Strategic Risk: It's all in your head

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School of Management
Working Paper Series
2006.01

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Working Paper Series

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SYNOPSIS

Strategic risks are those threats or opportunities that materially affect the ability of an organisation to survive. Despite the significance of strategic risks, existing risk management techniques tend to cope with them poorly because they rely on quantitative methods and are typically based on historical data that provides no indication of future events. One of the main limitations of existing methods is that they are not designed to encompass qualitative judgements, yet managers faced with complex situations are often forced to rely on judgement when quantitative methods fail to make sense of complex interactions.

Integral to risk perception and decision-making is managerial cognition of the risk environment, as limited perception of risks reduces the ability to recognise and manage them and increases organisational vulnerability. The research here, investigates how managers perceive their risk environment and how their understanding of environmental risk factors contributes to the robustness of an organisation to withstand strategic risk. Of particular interest to managers in all types of organisation and industry is the finding that decision-makers' depth of understanding of the risk environment can be used to develop an organisational risk profile, providing pointers to areas of potential threat and opportunity that are associated with a lack of understanding. This is of use to organisations that are looking to improve their risk awareness and also as a strategic tool for determining new areas of competitive advantage. It also has implications for the study and development of strategic risk management.

INTRODUCTION

The field of strategic risk has become of increasing interest to organisations and researchers alike in the years post-Enron and in the wake of the ensuing Turnbull risk management requirements. Strategic risk is generally defined as being any risk (threat or opportunity) that materially affects the ability of an organisation to survive (STRATrisk, 2005). All organisations are vulnerable to strategic threats to varying degrees despite their greatest efforts to manage them; a Deloitte Research study of the

1000 largest international organisations found that nearly half had lost up to 20% of their market value over a month long period in the last decade, with the value losses often taking longer than a year to be regained (Kambil, Layton and Funston, 2005). When strategic threats occur, the results are devastating and long lasting.

Contrary to typical risk management techniques that either involve the valuation of risk, as used in the financial industry, or the use of historic events to predict future risks, as with risk registers and other semi-quantified management techniques, the study here postulates that much can be learnt about an organisation's vulnerability to strategic threats and ability to recognise strategic opportunities through a cognitive and soft systems approach to the subject. By discovering how much strategic decision-makers understand of their risk environment, it becomes possible to map an organisation's vulnerability to strategic risks and thus create a unique risk profile for the organisation.

The research here takes the view that cognitive processes in individuals are essential to the way they scan and make sense of the environment, and therefore the perception of risks to the organisation is intimately linked to managerial cognition. To this end the following question was explored:

> *Do managers' perceptions of strategic risk correspond to actual sources of risk; and to what extent does this make organisational risk management robust or vulnerable?*

In consequence, this research aimed to fulfil two main objectives; firstly, to explore how managers' and organisations' perception of their competitive environment affects their perception of strategic risks and their reaction to them. Secondly, to create a means by which organisations can examine their "default" settings with respect to risk appetite, threat recognition and opportunity identification, to enable them to a) be more perceptive of potential threats and b) be more aware of potential opportunities.

BACKGROUND TO THE STUDY

This study is part of a larger research effort into management of strategic risk known as STRATrisk, which particularly focuses on the UK construction industry. STRATrisk

aims to "understand and improve Board level decision-making regarding risks and opportunities" (STRATrisk Interim Report, 2005, p4) and the research is sponsored by the Institution of Civil Engineers (ICE), the Faculty and Institute of Actuaries and the Department of Trade and Industry.

As part of the first round of the study, a series of semi-structured interviews were carried out with the strategic (executive) decision-makers in organisations in the construction industry. The interviews were initially analysed using a grounded theory approach to develop insights into the main types of strategic risks being faced by the industry. Some of the key findings from the initial stage of research related to the nature of strategic risks; they are "interconnected dynamic processes" rather than events, and that the root cause of these risks is nearly always "people and their unpredictable behaviour" (STRATrisk Interim Report, 2005, p10).

This paper aimed to build on the work already completed by STRATrisk, by examining the ways in which organisations' responses to strategic threats and opportunities are grounded in the perceptions of the corporate decision-makers. An experimental methodology was created for this purpose, based on cognitive maps created from the STRATrisk interviews. By examining the density of links between concepts using Decision Explorer software and the "centrality" of themes that developed from the interviews, it was possible to map individuals' depth of understanding of their risk environment. This information was then compared with actual risk events that occurred in the two year period after the interviews to determine whether there was a correlation between depth of risk awareness and susceptibility to risk events. Significantly, an inverse correlation was found between awareness and susceptibility – that is, organisations were most likely to be vulnerable to risks from areas in which they had little knowledge, with 35% of risk events that occurred in the two year post-interview period being completely unexpected by organisations. The mapping process developed derives some of its value from enabling to decision-makers to "know what they don't know", thus providing a starting point for improving awareness in these areas and reducing vulnerability to strategic threat.

