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Model to Assess Risk Perception and Behaviour of Individuals

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Abstract

Risk behaviour is the controlled conduct of people in contexts with uncertainty, where there is a possibility of the outcome received deviating from the outcome expected. The goal of this study is to assess how the confidence of individuals dominate individual risk behaviour. The study was carried out through a systematic review of literature, with which the gap of not using individual's confidence to interpret their risk behaviour was discovered. Hence, this study focuses on interpreting the individual risk behaviour through a combination of the theory of perceived self-efficacy and the reconceptualized model of risk behaviour. Perceived self-efficacy is a cognitive psychological concept where people's confidence on their own personal abilities affect their actions taken to reach designated goals. The reconceptualized model suggests that an individual's risk behaviour is dominated by two major characteristics; risk propensity and risk perception. The risk behaviour model has been adjusted by removing the organizational-related factors from it. The model has been validated through expert opinion.

Keywords
Risk Behaviour, Self-Efficacy Theory, Behavioural Model, Human Factors

1. Background and Objectives

Every decision taken by any human being bears a certain proportion of risk. The ambiguous nature of the future events makes it harder to settle on a single decision. Hence, they tend to prepare for the probable consequences that might arise from the decisions taken. According to Plato (427-347BC), "The problem with the future is that more things might happen, than will happen. With an infinite number of possibilities ahead, it is hardly surprising that the task of selecting the one which will eventually materialize is problematic. As the time horizon of prediction extends further into the future, the number of degrees of freedom increases exponentially, further complicating the ability to predict."

Even within the same context, there is a high chance of the decisions taken by two people differentiating from one another. The main reason behind this can be revealed as the diverse nature of individual conduct. Individual behaviour can broadly be identified as the method a person conducts oneself or reacts to a particular situation. One's behaviour affects the perceptions he bears, the interactions he engages, as well as the decisions he make. An individual's behaviour is governed by two main characteristics; Inherited and Learned (Morrow 2008).

Inherited characteristics are genetic in nature and are generally the attributes a person has acquired since birth. This includes features such as age, gender, intelligence and intellectual ability. These attributes are usually identified as difficult to change or modify. When explaining the relationship between age and the behaviour of people, psychologically, younger people are expected to be more energetic, enthusiastic, ambitious and risk taking. Whereas, elderly people are supposed to be conventional, hidebound and less adaptable. Intellectual ability is the skill required to think critically, see connections between disciplines and problem solve in new or changing situations. This certainly affects the behaviour of people as the decisions a person makes depends on his capacity of thinking and analyzing the situation. Learned characteristics are the relatively permanent behaviours a person has acquired through his experience. This concerns attributes such as personality, perception, attitude and values. Personality refers to the

combination of qualities that forms a person's distinctive character. According to these characteristics, a person's method of interpreting a situation differs, thereby dominating the decisions he takes.

Hence, the risk behaviour of individuals has been a contemporary area of interest. The willingness of a person to take risk depends on both external and internal stimuli. Throughout the years, numerous studies have been carried out to interpret the risk behaviour of people and a number of models have been introduced to explain the diverse actions.

In this study, the main focus is on developing and conceptualizing a model to interpret the risk perception and risk behaviour of individuals. A systematic review of literature has been carried out, and from the selected articles which are of the closest interest, a gap has been identified after a thorough analysis of the existing models. As a solution to fulfill this gap, an integrated behavioural model is presented.

The developed model is tested and validated through expert opinion and a survey-based questionnaire, distributed among a selective sample representing different industries including banking and finance, telecommunication, shipping, manufacturing, IT and tourism.

2. Methodology

A comprehensive review of literature of empirical research has been carried out in the study based on the following.

Time horizon: A period of 30 years has been chosen as the time horizon as the perceived self-efficacy theory was first introduced by Bandura (1986). Although modifications of this model have been taken into consideration, as the review proceeded, the time span from 1987-2017 was selected as the initial time horizon.

Selection of areas: The area of research interest was segregated into two major components as, risk perceptions and behavioural models. The objective of this was to methodically organize the articles and journals being referred by the authors before they were thoroughly analyzed.

