A GROUP COGNITIVE APPROACH TO OPERATIONAL RISK IDENTIFICATION AND EVALUATION

DR. MICHAEL P. MCGRATH, BSC, MBA, MIEI, DBA

PRESENTED AT

ENTERPRISE RISK MANAGEMENT SYMPOSIUM

SOCIETY OF ACTUARIES

CHICAGO, IL

MARCH 27TH – 29TH, 2007

ABSTRACT

This paper describes the *Cognitive Risk Identification and Measurement* (CRIM) framework of risk identification and measurement. A cognitive technique, based on the Delphi method which, can be employed rapidly and with limited organisational impact to identify the risks an organisation faces and assess them in terms of probability, impact and ability of the organisation to manage those risks. It also shows examples of how the results of this analysis can be presented to management for action.

BACKGROUND

Many solutions and approaches exist to manage risk. A frequent problem faced by researchers, managers and practitioners alike is comprehensive risk identification and building a consensus as to the relevant importance and probabilities of these risks.

Relying on external expertise alone does not take into consideration the unique operational risks that exist because of the operational procedures and organisational structure of a given organisation.

In particular there are challenges relating to achieving complete coverage of all risks and ensuring the importance of risks is agreed and recognised. This is complicated by additional challenges of organisational and group behaviours, such as "Group think" and the roles of dominant individuals, which can place a strong bias on any risk evaluation process.

CONTENT

This paper describes these and other challenges faced by the author whilst conducting risk research in a major investment bank. These include:

- Group dynamics
- Organisational impact of research
- Timing considerations
- Involving outside "experts"
- Dominant individual behaviours
- Decision making techniques and their impact, such as availability theory, and prospect theory.

It shows how cognitive techniques can be employed to overcome many of the issues faced by group methods, using a technique, developed from the Delphi method. The paper shows how this technique can be used in practice and how the results can be analysed and presented to decision makers.

COGNITIVE RISK IDENTIFICATION AND MEASUREMENT (CRIM)

This paper is primarily a description of a cognitive process which I call the *Cognitive Risk Identification and Measurement* (CRIM) framework. This was developed as part of doctorial research conducted by the author at Cranfield University in the UK. As such this paper is a description of the method developed and so is methodological. A paper describing the findings and their impact is also available entitled "Group risk behaviour in unfamiliar problem domains". The method is important because it provides a practical approach to identifying and prioritising risks.

The amount of regulatory and management attention donated to operational risk is increasing. While regulators are focusing greater attention on the operational risk they are not prescriptive. This means that organisations are free to apply the solution of choice to the problem.

There are a number of risk management frameworks. These frameworks generally fail to address the question of risk identification and risk assessment. That is to say the organisation needs to be aware of the risks and be able to evaluate them. Some organisations may take an approach of benchmarking and then examining the gaps, this approach may not be complete. Organisations face risks that result from their unique situation and this would not be addressed by a benchmarking approach.

To address this need CRIM was developed. CRIM aims to combine takes industry best practice, the company's documentation, where available, and the organisation's knowledge to produce a more complete set of risks. It then uses the organisations knowledge and experience to perform an initial assessment of these risks and how well the organisation can address them. This approach also has the advantage of being possible to implement quickly (typically 4 weeks) and with little impact on the organisation (typically 2-3 hours per participant, 12-15 participants). In practice it has proved a valuable contribution to initiating risk management projects, and assessing project risk.

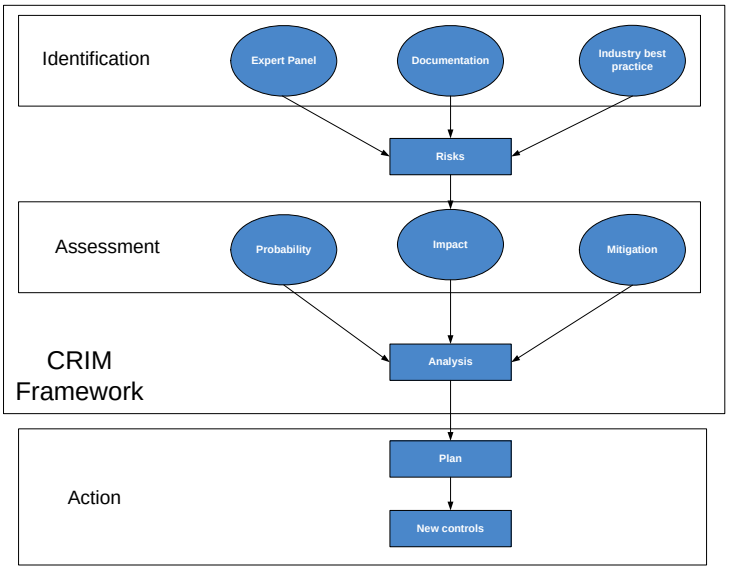

Figure 1 - CRIM Framework and risk management

THE CONTEXT OF THIS RESEARCH

CRIM has been used in various situations such as pre and post acquisition risk analysis, business development and project delivery risk analysis. The paper will draw examples from research into a large scale bank acquisition. The sample data shown is taken from that risk review.

Banks are no strangers to Merger and Acquisition (M&A) behaviour; they are frequently involved in M&A activities on behalf of their clients. This activity usually takes the form of financial involvement only (organising finance, valuing company assets and so forth). The context here is somewhat different; the bank is directly making an acquisition on its own behalf. As such it is involved directly in all aspects of the M&A process. This places the organisation outside its normal, and therefore "familiar", operational domain. This automatically presents new inherent risks. If the organisation is doing something different from the normal then it will not have the experience it would enjoy for everyday activities. This results in either normal controls being used in circumstances they were not designed to operate in or they will need to be modified or replaced.