NATURE OF STRATEGIC RISKS

The driver for creating a new method specifically suited to measuring strategic risk was the inability of existing risk management techniques (VaR, risk registers etc) to cope with strategic risks. The most commonly used techniques are hampered by several important weaknesses; they are reliant on quantitative data; they focus primarily on predicting and controlling risk events as opposed to risk processes; and, they are based on historical data which provides little help in preventing the 35% of strategic threats that are completely unanticipated. These weaknesses are exacerbated by the particular characteristics of strategic risks that make them so devastating to organisations.

Both the STRATrisk findings and those of a Deloitte Research study (Kambil, Layton and Funston, 2005) have found that strategic risk is a dynamic system that is not caused by a single type of risk failure or event but rather involves many of both and is thus often characterised by complexity. Due to their interconnected nature, strategic threats are often precipitated by the failure of managers to respond to the many different interdependent risks that typically occur in a short period of time. Thus, the focus of traditional risk management systems on preventing final risk events overlooks the opportunity to actively direct risk processes into more favourable outcomes by intervening earlier in the risk process. This is emphasised by the point that strategic risks are typically characterised by warning signs but they are either not recognised or not passed on in a timely manner for executives to take action. The issue of managerial cognition is clearly demonstrated in the differences in the results of the STRATrisk and Deloitte Research studies respectively into perceived and actual causes of strategic risks, which show that managers' perception of strategic threats can be quite different to the events that actually cause substantial corporate damage.

Another limitation of existing risk management techniques is that they lack the means of creating a comprehensive risk profile of an organisation that integrates all forms of risk, encompassing the differences between the quantification and management of operational risks, of purely "mathematical" risks such as credit and liquidity, and of purely qualitative risks such as reputation and network relationships. In fact, a significant weakness of risk management techniques is that they de-emphasise non-quantifiable risks altogether as there is no easy way of putting a "handle" on them, that would allow them to be easily understood and controlled (Perrow, 1999). However, as

noted above, strategic risks are typically caused by complex interactions between a number of processes and events, and constraining risk management to only those elements that can be quantitatively described presents a serious limitation to effective management.

Finally, one of the key characteristics of strategic risk is that they are often caused by low-frequency, high-impact risks (Kambil, Layton and Funston, 2005). Thus, there is an increased probability that the threat that destroys the company is one that has never occurred before and therefore is not predicted by risk management systems based on historical data. For this reason, an essential element of a robust strategic risk management system is the inbuilt capacity to recognise the development of these types of risk quickly and respond to them, and the ability to do this is directly related to the existing levels of environmental and system complexity, uncertainty and managerial cognition.

COGNITION AND THE ENVIRONMENT

One of the reasons why cognition is so inextricably tied up in managing strategic risk is due to the nature of strategic decision-making itself. Strategy can be defined as "the direction and scope of an organisation over the long term, which achieves advantage in a changing environment… with the aim of fulfilling stakeholder expectations" (Johnson, Scholes and Whittington, 2005, p9). Strategy is achieved through decision-making about strategic choices, which is characterised by "complexity arising out of ambiguous and non-routine situations with organisation-wide rather than operation-specific implications" (p15). Strategic risk emerges from strategic decision-making because the future is uncertain and therefore all outcomes of strategic choice will be accompanied by varying degrees of uncertainty.

Clearly then, the decision-making process at a strategic level within the organisation has an important impact on exposure to risk. If strategic decision-making was a straight forward, rational process based on order, rational choice and intentional capability (Kurtz and Snowden, 2003) as is implied by such economic strategic frameworks such as those created by Porter's (1985) generic strategies, or Faulkner and Bowman's (1995) "strategy clock", then the management of strategic risk would be an objective,

quantifiable process that should result in the same outcome regardless of who carries it out.

However, a vast body of literature notes that in fact decision-making is rarely rational but rather is carried out in a state of "bounded rationality" (Simon, 1986). This is especially relevant to the study of strategic risk, because it causes decision-makers to only perceive "those aspects of the situation that relate specifically to the goals and activities of their own departments"(Gronhaug and Falkenburg, 1998, p 93). The result of the cognitive biases and heuristics that cause bounded rationality is to alter the world from something that is objective and measurable, to one which is "a social construction inevitably and mainly shaped by the concerns of the present" (Spender, 1998, p18). Thus, "the meaning of a strategic issue is not inherent in external events" (Lindell et al., 1998, p79) but is superimposed by organisational culture, which predetermines the actions that are taken. This is of greatest importance in understanding strategic risk and is the concept underlying the research here; the notion that decision-makers' ability to perceive strategic risks is directly related to their perception of the world. Further, therefore, strategic risks develop from causes or areas that are not understood or have not been previously experienced by decision-makers; as decision-makers are unaware of the existence of these risks, they are oblivious to the warning signs preceding such occurrences.