Selection of journals and articles: The related articles and journals were collected through sources such as Google Scholar and ResearchGate, where a keyword-based search was initially done to discover the relevant articles and journals. The results were sorted according to the ranking procedure and the number of citations received by the article, where 36 articles with the highest citations selected.

Analysis of articles: A systematic review of literature was conducted to identify the most relevant literature. First, studies that have already been carried out to assess the risk behaviour was reviewed. Initially, both organizational and individual risk behaviour was analyzed, which was later narrowed down to individual behaviour. Concurrently, psychological theories and behavioural theories were studied to understand the different determinants of the individual behaviour. Both types of articles were first screened through an abstract and conclusion-based review to narrow down the articles and disregard the irrelevant articles. Thereafter, a methodical, content-based review of the articles were carried out to select the most suitable models to determine the risk behaviour.

Gap identification: With the methodical literature review, a research gap was identified in the Reconceptualized Model of the Determinants of the Risk Behaviour proposed by Sitkin and Pablo (1992). Although the model had taken into consideration of both individual and organizational characteristics, it was found out that the model has not incorporated the confidence of the individual in the determinants presented. From the psychological behavioural models studied, the Theory of Self Efficacy was selected as the most suitable model to determine the confidence of an individual.

Development of conceptual model: Following the systematic review of literature and the gap identification, a model was conceptualized through the incorporation of the Reconceptualized Model of the Determinants of the Risk Behaviour and the cognitive psychological theory of Self Efficacy.

3. Literature Review

3.1 Risk

Risk has been discovered as the extent of the uncertainty of a decision which realizes potentially significant or disappointing outcomes (Sitkin and Pablo 1992). Different studies have defined risk and its components in diverse ways. Although risk is bound with uncertainty, the two terms do not explicitly bear the same meaning. Risk only arises when the uncertainty of a situation results in significant consequences, thereby making risk a combination of both uncertainty and consequences (Hilson and Webster 2007). Another study highlights that risk mainly consists of two major components, namely the likelihood and the severity of the outcomes (Joop 1998). An alternate study depicts risk as the product of the probability of a situation occurring and the magnitude of the situation divided by the time horizon of the situation (Raynor and Cantor 1987). However, towards the latter part of the 20th Century, risk has become a dominant concern within Western context. People have progressively become risk tolerant and have a tendency of accepting the uncertainty that is associated with it (Chown 2014).

A survey-based study was conducted in order to measure the individual risk attitudes and their nature, which was performed using different domains such as holding stocks, smoking, self-employment and participation in active sports as subject. Evidence indicates that there is an economically significant impact on one's individual willingness to take risks, determined by factors such as gender, height, age and parental background. Furthermore, the study shows that although the specific contexts provide strong measures of determinants, this focus on a single context provides less predictive measures across contexts (Dohmen et al. 2011). Another study depicts that 'Perceived Risk' and 'Vulnerability' plays an important role in determining the precautionary behaviour of people. Although this study was conducted targeting the health-related risk behaviour of people, it was stated that the findings could be generalized. This study also evaluated the relationship between comparative/unrealistic optimism and the preventive behaviour of people. While the study lacked sufficient empirical evidence, the study proves that the perception of people have on their relative risk is fairly accurate (Joop, 1998).

The theoretical model reconceptualising the determinants of risk behaviour suggests that risk propensity and risk perception should be given more weightage than they were given in the studies beforehand (Sitkin and Pablo 1992). Risk Propensity has been introduced as the degree which an organization is willing to take risks. Although Risk Preference had already been recognized as a determinant of a person's risk propensity, in this study, two new determinants of risk propensity were introduced; Inertia and outcome history. Risk Perception depends on determinants such as Top Management Homogeneity, Problem Framing, Social Influence, Domain Familiarity and Organizational Control Systems. This particular study explains that risk propensity was positively related while risk perception was negatively related to the risk behaviour. Furthermore, this study depicts the contradictory results obtained beforehand by numerous other studies, by a theory where Risk Propensity has a governing impact on the risk behaviour (Sitkin & Pablo 1992).