A special challenge is the process of changing the legal ownership of the company (Change of Control). This is a highly regulated area and as such places constraints upon all organisations, and in the case of investment banks there are additional constraints which are unique to the financial services industry. This is because the basic legislation relating to mergers and acquisitions forces firms to take an "arms length" approach to the process prior to the change of control. Financial regulators request that there be sufficient integration of controls to ensure there is single regulatory reporting from the moment of the change of control. This therefore places the two companies very

closely together, at the same time they are required to be "arms length". The focus is primarily on the risk identification and behaviour during the acquisition's Change of Control (CoC).

Research and business experience shows that M&A activity is both expensive to undertake and also failure-intensive. Most M&A transactions do not achieve their stated aims (Meeks, 1977). M&A failures are very expensive in terms of shareholder value and can even threaten the very existence of the organisation. A recent example of this is the post-merger losses of US$97 billion at AOL Time Warner (Thal Larsen, 2003).

As indicated earlier, banking and finance M&As are subject to special regulatory reporting requirements which require close co-operation between the acquirer and the acquired, which is normally prohibited and therefore normally not an operational consideration prior to the CoC.

With such high probability of loss combined with such high potential loss, risk management is very important in these circumstances. This has been given greater importance in recent years by a number of regulators and other stakeholders, looking to improve financial reliability, governance and reporting. High-profile corporate failures and reporting scandals such as those involving Enron/Arthur Andersen and WorldCom (Larkin and Casscles, 2003) have added impetus to the drive for greater corporate reliability.

ORIGINAL RESEARCH QUESTION AND DESIGN

As mentioned earlier when this method was developed it was in support of research which was undertaken to answer a number of questions:

1. What risks did the organisation face?
2. What were the relative probabilities of each risk occurring?
3. What were the relative impact of each risk, if they should occur?
4. How well prepared is the organisation to address or mitigate these risks should they occur?

The bank had successfully completed one acquisition and was about to undertake another. It wanted to understand its risk profile in this situation so that it might be able to take preventative action when approaching the upcoming acquisition.

CHALLENGES AND CONSIDERED TECHNIQUES

This section describes various approaches and methods that were considered to answer the original research questions. It also describes the rationale for selection and rejection, which ultimately led to the creation of CRIM. The objective of the project was to identify risks and quantify their significance (probability and impact) and their

mitigation (the degree to which the organisation has either eliminated the risk or taken action to mitigate its impact.). Because of this a method would ultimately be required which would answer these questions in a quantitative manner. It is also necessary to be able to analyse the risks in terms of their timing, and classify their nature. The information available came from three sources; industry practice (attained by using an outside expert in M&A activity), company records and a small pool of professionals who were familiar with the organisation and challenge it was facing.

INITIAL APPROACHES CONSIDERED FOR THE RESEARCH

Appropriate methods that could be considered for the research were required. The starting point was to review *Doing Quantitative Research in the Social Sciences* (Black, 1999) and *Qualitative Data Analysis* (Miles and Huberman, 1994) to inform and to provide an overview of the options that one could consider. These methods had to work with the constraints of the data sources available, the limited time (because of the need to prepare for the next acquisition) and objectives of the research. Black (1999) proposes a process for hypothesis which was not appropriate for this research, since the objective was to identify and measure and not propose a hypothesis. However, he also outlined approaches to data gathering which can be used. The selected method needed to be appropriate for post-facto investigation, based on three broad approaches which can be identified;

- The first approach would be to review the company records (from the first acquisition) and identify the risk to the merger's success documented in the company's records. This could then be followed by producing a questionnaire which could be used to poll the panel of experts. This approach benefited from the ease with which it could be "operationalised", provided that there was a way to manage the volume of data in the company records. A significant downside with this approach is that it would not gather data from the experts and so miss the benefit of their experience. Also, a questionnaire might not be interpreted in the same way by all respondents. In addition, there is also no real scope for follow-up with this approach. Because of these concerns the approach was discounted.

- The second approach considered was to interview the panel of experts. Analysis of the transcripts of these interviews using content analysis (or a similar analysis) extract the risks identified and produce a questionnaire which the panel could complete. This offers many benefits because it would base the work on the experts' opinion and so include their input. They would be able to incorporate whatever they wished, and as it is based on the interview; it could be structured it to bring greater focus on the change of control part of the merger (the primary focus of the research). In spite of the advantages of this approach, there were also concerns. There could be ambiguity in the results returned by the experts, and in addition, there could be disagreement over the answers without the opportunity to address these.

- A third approach would be to organise a workshop or focus group session with the experts. This offers the possibility of the experts getting into a detailed discussion and debate relating to the central issues, which

presents great scope to arrive at an agreement and to elicit greater depth in relation to understanding the risks present. Such a focus group would be challenging to run as there would be many participants from different organisational levels involved. It would need to be managed and directed appropriately so as to cover all the issues in a reasonable time frame. An additional logistic challenge would be scheduling a time and venue agreeable to all of the parties. Even if this could be achieved the possibility exists that the group could be dominated by a small number of individuals, a common problem with group discussions (Fourlis, 1976; Jenkins and Thoele, 1991).