ENACTMENT AND ENVIRONMENTAL COMPLEXITY

One of the reasons why managerial *understanding* of the risk environment is so important is because without understanding, it is impossible to make decisions about what actions are needed to mitigate the consequences. In the absence of prior understanding, decision-makers have to make sense of events as they occur, as until people make sense the event remains incomprehensible. This sensemaking process typically occurs at a critical period when risky interactions can start to spiral out of control if they are not managed effectively.

An important attribute of sensemaking and thus the ability to understand what is occurring is that it largely occurs in retrospect, when we analyse our experiences and generate predictions about how to act next time (or in Kelly's (1963) terms, "create

theories"). Weick (1988) uses the term 'enactment' to explain how people think by acting; that is, we take action to help us understand what is happening by seeing what happens as a result of our action. However, the nature of enactment is that "when people act, they bring events and structures into existence and set them in motion… often producing structures, constraints and opportunities that were not there before they took action" (p306). This has important repercussions in the type of low frequency, high consequence events that characterise crisis situations and strategic risks. As our actions are always further along than our understanding we can actually intensify crises before we know what we are doing, especially when "technologies are complex, highly interactive, non-routine, and poorly understood" (p308), themes which are strongly emphasised in Perrow's (1999) discussion of how environmental complexity and system coupling reduces comprehensibility.

However, by recognising the impacts of enactment upon a crisis situation, Weick suggests a number of means by which crises can be controlled. Most importantly from a management point of view is his suggestion that we consider large crises as the outcome of smaller scale enactments, which gives us many more points at which we can manage crises to lower levels of intensity.

Clearly then, the key to reducing the dangers of enactment in risk scenarios is to increase understanding of what is happening, thus reducing incomprehensibility. Yet, the level of comprehension of a situation is closely tied to the complexity of the environment. Comprehension will take much longer in an environment of "complex" interactions; that is, where there are "unfamiliar sequences, or unplanned and unexpected sequences, [that are] either not visible or not immediately comprehensible" (Perrow, 1999, p78). For these reasons, the management of strategic risk is intimately related to managerial cognition, risk awareness and environmental complexity, and successful management techniques will need to take all of these factors into consideration.

THE SOFT SYSTEMS APPROACH

The consequence of this line of reasoning is that strategic decision-makers need a means of making sense of the complexity of the business environment in order to be able to perceive risks and manage them.

The systems approach provides a philosophical standpoint from which a holistic view of a subject is taken, rather than the "reductionist" view typical to scientific techniques that aim to get the parts functioning optimally without reference to the whole (Winter and Checkland, 2003). Putting the "whole" before the parts is particularly suited as a means of addressing strategic risks, in part because they are often the result of a number of interrelating systems, and also because if not managed properly they will have a profound effect on the whole organisation. Integral to the systems perspective is the notion that organisations are open systems that have to interact with their environment to maintain their existence (Jackson, 2003). This provides some explanation for the way in which strategic risks are particularly the result of organisational interaction with the environment and again makes the systems approach well suited to the task of addressing strategic risk.

Winter and Checkland (2003) make a distinction between hard and soft systems. Hard systems approaches are characterised by situations of objective clarity and environmental certainty in which goals can be set and achieved by planning and controlling the implementation of processes. In fact, most existing risk management systems would perceive risk from this perspective; the context is clear and unambiguous (goals, problems), the content is discrete (scope, schedule, cost) and the process is linear and systematic. However, real life is not often like this.

In contrast, the soft systems perspective is more relevant to complex and uncertain, "messy", dynamic situations. Rather than focussing on management *processes*, soft systems thinking focuses on *managing*; that is, how managers perceive situations, evaluate parts of them and make decisions about how to act, which in turn becomes part of the flux with which they are constantly interacting. Checkland (1990) uses the word "Weltanschaaung", or world view, to describe the mental models that people build up of their world, the understanding of which can be critical to understanding how they perceive and react to strategic risk.

Therefore, by taking the holistic perspective of messy and complex problems, it becomes clear that strategic decision-makers need two main tools to help address strategic risk; firstly, a methodology for being able to make sense of their environment, of which Kurtz and Snowden's (2003) Cynefin framework is one of the most sophisticated and adaptable; and secondly, an holistic means of identifying, measuring and managing the organisation's strategic risk profile. This latter requirement is what the strategic mapping method developed and presented here aims to achieve.