A modified version of Sitkin and Pablo Model, which has been carried out to determine a behavioural model to assess the risk behaviour of the young adults suggests that the findings can be used to develop risk portfolios through the use of a comprehensive model. Furthermore, the study has showed that factors such as problem framing, attitudes, beliefs and norms, knowledge, together with risk propensity affects individual risk behaviour (Himasara & Peter 2016).

3.2 Risk Behaviour and Self-Efficacy

It has been shown that 'behaviour' can be conceptualized as an outcome of both external and internal factors of humans, although the latter plays a dominant role by influencing individual behaviour through cognitive processes (O'Brien et al. 2017). Although models of behavioral theories have initially indicated that the individual differences in preferences and personalities dominate the individual decision making behaviour, they hold limited ability of prediction. Latter studies have focused on situations and contexts in modeling the individual behaviour (Kruger and Dickson 1994). As an example, the prospect theory of behaviour suggests that people tend to be risk-seeking at situations where the existing state of affairs is positive and risk-averse at situations where the current context is negative. It also demonstrates that, rather than absolute outcomes, people think in terms of expected utility relative to a certain reference point. Prospect theory was developed by framing risky choices such as gambling. The study

indicated that people are loss-averse and therefore, they are more willing to take risks to avoid a loss as individuals dislike losses more than equivalent gains (Kahneman and Tversky 1979; Kahneman 2011).

According to the Self Efficacy Theory, a person's optimistic self-belief of his competence and successfully accomplishing a task to produce a favourable outcome depends on four factors, namely, mastery experiences gained through first-hand involvement, vicarious experiences gained indirectly through people of the same potential, verbal persuasions by experts and emotional and psychological states (Bandura 1997).

The application of Perceived Self Efficacy was studied in a context subjected to prevent and control the risk behaviour which exercises AIDS infection. According to this study, four major components of self-directed behavioural change was found. The first component is informational, where the knowledge and risk awareness are increased. The second component relates to the development of social and self-regulatory skills, where the risk related information is translated into controlled actions. The third component is concerned with skill enhancement, where a person's behaviour is changed through a guided practice and corrective feedback provided in high risk situations. The fourth component is enlisting social supports for desired personal changes. This study states that "People's beliefs about their capabilities affect what they choose to do, how much effort they mobilize, how long they will persevere in the face of difficulties, whether they engage in self-debilitating or self-encouraging thought patterns, and the amount of stress and depression they experience in taxing situations." (Bandura 1990).

In another study done in order to identify the relationship between Perceived Self Efficacy and Opportunity Recognition, it was shown that those who are led to believe that they are very competent at decision making are led to be more risk-seeking, as they see more opportunities in risky choices. The opposite of this happens when people believe that they are less competent, leading them to be more risk averse. This study was conducted in an organizational context and discusses managing perceived self-efficacy in order to pursue and exploit the opportunities an organization receives (Kruger & Dickson 1994).

3.3 Overview of the Literature Review

Although the methodical review of literature analyzed a number of previous research publications, journals, books and other materials, the studies summarized in Table 1 were selected as the most relevant articles for this particular study.

Table 1: Overview of the literature review

Author(s)/ Year	Research article	Description	Relevance to the current study
(Sitkin and Pablo, 1992)	Reconceptualizing the determinants of risk behavior	Examines the usefulness of risk propensity and risk perception as the main dominants of risk behaviour. Introduces two new determinants of risk propensity namely, inertia and outcome history. Discusses drawbacks in other behavioural models related to risk.	Introduces a single reconceptualized model on how the risk behaviour can be governed by risk propensity and risk perception
(Bandura, 2010)	Self-Efficacy	Four components of self-confidence dominate and increase one's competencies. • mastery experiences • vicarious experiences • verbal persuasions • psychological state	An unexploited area in financial behavioural science. Ability of incorporating to determine investors' risk behaviour model