The second approach, while attractive from an operational and data quality perspective, still suffered from the possibility of there being disagreement on the relative importance of risks. This makes it harder for management commitment to address the risks from within the organisation if there is a perception of disagreement as to the importance of these risks. To solve this the basic approach is altered so as to incorporate a variation of the Delphi forecasting method. This would allow the respondents to answer the question more than once, and thus modify their answers once they became aware of the answers of the others in their group.

While popular in the commercial world, the Delphi method is not widespread in academic research (Fourlis, 1976), partly because it is usually used as a forecasting tool (Helmer, 1968; Dalkey, 1969), and partly because some academics are not comfortable with it as a rigorous research tool (Fourlis, 1976; Jenkins and Thoele, 1991).

THE DELPHI METHOD

The Delphi method developed as a group consensus technique to produce forecasts for a particular topic or area of interest (Hiltz and Turoff, 2001). It was developed by Olaf Helmer and Norman Dalkey at the Rand Corporation during the 1960's (Helmer, 1968; Dalkey, 1969).

Its popularity has grown substantially in terms of frequency of use and purpose for which it is applied. It is applied to a wide range of forecasting activities across various industries (Jenkins and Thoele, 1991). It has been found to be more appropriate than numerical forecasting methods in many circumstances (Fourlis, 1976). Fourlis found that successful use of the Delphi method depends upon:

- Anonymity of the members of the panel – the panel would be unaware of the identity of any other panellist, so as not to influence their opinion.
- Controlled feedback – the panel make their estimates (give their opinion) in a uniform way.
- Statistical group response – the opinions are weighted in some manner. This would depend on the topic, such as favouring the views of recognised specialists, or those with long experience.

One of the benefits of the Delphi method is the fact that it is asynchronous. Some consider this to be a prerequisite (Hiltz and Turoff, 2001), partly because of the use of mail to co-ordinate and correspond with the members of the panel. Today, we can use technologies to support us to work in a more iterative fashion, if desired. When Helmer was describing the Delphi method in the late 1960s, he made no specific reference to this, in fact, he described the process as a series of sequential steps.

This is not the first time the use of the Delphi method has been extended beyond forecasting. It is frequently used as a "decision support" tool (Hiltz and Turoff, 2001), though there is no indication that this was Helmer's original intention.

The use of the Delphi method as the core of this research method was because of the consensus-building nature of the method. Using it facilitates the formation of consensus about the risks, their significance and the ability of the organisation to mitigate them.

A further advantage of the Delphi method is that it offers the potential to achieve higher quality decision-making. In the late 1960s research into the issue of the quality of decision-making was conducted within the Rand Corporation (Dalkey, 1969). The conclusion was that the lack of a "face-to-face" procedure and the anonymity of the Delphi method results in a better quality of decision-making, thus resulting in a better consensus.

Jenkins and Thoele (1991) also identified the potential for better quality decision making within the group decision-making process. Further support for the accuracy of group forecasting compared to that of individuals is found in Sniezek (Health & Safety Executive, 1989).

Interestingly Jenkins and Thoele also point out that sometimes a group of experts was not significantly better at forecasting than the general public, citing an example from Wright and Schaal (1988) relating to the quality of decision-making, in terms of the selection of high performing equities between the general public and experts.

The process also allowed for better learning. By going through multiple iterations of the opinions of various stakeholders, it was possible for each to gain an appreciation and understanding of the knowledge, issues and perspective of the others. Mandanis (1968) found that "the Delphi method can take the form of a detailed understanding by corporate executives of the reasoning that underlies their respective staff's recommendations, or it can help the latter appreciate more intimately, the biases and style of those they counsel".

There are two great dangers with group decision making. The first is the existence of group think (Janis 1972). The Delphi method does not necessarily mitigate against this, but it is less likely to produce the conditions under which groupthink can exist. The second danger of group decision-making is the impact of a dominant individual (Jenkins and Thoele, 1991). The anonymity of the Delphi method avoids contact between participants - this eliminates the

impact of dominant individual behaviour. There is no threat of a single individual "setting the direction" or intimidating others and preventing them from taking part, as there is no group interaction.

Other researches have identified weaknesses with the Delphi method. Fourlis (1976) identifies and addresses a number of these, namely;

- Panel selection - the members of the panel need to be deemed to be "experts". Those selected for the panel are all experts in that they have either considerable professional or academic expertise of the subject area. Of course, some experts can have a greater degree of expertise on some aspects of the issue than others. It is possible to allow participants to assign a self-weight to the questions if necessary.
- Group size - like any sampling method, the error decreases as the sample size increases. Group sizes of 13 to 15 are optimal (Dalkey, 1969). This is possibly a reflection of the technology used at the time. Today, using interactive technologies, it is possible to have any number of experts take part. No research has been undertaken to determine whether or not this is the case.
- The questionnaire - this needs to be clear to the respondent, in that they must be clear as to the questions being asked of them. Because of this, it may be necessary to provide the participants with extra background knowledge.
- Reliability of the technique - the conclusion that Fourlis (1976) comes to, and quotes a number of sources to support him, is that the method is reliable when used in the right context. The sort of economic and academic value placed on the findings of Delphi studies by commercial organisations also supports this. An example of this is the recent Delphi-X study (Flynn and Belzowski, 1999) which examines trends within the petroleum industry. Fourlis also concludes that there are a number of potential issues relating to the respondents' interpretation of the questions that in turn bring into question the researcher's ability to compare answers. There are also issues that surround other group techniques, such as polling. Therefore, we should conclude that the issue relates to the application of the technique, rather than to the technique itself.

The method of qualitative data collection selected was adapted from the Delphi method. This process started off initially as a series of interviews. In order to draw these interviews together, the process described below was followed.