DEVELOPMENT OF AN EXPERIMENTAL METHOD

The systems approach strongly informed the methodology that was developed for investigating the hypothesis in this research that risk awareness affects actual organisational exposure to risk. It was clear from the literature that inter-dependencies between environmental factors increase complexity and decrease managerial comprehension. Likewise, the ability to perceive and manage risk appears to be strongly dependent on managerial perception and cognition of the environment. Thus, the methodology that was developed aimed to create a means of measuring managerial understanding of environmental risk factors and the inter-dependencies between these factors. It was postulated that risks would be more likely to develop in areas that managers showed less comprehension of, as they would be less likely to recognise any warning signs and manage the developing risk scenario. In fact, the importance of understanding the risk environment was a theme that ran strongly through the interviews, with numerous interviewees noting that risks were bound to occur when the company got involved in things that it didn't understand. Examples of the types of comments made are outlined in Table 1.

Table 1: Examples of issues raised relating to understanding risk

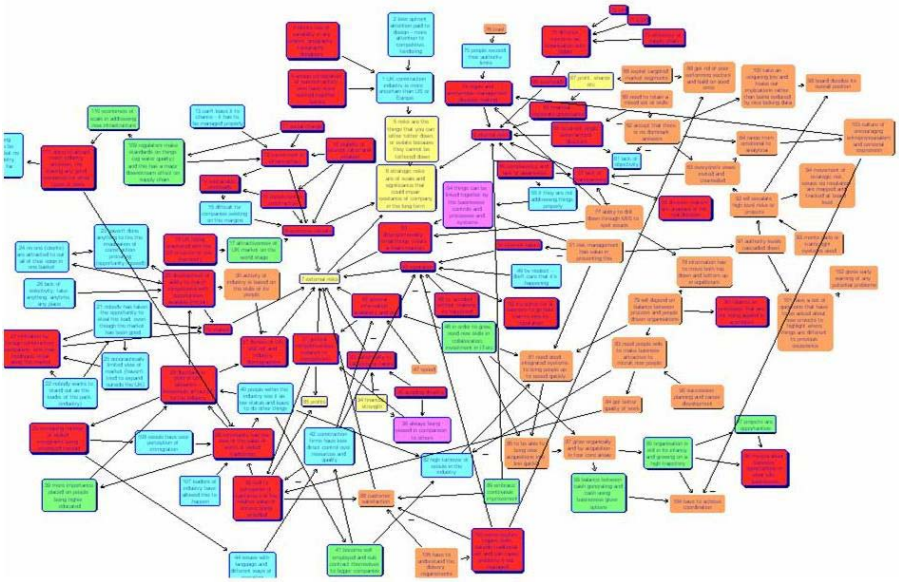
Issue: Understanding
• You can't identify risks if you don't fully understand what you are doing • Risk is about assessing and understanding what you know or believe you know • If you understand the situation better you can make appropriate decisions • Honest, open disagreement establishes an understanding which creates a robust approach to risk issues • Adeptness at understanding the environment enhances understanding of what can and cannot be controlled • By understanding risk, you can engineer it and then manage it • If you gain a good and detailed understanding of what you are going to do, a clear picture, then risk disappears • In some cases you must stick rigidly to the process as this is what you understand; if you stray outside understanding, you cause risks • Risk management should spot when you are dealing with something you don't understand well and don't do often; unfamiliar territory

Cognitive (causal) maps were built up using Decision Explorer software from transcripts of thirty STRATrisk interviews that had been held with board level members of major firms in the UK construction industry. The interviews investigated managers' beliefs about the causes of strategic risk for their firm and the industry, and moreover asked for examples of what they perceived as having been successful and unsuccessful instances of strategic risk management in their organisations.

Causal maps are particularly useful for studying strategy (and also risk) as "causal associations are the major way in which our understanding about the world is organised; causality is the primary form of post-hoc explanation of events; and, choice among alternative actions involves causal evaluation" (Huff, 1990, p28). The maps are built up

from “concepts”, which are short statements taken from the interview transcripts that outline a belief held by the interviewee about their world. Concepts are linked together in a “cause and effect” manner and thus provide an excellent pictorial representation of managers’ world views, as they illustrate managers’ beliefs about the causal links between environmental factors leading to strategic threats (Figure 1).

Figure 1: Example causal map created from a STRATrisk interview



Developing a method of measuring the depth of managers’ understanding of risk factors in the environment and the inter-relationships between factors was one of the most important parts of the study. This was aided by carrying out two levels of coding of the concepts that made up the maps.

Firstly the concepts were coded as to whether managers perceived them as being strengths or weaknesses; which relate to the internal environment of the organisation, or threats or opportunities; relating to the external environment.

Next, the concepts were coded for the main environmental factor to which they related. The codes were chosen to reflect environmental categories typically used in strategic literature, as it was considered that these would provide a good basis from which results could be interrogated and made sense of in the context of ‘strategic’ risk. Thus, the

categories used were: 'macro' environment using the 'PESTEL' factors; the 'micro' or market-level environment based on Porter's Five Forces; and the internal organisational environment based on the "7 S" framework of Peters and Waterman (1982), reduced here to 5 factors instead. Table 2 presents a full list of the codes used.