		Explains how self-efficacy beliefs regulate the human cognitive, motivational, emotional and selection processes.	
(Himasra and Peter, 2016)	A behavioural model to assess risk behavior of young adults	Factors such as problem framing, attitudes, beliefs and norms, knowledge, together with risk propensity affects individual risk behaviour.	The reconceptualized model of Sitkin and Pablo is modified by removing the organizational factors, narrowing them down to individual behaviour.
(Kruger and Dickson, 1994)	How believing in ourselves increases risk taking: perceived self-efficacy and opportunity recognition	Increased belief in one self improves his risk seeking behaviour while degrading one's capabilities improves his risk-avoiding behaviour.	Discusses on managing perceived self-efficacy in order to pursue and exploit the opportunities. Forms a link between risk and self-efficacy.

4. Conceptual Model

Through the systematic review of literature, a model was conceptualized to interpret the risk behaviour of individuals. Figure 1 illustrates a revised behavioural model conceptualized by the use of existing reconceptualized risk behavior model and the cognitive psychological theory of self-efficacy. This model is designed to evaluate the risk behaviour of investors to establish the relationship between individual self-efficacy and internal and external stimuli. The model shown in Figure 1 indicates that risk behaviour is determined by two major individual factors, risk propensity and risk perception. Risk propensity was found to be positively related to risk-taking behaviour whereas risk perception was negatively related to risk-taking behaviour (Sitkin & Pablo 1992). The reconceptualized model of behaviour has been modified here by removing the organizational factors, focusing on individual behaviour and how the confidence of an individual affects his risk behaviour.

According to the model conceptualized, three clusters of elements which controls the risk decisions of an individual decision maker were identified. They were individual characteristics, societal influences and problem-related characteristics.

- Individual characteristics: risk preference, inertia, mastery experiences
- Societal influences: vicarious experiences, verbal persuasions
- Problem-related characteristics: problem framing, knowledge

The model shown suggests that individual characteristics, inertia, mastery experiences, problem framing, vicarious experiences, verbal persuasions and knowledge as independent variables of the study. Risk propensity and risk perception were identified as the mediator variables which formulates relationships between the above-mentioned independent variables and the individual risk behaviour, which is the dependent variable of the study.

As stated before, Risk Behaviour is the controlled conduct of people in contexts with uncertainty, where there is a possibility of realization of potentially significant or disappointing outcomes due to outcome received deviating from the expected outcome. Risk Propensity is the extent an entity is willing to take a risky decision or avoid a risky decision, which influences the decision maker's behaviour, while Risk Perception is the way a person sees, understands and interprets the risk concerned with a particular situation or a decision. This is a subjective judgement of the attributes and the severity inherent to a particular situation regarding its risk.