The need for an expert panel for the Delphi method required people who had played an important role in one of the mergers. They were broadly categorised as consultants, managers, senior managers, staff and external specialists. Appropriate individuals who would fit the criteria were identified. In practice, there was not 100% participation as can be seen in Table 6 - Delphi participation.

TECHNIQUE DEVELOPED

This section describes the method developed. The method is the result of the research constraints and the viability of other research methods in addressing the needs of identifying risks, agreeing their relative significance and how well the organisation is able to mitigate them.

PANEL SELECTION

A "panel of experts" was formed. A list of people who had worked on the previous acquisition at various organisational levels, but in positions that were sufficiently central to allow them have a cross-organisational view of the acquisition (as was the scope of the research). Over twenty potential participants were identified. These were classified into a number of categories based on their role. These were external consultants, managers, senior (top team) managers and central staff. A panel size of 15 was selected because it was possible that there would not be 100% participation, and this is the "high end" of the optimum panel size. Panel members were selected by their areas and business unit to elicit as wide a group of responses as possible. The panel was balanced in terms of representation from each group. The method of qualitative data collection is based around the Delphi method. For it to be effective a body of individuals with expertise and knowledge of the merger being studied was required. The people needed to have worked in areas where they would have been exposed to a wide range of issues, and thus not bias the data in any particular direction. To reduce the possibility of bias resulting from a homogeneous panel, a cross-section of participants was drawn from different levels within the organisation, including external resources. All of the external resources were consultants who had worked on the acquisition. In addition an external member who had not worked on the acquisition, but who is a leading academic and business consultant, and is generally considered to be one of the UK's experts on mergers and acquisitions was also included. His input was included because he could bring a wider perspective than merely this particular acquisition. All the members of the panel were approached and agreed to take part. In total two iterations of the questionnaire were circulated; these are referred to as Delphi 1 and Delphi 2. Not all panel members took part at every stage of the process. In practice only 12 contributed, the actual level of participation is shown in the table below.

Area	*Interview*	*Delphi 1*	*Delphi 2*
Consultant 1	Yes	Yes	Yes
Consultant 2	Yes	Yes	No
Consultant 3	Yes	Yes	No

Manager 1	No	No	Yes
Manager 2	Yes	Yes	Yes
Manager 3	No	Yes	No
Senior Manager 1	No	Yes	No
Senior Manager 2	Yes	No	Yes
Specialist 1	Yes	No	No
Staff 1	Yes	Yes	Yes
Staff 2	Yes	Yes	Yes
Staff 3	Yes	Yes	Yes

Table 1 - Delphi participation

INTERVIEWS

Two semi-structured pilot interviews were conducted. The basic structure of the interview was:

- Introduction
- Explain the research in general terms
- Explain its goals
- Explain the method of research
- Ask the interviewee to describe their position at the time of the merger
- Conduct the interview by asking a series of questions, prompting where necessary by asking follow-up questions. The focus of this part of the research is around the CoC, so the questions focused on this period.

Once satisfied with the result of the two pilot interviews and the data collected during them, it was possible to progress and attempt to interview the remaining candidates. All participants agreed to the use of a cassette tape-recorder.

IDENTIFYING, EXTRACTING AND CLASSIFYING RISKS

To facilitate the analysis of the risks identified from both the company records and the interviews together, it was necessary to create a structured risk taxonomy for the risks identified. This was developed by starting with the root risk 'The merger fails' and working "back" from there. If a risk did not contribute to the primary risk, then it was outside the scope of the research. By "working back" from there, a six-tier hierarchy was developed, into which each risk could be classified. This is illustrated below:

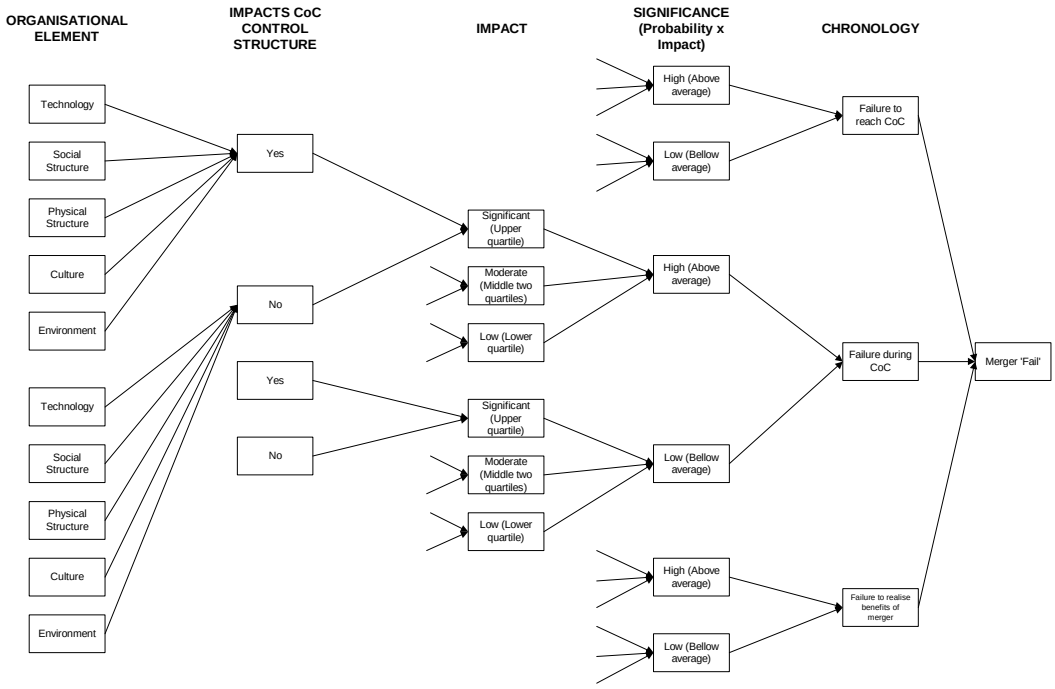

Figure 2 - Risk classification

Layer	***Contains***	***Valid Classifications***
Merger failure	Risks that could result in the merger failing	Yes
Chronology	When the risk can <u>first</u> occur	Pre-CoC CoC Post-CoC
Significance	What is the significance of the risk? For interview data this is based on the impact	High Low

Layer	*Contains*	*Valid Classifications*
	multiplied by the probability. Above average is rated high, otherwise it is rated as low. For document originated risks this is rated as high.	
Preparation	The level of preparation. For interview-originated risks this is based on the quartile into which the mitigation is rated as falling. For document-related risks this is rated as described earlier.	Significant Moderate Low
Impacts CoC structure	Can the risk impact the CoC control structure in any way?	Yes No
Organisational element	To which organisational element does the risk belong?	Technological Physical Cultural Social structure Environment
Specific risks	The specific risks which must fit into the structure.	

Table 2 - Risk classification

From a methodological perspective the risk classification is very useful. However, it needed to be useful from a practical standpoint also. The data gathered was made available as a database, which allows the risks to be treated as an n-dimensional cube which is "sliced and diced" in various ways, this I call the "risk cube". This means that a user of this database could select, for example, those external risks which could impact the CoC. This is useful because it allows management to allocate risks to the people who are going to manage the risks, and also as part of a systematic means to address risks in a grouped manner.

The risks are entered into a database as they are identified. Each risk is tagged with as much meta-data as possible. For each risk the following meta-data could be entered:

Metadata	*Description*
Risk number	A unique number assigned to each risk
Short name	Brief description of the risk
Description	More elaborate description of the risk
Merger	Can the risk impact the merger – Yes/No
CoC impact	Can the risk impact CoC – Yes exclusively/Yes inclusively/No
CoC manifestation	Can the risk manifest itself during CoC - Yes exclusively/Yes inclusively/No
Immediate impact	Does the risk have immediate impact – Yes/No
Impacts control centre	Can the risk impact the control centre or control centre structure - Yes exclusively/Yes inclusively/No
Average probability	Average probability of the risk occurring (only applies to the risks identified in the Delphi process, it is calculated at the end of each iteration) – score between 0 and 6
Average impact	Average impact of the risk occurring (only applies to the risks identified in the Delphi process, it is calculated at the end of each iteration) – score between 0 and 6
Average mitigation	Average level of mitigation of the risk occurring (only applies to the risks identified in the Delphi process, it is calculated at the end of each iteration) – score between 0 and 6
Source interview	The source of the risk is an interview – Yes/No
Source documents	The source of the risk is a reviewed document– Yes/No
Source literature	The source of the risk is public literature – Yes/No
Source	A reference to the source of the risk
Contributes to	Number of the risks that this risk contributes to
Pre-CoC	This risk can manifest itself during the pre-CoC phase
CoC	This risk can manifest itself during the CoC phase
Post-CoC	This risk can manifest itself during the post-CoC phase
Significance rating	The rating of the significance of the risk – High /Low

Metadata	*Description*
Mitigation rating	The rating of the mitigation of the risk – High /Moderate / Low
Organisational element rating	Coding of the organisational elemental category the risk belongs to – Technical/Social Structure/Culture/ Physical/Environment

Table 3 - Meta-data added to risk data

Transcribing every interview was the original intent. After the first three interviews transcription was showing little benefit. Instead, each interview was carefully listened to, and from it, a series of risks to the successful completion of the merger was identified. These were entered into a work document with a page for each interview. To guide this activity a comment would only be considered a risk if it , no matter how small, could impact or delay the completion of the change of control or the merger itself.

From each of these sheets the core risk was identified, for example a risk that might suggest that there is a danger that staff cannot use a particular tool is in essence the fact that staff are not familiar with, or trained to use, the tools available to them. By following this distillation process, and by combining risks from various interviews, a list of 55 risks was created. Each risk was assigned a unique reference number (Risk Number). The data relating to the classification of the risk was also entered with it. These included the phase of the merger the risk could impact.

THE QUESTIONNAIRE

Within the risk cube database is a special report which is used to produce the risk questionnaire. This questionnaire, plus a two-page instruction sheet, is sent to each participant. Participants evaluate each of the risks in terms of:

- Severity of the impact if it were to occur
- Probability of it occurring; and
- Degree to which the organisation was prepared to address the risk, i.e. the degree of mitigation.

Participants indicated any identified risks which they felt were not actually a valid risk. They were also instructed that if they felt they could not comment on a risk, they should just leave it blank. These results were also entered into the risk database.

Following initial analysis a second questionnaire was prepared for Delphi 2. This was similar to the first but also included the average value for each parameter (probability, impact and mitigation) from the first round (Delphi 1). This was sent to each participant. In addition, each participant was given a copy of the values they had chosen in Delphi 1. They then returned the questionnaire with their replies. This data was then entered into the database with the earlier data. The data from the two Delphi iterations was analysed.