Table 2: Codes used to categorise concepts

MACRO ENVIRONMENT (PESTEL)	MARKET ENVIRONMENT (PORTER'S FIVE FORCES)	INTERNAL ORGANISATION FACTORS (5 S's)
• POLITICS • MACRO-ECONOMICS • SOCIAL / ETHICAL • TECHNOLOGICAL • ENVIRONMENT • LEGAL	• SUPPLIERS • BUYERS • SUBSTITUTES • COMPETITION • ENTRANTS • MARKET • NETWORK MGT	• STRATEGY • STYLE • PEOPLE (&SKILLS) • STRUCTURE • SYSTEMS

As the coding process started, it became clear that several other codes would be needed to complement Porter's 5 Forces in describing the market environment:

- "Market" is used to describe concepts relating to the general state of the industry and market, including "market facing" concepts such as references to financial analysts, "the City" and so on.
- "Network Management" is used to describe the relationship between organisations and their network of clients, suppliers etc. in the marketplace, including references to contracts, relationships, supply chain management and so on.

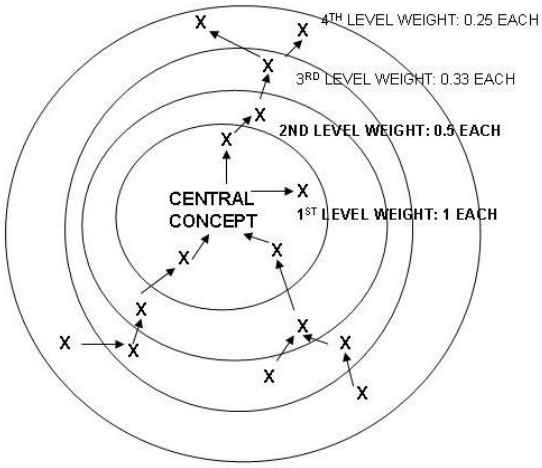
MEASURING DEPTH OF RISK AWARENESS

In an evaluation of the causal maps that had been created and relevant literature, it was concluded that the depth of awareness and understanding the interviewee had of the effect of environmental factors on risk could be measured by using an inbuilt data analysis function in the Decision Explorer software called "centrality" analysis.

Centrality analysis looks at how many links a given "concept" has with other directly linked concepts and with concepts once and twice removed. Figure 2 shows how the centrality scores are calculated, with a decreasing weight being given to each concept as it is further removed from the central concept. This "provides some insight into discovering the centrality of the concept in the whole model rather than just its immediate vicinity" (Banxia, 2002, p67), or in the context here, how strongly the interviewee is aware of the interdependencies any particular environmental factor has with other factors, which could potentially be involved in chain reactions leading to risk events.

Concepts with the highest centrality scores represented environmental factors that the interviewee understood best and thus had a greater awareness of the different pathways through which risk events could develop from them. As a result, it was expected that these were areas of risk that the interviewee's organisation was best prepared for and would comprehend most quickly, reducing the likelihood that full scale strategic threats would develop as warning signs would be recognised early and the risk process managed to minimise negative outcomes. This process also provided a neat means of investigating the interviewee's awareness of the interactions between the organisation's internal and external environments, and also of how events in one part of an organisation's operations related to events in another part.

Figure 2: Calculation of concept centrality scores



Source: Adapted from Banxia, 2002, p67

COLLATING ACTUAL RISK EVENT DATA

In order to see whether mapping decision-makers' depth of understanding of the risk environment had any predictive power for determining where future strategic threats were most likely to come from, data was collected for each interviewee's company about the strategic threats and opportunities they faced in the period since their STRATrisk interviews. For most, this period was only one to two years. Although this limited the number of events that had had time to occur, the data collected was deemed to provide a good overview of the types and frequencies of strategic risks that would be faced in the longer term and thus suffice for comparative purposes.

Strategic risks were identified by searching the news archive LexisNexis for articles from major UK newspapers and publications relating to each company. Two particular problems arose from this stage of the analysis: Firstly, newspaper articles mainly focus on events related to larger companies so there is little news about strategic risks occurring to the smaller companies that were interviewed. Secondly, strategic threats (in particular) that are well handled by the organisation do not become known outside the organisation and therefore do not appear in the newspapers. It is quite likely that threats of this type occurred but have not been accounted for in the analysis, thus creating a bias in the comparison between perceived and actual risks. The only way to rectify this problem for future analyses would be to specifically ask each participant

about strategic risks their company has faced since the interview, which unfortunately was not practicable in the research undertaken here.

These risk events that occurred were then coded using the categories in Table 2 so that they could be meaningfully compared with the cognitive mapping data.

THE PREDICTIVE POWER OF RISK AWARENESS

Finally, regression analysis was carried out to determine whether those environmental risk factors that the interviewee exhibited the greatest understanding of (that had the highest "centrality" analysis scores) affected their ability to predict and avoid risks; that is, whether there was any correlation with actual risk events that occurred.