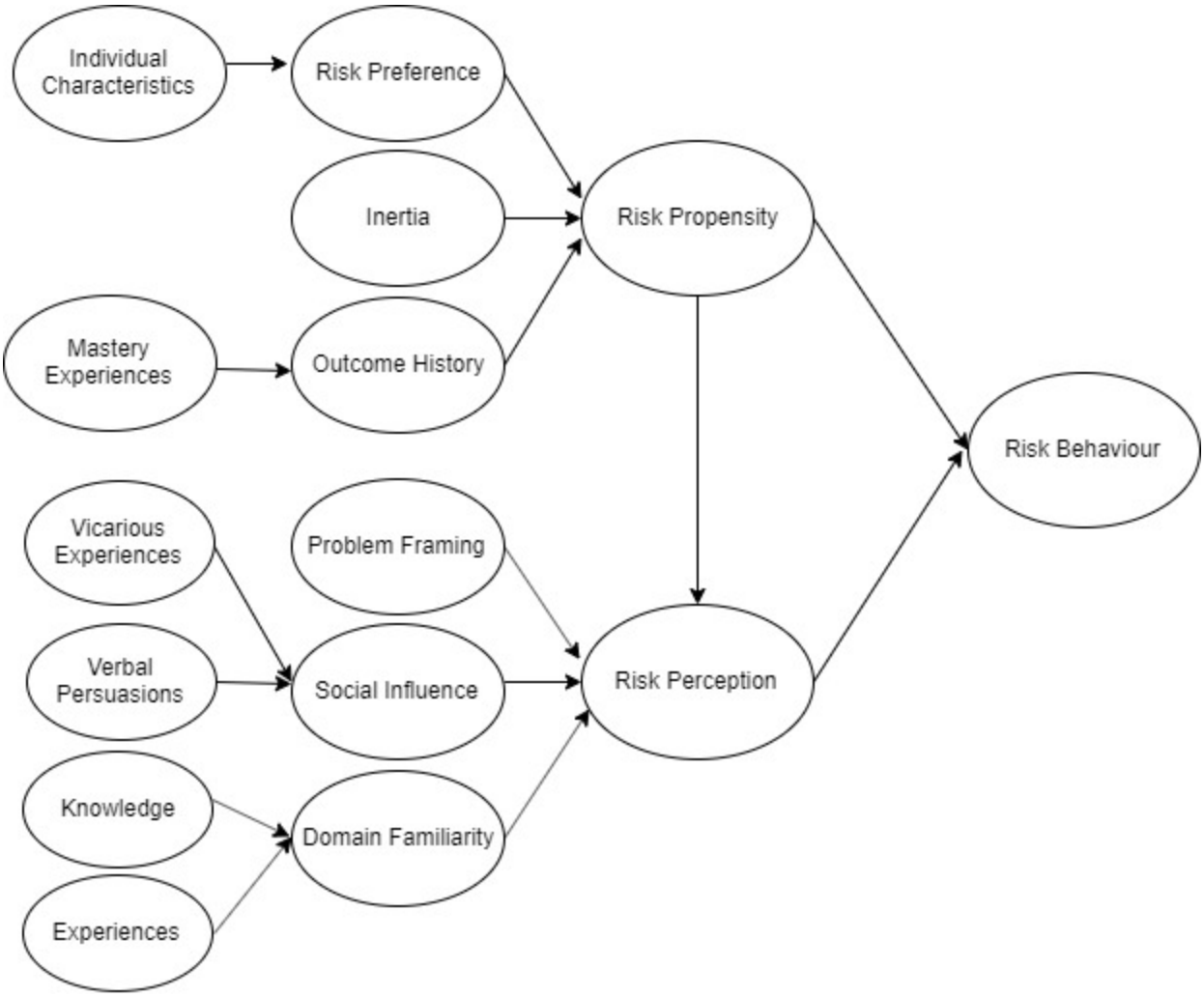

Figure 1: Integrated risk behavioural model

Inertia is the reluctance of a person to change what he has been familiar with over a period of time. Hence, an individual holds the tendency of repeating his/her previous choices and maintains the status quo regardless of the outcome (Alos-Ferrer et al. 2016; Gal 2006).

Outcome History can be defined as an individual's persistence of particular propensity towards risk, based on the prior success/ failure of that risk propensity. Decision makers tend to take risky decisions if their prior risk-seeking actions were successful. People who have become successful in making risk-averse decisions will continue their cautious behaviour (Osborn and Jackson, 1988). According to Bandura (1997), successes build a robust belief in one's self efficacy.

Problem Framing is a particular factor which depicts that an individual's risk perception is determined by the way he frames the problem; negatively or positively. People who are in favourable contexts believe that they have more to lose in case a risky decision brings a significant loss. Hence, they tend to exhibit more risk averse behaviour. In contrast, people who are in unfavorable situations tends to be more risk seeking as they believe that they have little to lose (Kahneman and Tversky 1979).

Social Influence can be depicted as the nature of individuals which makes them rely on the information and advices gathered from external parties. Models serve as motivation and seeing people with similar competencies succeed raises

the observers' confidence in their own capabilities. Furthermore, people tend to exhibit more confident behaviour in decision making if they are encouraged by verbal persuasions/ social persuasions from experts (Bandura, 1997).

An individual's close acquaintance with the knowledge related to a specific context is known as his Domain Familiarity. While the outcome history focuses on the nature of the outcome attained, the domain familiarity depends on the past experiences and the knowledge a person holds regarding a specific domain. Primarily decision makers learn through their personal experience and the decisions are improved through the knowledge gathered.