In addition to examining the difference between iterations it is possible to test for changes in individual responses between iterations. To test if their replies had changed significantly between iterations the non-parametric Wilcoxon test is used. The analysis of the results from Delphi 1 and Delphi 2 indicated a third iteration was not required. In this example it could be concluded no further iterations were required.

Finally, a small number of outlier risks, (see the results section), were investigated to validate if this is a true reflection of the risk situation. It is reassuring if the investigation of this small set of risks indicates that the ratings are correct and justified. If they indicate that the risks correctly evaluated by the group, that indicates a very significant organisational issue as the groups understanding of the risk situation is at odds with what can be found with close inspection. This indicates that the organisation's perception of risk is not accurate and this is clearly a major concern .

ANALYSIS & REPORTING

Having completed the Delphi study, it remains to analyse the data and present it. This section describes the primary analysis conducted and how the results were presented and communicated to management.

ANALYSIS

Imagine a well run, efficient organisation. If you were to map all of the risks it faced in terms of how significant they are (probability and impact) and how well prepared they were to address them, you would probably expect to see them map on a scatter diagram as a diagonal. The reason being the most significant risks over time would receive management attention to ensure the organisation was able to deal with them. Obviously since this is based on group opinion it is unlikely to be a perfect diagonal line, rather a general cluster. Risks which follow this type of pattern can be referred to as those which are effectively managed.

On the other hand risks which are so very well mitigated, compared to their relative significance, would suggest that these risks are being managed excessively. The opposite of that, where risks that are highly significant are not being well mitigated and those that are less significant are being very well mitigated, would be classified as negligently managed. These three broad situations are shown below in Figure 3 - Classification model of level of mitigation and significance of risks.

Of course, this is just a guideline. Where the boundary falls between these three "regions" on a scatter graph depends on all sorts of factors, including the organisations appetite to suppress risk. This will be influenced by various factors such as the organisational structure, market structure and the regulatory environment.

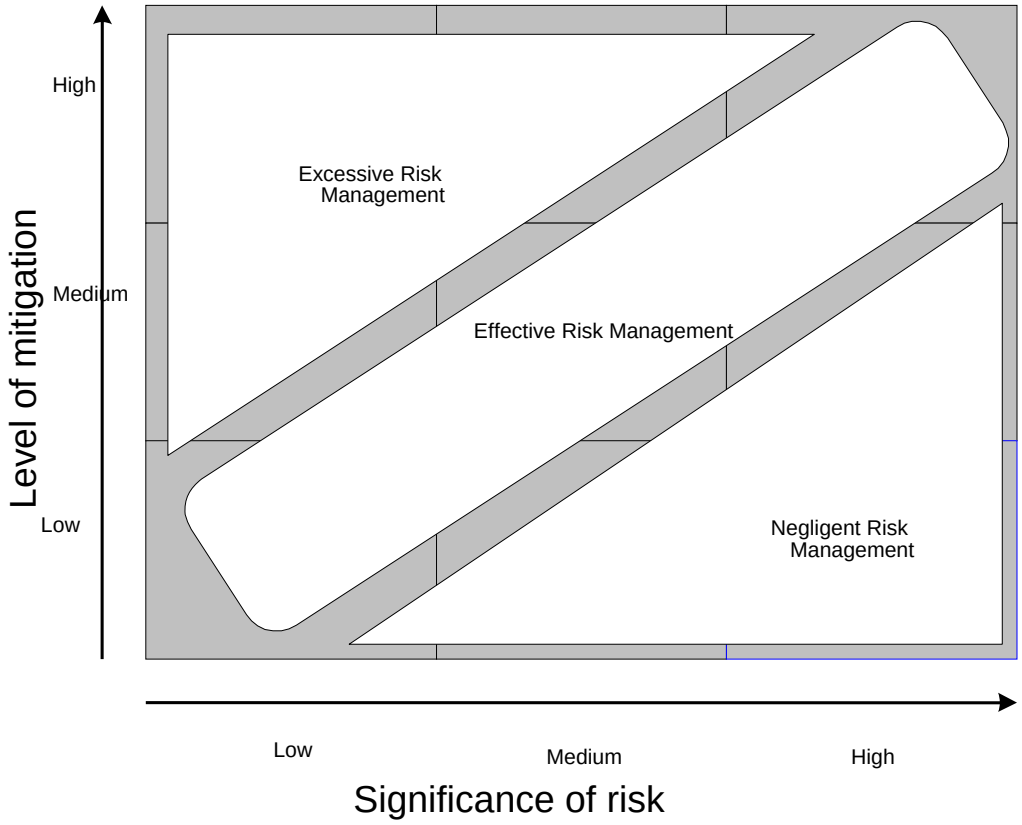

Figure 3 - Classification model of level of mitigation and significance of risks

To assist management understand their risk/mitigation relationship each risk is mapped onto a "scatter diagram" to indicate where possible areas of particular concern lie. An actual example of this is shown in Figure 4 - Significance

V mitigation scores, which follows.