The following hypothesis was tested:

Risk awareness affects actual exposure to risk

There was a statistically significant, inverse relationship between the centrality of environmental factors and the frequency of actual risk events, both threats and opportunities. In both cases, the p-value was less than 0.05 and the correlation coefficient (r) was significant for the sample size. These results indicate that as the centrality decreases (that is, becomes less prominent in the cognitive map and interviewee's awareness), the probability of a threat or opportunity occurring in this topic region increases.

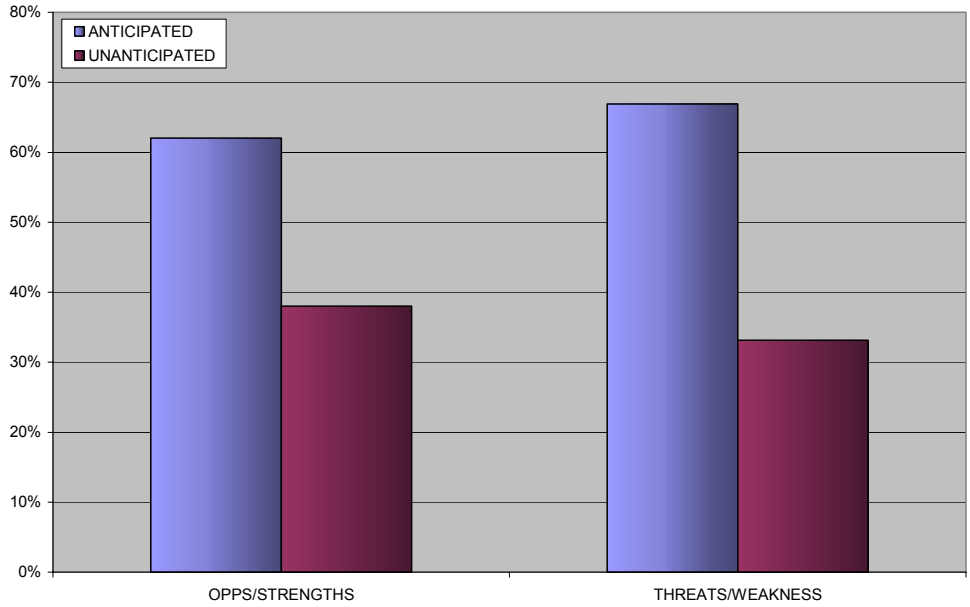
These are very interesting results that essentially say:

1. Opportunities are more likely to come from unexpected origins
2. Risks are more likely to come from unexpected origins

While these statements may appear to be truisms, they are subtly important as they suggest that existing organisational risk management and risk identification systems are failing to prevent strategic threats occurring. Rather than enabling organisations to deal with expected risks for which they are prepared, organisations are more likely to have to improvise to cope with unexpected risks; in fact, an analysis of the data in Figure 3

shows that approximately 35% of strategic threats and opportunities are completely unanticipated. The significance for organisations is that these risk processes have to be made sense of as they occur and thus incur all the dangers that enacted sense-making can bring; most important of which is that the situation can be made significantly worse by the actions of decision-makers while they are trying to understand what has happened.

Figure 3: Anticipated vs. unanticipated threats and opportunities



CREATING RISK VULNERABILITY PROFILES

The same centrality data from which these results have been derived can also be used by industry, industrial sectors and companies within the industry to map their vulnerability to threats or awareness of opportunities.

Figure 4 and 5 present a visual means of amalgamating the qualitative data from the cognitive maps into a format which allows an organisation to map their own unique susceptibility to threat and opportunity.

To create these vulnerability and opportunity maps, the centrality scores for threats and weaknesses (or strengths and opportunities) for each environmental factor were summed

and then normalised to give a score between 1 to 100; represented by the axis on the vulnerability map. Environmental factors with the highest score are most central and highly interconnected in the original cognitive maps and represent areas that the interviewee (and their organisation) is most familiar with. Then the actual risk events that occurred post-interview were collated by primary environmental cause, their frequencies were normalised to give a score out of 100 and were plotted on the map; a higher score in this case indicates more frequently occurring risks. These results are then plotted in Figures 4 and 5 to present a comparison between risk perception and actual risk events.

