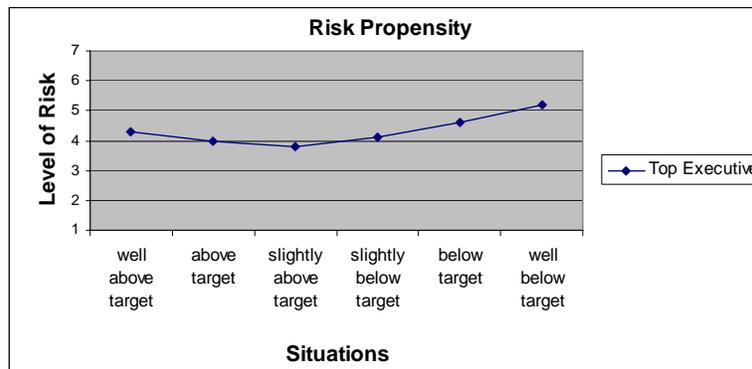


**Figure 2: Model of the Determinants of Risk Decision Making Behaviour (Sitkin and Weingart, 1995: 1574)**

An important influence on a decision-maker’s risk perception is risk propensity (Pablo, 1999; Sitkin and Pablo, 1992). A risk-averse decision maker is more likely to attend to and weigh negative outcome (Schneider and Lopes, 1986), thus overestimating the probability of loss relative to the probability of gain, and requiring a higher probability of gain to tolerate exposure to failure. Conversely, a risk seeking decision-maker will tend to weigh positive outcomes more highly and, thus, will tend to overestimate the probability of gain relative to probability of loss. Sitkin and Pablo (1992) state that “decision-makers who have a risk-seeking propensity will perceive risk to be lower than decision-makers who have a risk-averse propensity” (p. 19). In other words, the higher a decision maker’s risk propensity, the lower the level of perceived situational risk, and thus the riskier will be his or her decision-making behaviour (Sitkin and Weingart, 1995: 1575).

Shapira (1995) examined the risk propensity of top executives by asking them to rate on a seven-point scale (with 1 representing minimum risk and 7 representing maximum risk) under six scenarios from highly successful to considerable failure (A to F). The results are displayed in Figure 3. The degree of risk

taking monotonically increases within each domain (above target or below target). It also demonstrates that top executives' risk propensity is asymmetric between above target and below target. Top executives tend to minimise risk from well above target to slight below target (A to D), and increase risk taking in conditions of below target (D to F).



**Figure 3: Risk Propensity of Top Executives (Shapira, 1995)**

## 6. Conclusions

This study considered theory from psychological and strategic management disciplines. From the psychology perspective, biases, heuristics and problem framing will affect perception of risk. From the strategic management perspective, organisational factors such as return, organisational and industry performance, expectations, aspirations and slack will affect the strategic decision-making behaviour of organisations. Individual characteristics, such as age, experience, level of management, educational background, risk propensity and risk interpretation, are likely to affect the perception of risk. In conclusion, there are three main factors affecting perceptions of risk, which are heuristics and biases, problem framing and risk propensity. Firstly, biases are important factors that affect people's perception of risk. These emanate from heuristics including representativeness, availability, adjustment and anchoring. Secondly, Prospect Theory suggests that people tend to be risk averse concerning gains and risk seeking concerning losses, and that people are more sensitive to losing a certain amount than to gaining the same amount. Thirdly, risk propensity is negatively correlated with risk perception which means that the higher a decision maker's risk propensity, the lower the level of perceived risk. The main implication of this study suggests that combining the risk ratings of professional groups with different professional backgrounds, in an attempt to indicate the significance of particular risks, is inadequate and misleading. The "highest" combined rating of a particular risk seems to be a meaningless measure, and risk requires further investigation in this direction.

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