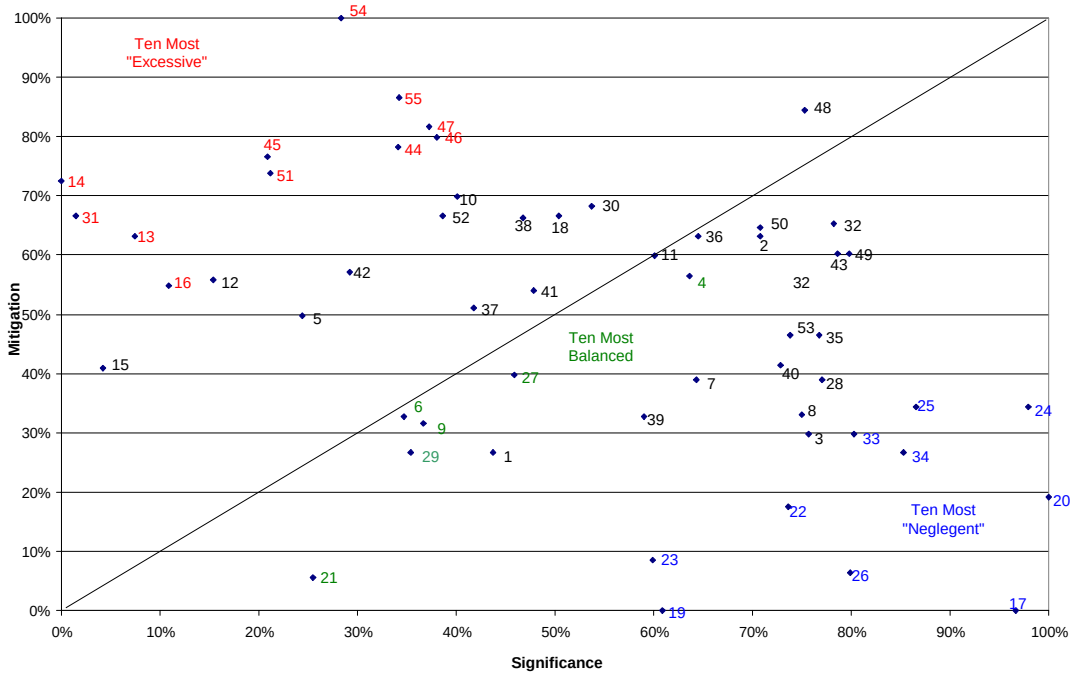

Figure 4 - Significance V mitigation scores

In this example, the diagonal line that well balanced effective risks management would follow is shown. The most balanced risks are indicated in green. These are risks which the organisation is basically managing appropriately. The most excessive risks are shown in red. In this situation the organisation has put more effort into managing these risks, or as was in this case, these are risks the organisation faces in its normal operating environment, and so, it has them well controlled and need take few extra steps to manage. Finally, the most negligent risks are shown in blue. These are risk which the organisation needs to focus its risk management efforts. These are both significant and the organisation is not well positioned to deal with them.

Examination of these specific risks indicated that these were risks that were raised by the merger and acquisition activity. These were outside of the normal operational domain for the organisation and so needed special action to be taken to mitigate or eliminate the risk.

The same data was also presented by sorting the risks by their significance and then showing the corresponding level of mitigation.

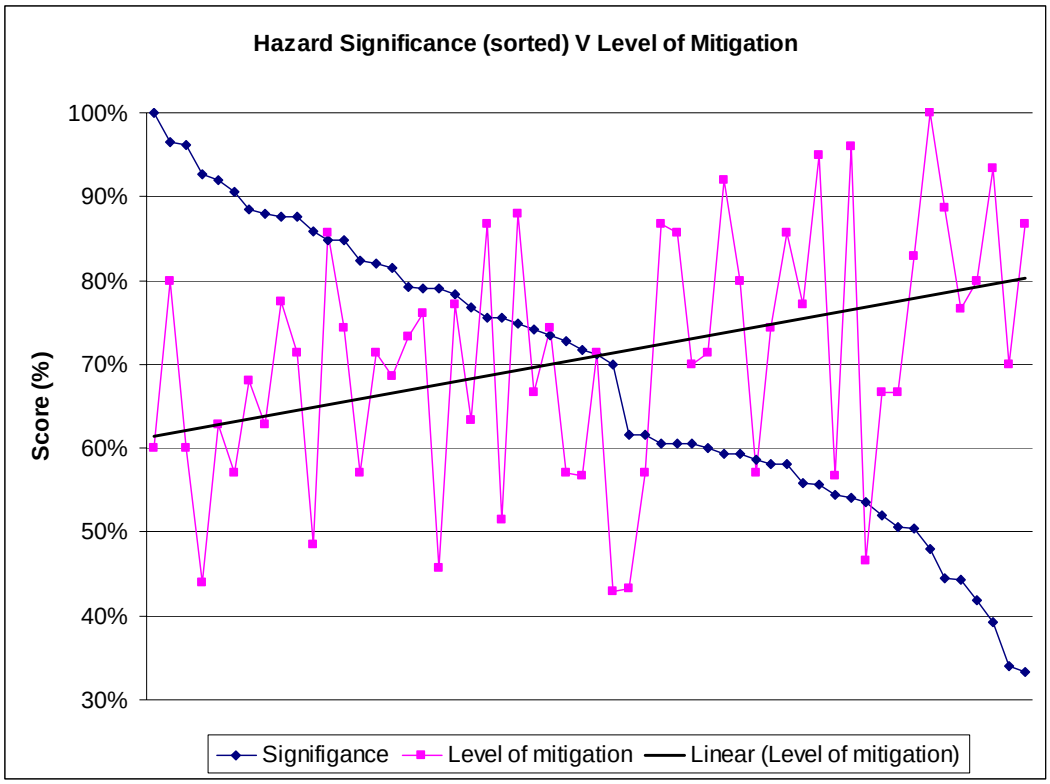

Figure 5 - Risk significance (sorted) versus level of mitigation

This way of illustrating the results illustrated the inverse relationship between the level of mitigation and the significance of the risks.