Figure 4: Vulnerability map: Construction Industry

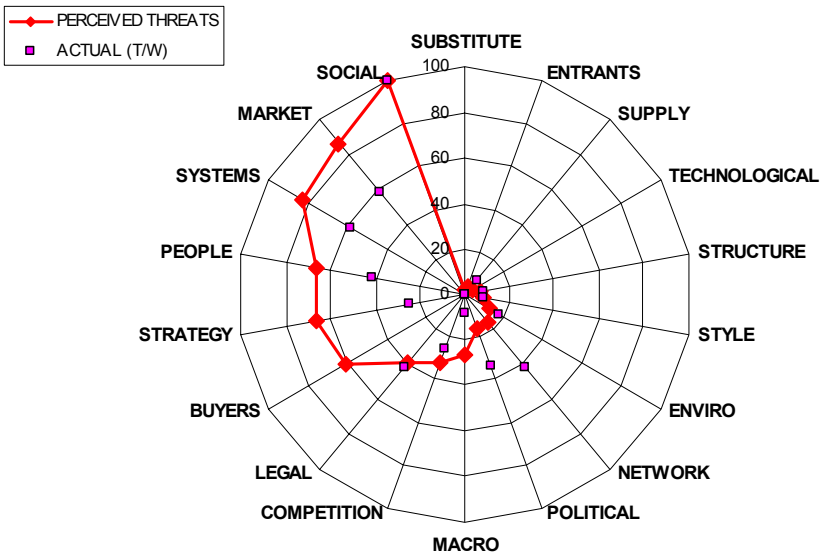
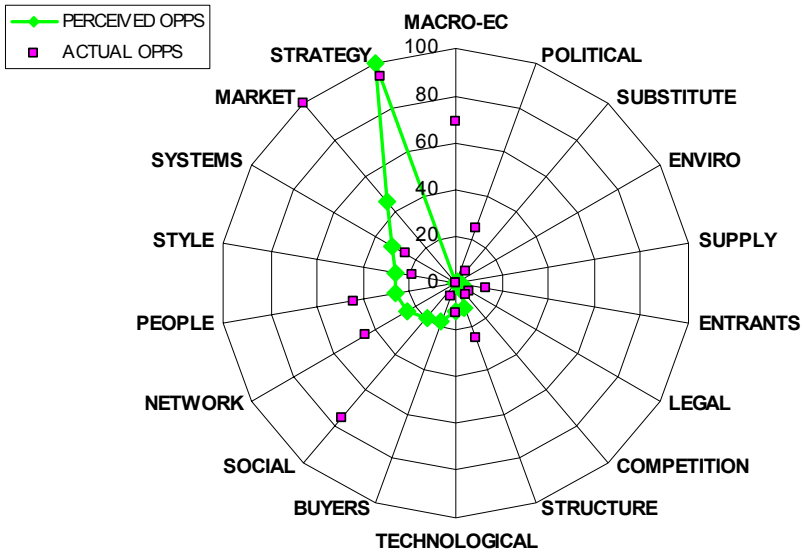


Figure 5: Opportunity map: Construction Industry



In Figure 4 it can be seen that the threats that occurred for the most part were anticipated by industry players, which indicates that even though organisations were aware of them, they either did not have appropriate risk management systems in place to manage them or were unable to prevent them occurring.

In Figure 5, it can be seen that again many of the opportunities that were taken advantage of occurred in areas that were expected; although the potential of areas such as 'people', 'network' and 'social' appears to be underestimated and may provide a good source of future opportunities.

USING VULNERABILITY MAPS

Mapping data in such a way has a number of advantages, although the maps cannot definitely prescribe where the next threat will come from. As the occurrence of both threats and opportunities is related to lower centrality scores, these maps present a means of identifying the direction from which new risks may be coming; in Figure 4 for instance, 'substitutes' and 'entrants' may present scenarios that the industry wishes to consider as a source of threat.

Further, mapping data in this way presents a high degree of flexibility. It is possible to compare a company's unique vulnerability footprint with that of the industry by plotting them both on the same map; this will allow decision-makers to not only identify areas where the rest of the industry is better prepared for risk events than they are and therefore where risk management improvements need to be made, but can also be used to compare a company's strengths with an industry's weaknesses, providing an excellent strategic tool for gaining competitive advantage and identifying new areas of opportunity.

The slope of the "perceived threat / opportunity" line provides a good indication of the robustness of an organisation's understanding of the risk environment. For example, in Figure 4 there is a relatively high level of awareness and understanding of a number of topic areas: social, market, systems, people, strategy and buyers. This indicates that decision-makers have a good understanding of the inter-relationships between these topics and therefore a high level of robustness; both in managing the risks and making decisions about them when they occur.

In comparison, Figure 5 shows a quick leap from style to strategy and in this map it appears that decision-makers are only positively aware of opportunities in the areas of strategy, market and systems; presenting a much smaller scope for recognising and acting upon potential opportunities. Realising that this is the case then provides managers with a systematic tool by which they can start scanning the environment for further opportunities. Again, recognising those areas where the rest of the industry is also looking for opportunities means that companies can focus specifically on less well trodden ground and thus gain a competitive advantage.

In essence, mapping data in this way provides a means of reducing the complexity of cognitive maps while at the same time retaining information about the strength of the interconnectedness of ideas. Thus, a means has been created of uniting quantitative and qualitative data, which is an essential part of the decision-making process about strategic risk.