5. Testing and Validation

The model presented in this review discusses the psychological determinants that affect the individual risk behaviour. Through the systematical review of existing literature, the model proposed has been developed by the integration of two existing models; the reconceptualized model of risk behaviour (Sitkin & Pablo 1992) and theory of perceived self-efficacy (Bandura 1990), which are already proven of their validity in the relevant contexts. The integrated conceptualized model presented in this study has been validated through expert opinion.

Further, this model was statistically validated through a questionnaire-based survey, which was developed after the operationalization of the variables related to the study. Knowledge gathered from the literature review was used as basis in preparing the structure of the questionnaire. Through a statistical analysis, the following results were obtained.

Table 2: Model summary table of the overall fit of the model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.866[a]	.750	.726	.31172	2.062

a. Predictors: (Constant), DomainFamiliarity, RiskPreference, Inertia, OutcomeHistory, ProblemFraming, SocialInfluence, RiskPropensity, RiskPerception

b. Dependent Variable: RiskBehaviour

Table 2 explains the overall fit of the conceptualized model in determining the individual risk behaviour. For this study, risk behavior is considered as the dependent variable and the determinants of risk behaviour; risk propensity, risk perception, inertia, risk preference, outcome history, problem framing, social influence and domain familiarity are considered as the independent variables.

The R value represents the multiple correlation coefficient, which is a measure of the quality of the prediction of the risk behaviour; the dependent variable. Here, the R value of 0.866 indicates that the quality of prediction of risk behaviour by the given independent variables are high. The R square value (R^2) represent the coefficient of determination, which explains the proportion of variance in the dependent variable explained by the independent variables. Since the adjusted R^2 value for the subject model is 0.726, it could be interpreted that 72.6% of the variance of risk behaviour can be explained by the independent variables of interest; risk propensity, risk perception, risk preference, inertia, outcome history, problem framing, social influence and domain familiarity. Further tests proved that the model studied is of statistical significance with a p-value less than 0.05, with a 95% level of significance.

Thus, it can be concluded that the determinants considered in this particular study, significantly determines the risk behaviour of individuals with a higher quality of prediction.

6. Applications

The study of human factors is a branch in Industrial Engineering, where principles of human physiology and psychology are used in when designing and engineering processes and systems. Humans differ from one another according to their personality, cognitive and physical abilities and experience. As a result, the extent they excel in performing a task vary accordingly. Especially, in job designing, it is important to understand the limitations, capabilities and preferences of the employees so that the desired outcome is achieved. Although risk assessment of a job or a process is already being done, not many industries assess the risk behaviour of the individual employees, which is also an equally important factor in enhancing job performance. Some jobs require risk averse employees where they will do as per the status quo without a need of changing the existing methods. Whereas some jobs will require employees who are more ambitious and risk seeking, in order to utilize the opportunities received for the organization. Therefore, understanding and accurately assessing risk behavior, is an important and a timely need.

Using the developed model as base, the risk appetite of the individual workers can be assessed and matched with the requirements of the job, so that the best match is selected and assigned for that particular task. Although talent analysis is done in certain organizations at the recruitment process, risk behaviour analysis has not been given much importance. Hence this study will be beneficial in matching the recruit with the potential job and thereby achieving operational excellence.

7. Conclusion

The risk behaviour of individuals depends on both psychological factors and environmental factors. This study focused on developing a model to identify the determinants of the risk perception and risk behaviour of individuals. A gap was identified through a systematic review of literature as the existing reconceptualized model of risk behaviour does not explain how the self-confidence of a person affects the risk behaviour of an individual. From the psychological behavioural models studied, the Theory of Self Efficacy was selected as the most suitable model to determine the confidence of an individual. An integrated model of self-efficacy and reconceptualized model of risk behaviour was developed in order to explain the individual risk perception and behaviour better. The model was empirically and statistically validated and has the potential of being tested in different contexts in the future as further improvements.

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