As indicated earlier the risks were also classified. This allowed risks to be analysed by one or more of the categories in the classification structure. The classification structure is coded consistently for all risks. This means that each risk isn't just placed in a hierarchy, but into any of the dimensions.

One example is shown in the following table (Table 4 - Classification of risks identified through the Delphi process), which indicated how each of the risks relates to the organisational area from which it originates. This showed that the majority of the risks the organisation faced were technological in nature, with social and cultural factors accounting for 16% and 13% respectively.

Organisational Area	**Number of risks**	**(%)**
External	0	0%
Physical	3	5%

Organisational Area	**Number of risks**	**(%)**
Social structure	7	13%
Culture	9	16%
Technology	36	65%

Table 4 - Classification of risks identified through the Delphi process

CONCLUSION

This paper is about methodology. The purpose is to describe a research method based on the Delphi method which can be used by practitioners and researchers alike to identify and build consensus relating to risk significance and current level of mitigation. The paper shows how it can be applied and reported upon. The method has proven valuable as it can be applied:

- Pre-facto and post-facto
- In many situations
- It avoids many of the usual issues with group interaction
- It builds consensus
- The reporting is easy to understand
- It can be applied quickly
- There is little impact on the target organization

BIBLIOGRAPHY OF AUTHOR

Michael McGrath is founder of Hibernia Consulting, a project delivery and risk management consulting firm serving major investment banking clients. He is a former regional CTO at Merrill Lynch and Project Delivery Director at both Bankers Trust and Deutsche Bank. He holds an MBA from the Smurfit School of Business and his Masters thesis won the Institute of Accountant's in Ireland gold medal for research in 1996. His doctoral research examined risk behaviour in unfamiliar problem domains by examining the risk behaviour of a major global bank.

He has published previously and presented at the British Academy of Management and presented internally at Cranfield colloquia.

APPENDIX 1 – RISK CLASSIFICATION

Risk Number	Classification
1	Culture
2	Technology
3	Culture
4	Culture
5	Social Structure
6	Technology
7	Technology
8	Social Structure
9	Technology
10	Technology
11	Technology
12	Technology
13	Physical
14	Physical
15	Physical
16	Social Structure
17	Technology

Risk Number	Classification
29	Technology
30	Technology
31	Technology
32	Technology
33	Culture
34	Social Structure
35	Technology
36	Technology
37	Technology
38	Technology
39	Technology
40	Technology
41	Technology
42	Technology
43	Technology
44	Technology
45	Technology

18	Technology
19	Social Structure
20	Social Structure
21	Culture
22	Culture
23	Culture
24	Technology
25	Culture
26	Technology
27	Technology
28	Technology

46	Technology
47	Technology
48	Technology
49	Social Structure
50	Culture
51	Technology
52	Technology
53	Technology
54	Technology
55	Technology

APPENDIX 2 – DELPHI 1 & 2 RESULTS

Average of standard deviations	**Probability**	**Impact**	**Mitigation**
Delphi 1	1.15	1.11	1.02
Delphi 2	1.12	1.10	1.00

BIBLIOGRAPHY

Black, T.R. (1999), *Doing Quantitative Research in the Social Sciences,* Sage, London.

Dalkey, N.C. (1969), *Rand Corporation Journal of Research*, Report no. RM-5888-PR , Rand Corporation, Mount Morris, IL.

Fourlis, S.A. (1976), *An Appraisal of the Delphi Technique* (unpublished MSc thesis), Cranfield University, Cranfield.

Health and Safety Executive (1989), *Risk Criteria for Land-Use Planning in the Vicinity of Major Industrial Hazards*, HMSO , London.

Helmer, O. (1968), 'Analysis of the Future: the Delphi Method.' *Forecasting for Industry and Government*, Rand Corporation, Santa Monica.

Hiltz, S.R. and Turoff, M. (2001), *Gazing Into the Oracle: The Delphi Method and Its Application to Social Policy and Public Health,: Chapter: Computer Based Delphi Processes*, Kingsley Publishers, London.

Janis, I.L. (1972), *Victims of Groupthink*, Houghton Mifflin, Boston.

Jenkins, M. and Thoele, D. (1991), 'The Delphi Technique: Forecasting in Turbulent Times', *Graduate Management Research,* Vol. 5, No. 4, pp. 30-42.

Flynn, M. and Belzowski, B. (1999), *Delphi - X: Forecast & Analysis for the North American Automotive Industry*, OSAT, University of Michigan, Michigan.

Larkin, W.J. and Casscles, S. (2003), 'How the Recent Corporate Governance and Financial Scandals May Affect the Debate on the Future of the State Regulation of Insurance', *Journal of Insurance Regulation,* Vol. 21, No. 4, pp. 3.

Mandanis, G.P. (1968), 'The Future of the Delphi Technique', *Forecasting for Industry and Government*, Edinburgh University Press, Edinburgh.

Meeks, G. (1977), Disappointing *Marriage: a Study of the Gains from Mergers*, Cambridge University Press, Cambridge.

Miles, M.B. and Hubermann, A.M. (1994), *Qualitative Data Analysis,* (2nd edition), Sage, London.

Thal Larsen, P. (30th January 2003), 'AOL's $98bn Loss Is Largest in US History', Financial *Times,* pp. 1.

Wright, J.P. and Schaal, D. (1988), 'Groupthink: The Trap of Consensus Investing', Journal *of Financial Planning,* Vol. 1, No. 1, pp. 41-44.