LIMITATIONS OF THE RESEARCH AND AREAS OF FURTHER WORK

Although utmost care has been taken to develop the methodology and carry out the analyses here with academic rigour, there are a number of limitations to this study.

Firstly, the cognitive maps were developed from interview transcripts rather than with the direct assistance of the interviewees and, as Eden and Ackermann (1998) note, "Document analysis is a very poor third" (p194) to the preferred methods of building cognitive maps from one-to-one interviews or group sessions. A further constraint is that the maps are based on a single interview from each firm; a better picture of organisational response to risk situations could be elicited with a broader range of input from each firm.

Subjectivity is likely to be a factor influencing the reliability of the research; that is, the ability to replicate results (Jenkins, 1998) and in cognitive mapping, this particularly refers to the processes of interviewing and coding and depends upon interviewer consistency during acquisition. Laukkanen (1998) cites the qualities of high quality data being "reliable and authentic, sincere and, moreover, pragmatically relevant, not marginal or espoused academic wisdom" (p175). In these aspects, the interview data used meets the requirements for reliability in terms of its relevance and authenticity. A slightly different issue is the use of assumptions when creating the cognitive maps, particularly about causal relationships between activities which have not been explicitly stated in the interview. Again though, impacts upon reliability were minimised by only creating links where causal relationships were specifically implied by the context of the interview transcript.

These concerns relating to subjectivity and reliability, as well as the constraints imposed by experimentally developing a method of mapping risk vulnerability, point to some interesting areas where further work could be carried out. Firstly, it would be interesting to elicit the risk values of the entire Board of each organisation (rather than just one member) to determine whether companies have a "characteristic" risk approach that affects their vulnerability to strategic risk. There is also scope to interview people from different levels of the organisation and tie these interviews together using causal mapping to model how chains of events can escalate. This would give a more thorough analysis than simply relying on a view of the organisation from the top.

Finally, it would be interesting to investigate the effects of risk perception and the time-horizon over which risks occur. More than one interviewee mentioned that strategic risks that were seen coming but did not require imminent action were often ignored in favour of situations that demanded immediate attention, thus allowing the others to grow out of control.

MANAGERIAL IMPLICATIONS OF THE FINDINGS

The UK construction industry is unique, with its highly fragmented and competitive nature, reliance on government expenditure and thus on macro-economic trends, its physically risky nature and its resultantly heavier reliance than most industries on the people it employs. Yet, perhaps for these very reasons, any conclusions that can be drawn from such an industry will be robust and have a multitude of applications for managers in many other industries.

The results of the analyses here indicate that up to 35% of strategic risks are unanticipated, particularly because interviewees mostly focus on what Kurtz and Snowden (2003) call the "known" domain; that is, the internal organisational environment that can be directly controlled. On the whole, interviewees showed a limited understanding of how their organisations interacted with the external environment; particularly the influence of network relationships with suppliers, clients, financial analysts and other stakeholders. This is probably one of the main contributors to the finding that decision-makers' cognition of the strategic risk environment is inversely correlated to the strategic risks their company faces; that is, strategic risks are most likely to originate from sources that are less well understood. This is an important finding for managers because a lot of resources are currently being spent on improving risk management systems in the wake of new regulations and high profile corporate collapses.

Recognising that strategic risks evolve because they are not understood by management and are therefore allowed to develop without being recognised until it is too late should suggest some new functions for risk management systems; for example, in the words of

one interviewee, “Risk management should spot when you are dealing with something you don't understand well and don't do often”. Building up an understanding of all environmental factors that have the potential to impact upon the organisation is a crucial first step in improving risk management; not least for enabling recognition of when a problem is developing. Secondly, as strategic risks tend to be unanticipated the development of processes to make rapid sense of risk events and enable fast, effective responses to mitigate threats and capitalise on opportunities should be a vital component of risk management systems. Strategic risks escalate most often because the sensemaking process is too slow or actively contributes to the problem.

Finally, strategic risk perception has been shown to be closely tied to both individual experience and the complexity of the business environment. Developing different ways of understanding the environment presents new ways for managers to perceive risks without having to personally experience them, which in the case of catastrophic strategic threats is a valuable thing. The process of mapping an organisation’s understanding of its risk environment in the form of a visual ‘vulnerability’ map provides a tool for developing this understanding, as well as providing a useful starting point for determining a company’s risk robustness or vulnerability. Of most interest for decision-makers is the map’s ability to transform subjective, qualitative data into an organisational risk profile that can be compared to industry and sector norms. This provides a means of firstly, strengthening their risk management systems in vulnerable areas, and secondly, imagining scenarios and appropriate responses for those areas that cannot be controlled by organisational risk management systems, particularly those relating to the external environment.

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