THE MANAGEMENT PROCESS OF PROJECT RISK IN SOUTH AFRICA

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Abstract

As enterprises need to remain financially viable and competitive in a business environment which changes continuously, projects are of prime importance to assist the transformation process. Executive managers should therefore play a proactive role by handling project risks during the project life cycle to ensure the successful completion of projects.
The objective of this research embodies the improvement of financial decision-making concerning the management of project risk. To achieve this objective, attention is paid, amongst others, to the project life cycle, the importance, duration and re-evaluation of the phases of the management process of project risk, the techniques used to identify, as well as analyse project risks, and alternative response strategies used when handling project risk. The various aspects mentioned will be addressed by means of a literature study and an empirical survey.

Keywords: Management process, Monitor and control, Project life cycle, Project risk, Response strategies, Risk analysis, Risk identification, Risk prioritisation

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1. Introduction and objective of the research

Enterprises have to be continuously transformed in order to remain financially feasible and competitive in an ever-changing business environment. Projects are needed to assist in the transformation process to achieve the desired business objectives and a sustainable competitive advantage (Frame, 2002:3).

Projects, however, are subjected to risks, which are particular circumstances of which the probabilities of occurrence and the possible alternatives are known and can be usually be measured (Diacon & Carter, 1992:4). This highlights the proactive role which risk management should play in the management process of project risk by handling the risk (Munns & Bjeirmi, 1996:84; Olsson, 2007:746). The lack of proper risk management may lead to project failure (Royer, 2000:6). According to Scharf (2009:53), a too small role allocated to risk management is often an important limitation in the management process of project risk.

When a project is executed successfully, despite the risks, it should provide a unique set

of benefits to the enterprise, ranging from the development of the technical skills of the organisation to obtaining an attractive return on the capital employed (Kerzner, 2006:23). It is, however, important that the allocation of resources should be done in a proper and responsible manner to provide a satisfactory product or service at the end of the project life cycle (Turner, 2000:65).

The *objective* of this research embodies the improvement of financial decision-making concerning the management process of project risk. In order to achieve this objective, this research focuses on the management process of project risk by highlighting, amongst others, the project life cycle, the importance, duration and re-evaluation of the phases of the management process of project risk, the techniques used to identify, as well as analyse, project risks and alternative response strategies used when handling project risk. The success of projects depends mainly on the manner in which project risks are managed. The various aspects of this topic will be addressed by means of the following literature study and empirical survey.

2. The project life cycle

As a project is a unique package of possibilities, it should have a sequence of activities and tasks to achieve specific objectives, deadlines and funding limits (Kerzner, 2006:2). In order to achieve its goals, a project has to go through the four stages, viz. (Chapman & Ward, 2003:17-24; Melton, 2007:7):

- The conceptualisation stage entails the identification of the product or service which will eventually be provided, as well as the benefits anticipated from the product or service.
- The planning stage embodies the design of the product or service, the planning of the execution of the project, together with the allocation of resources.
- The execution stage focuses on the actual production of the product or the development of the service.
- The termination stage has three goals in mind, namely the *delivery* of the product or service, the *review* of the process in order to avoid that the same mistakes are repeated when other projects are undertaken, as well as providing adequate *support* for the product or the service rendered.

3. The management process of project risk

Project risk management is a broad concept. Several processes have been developed to assist in the effective and systematic management of risks, with the intention of ultimately improving project performance. These processes include the PRAM (Project Risk Analysis and Management) process which was developed in the mid 1990s as a guide to risk management within projects (Chapman & Ward, 2003:65). Another guide for managing project risks appeared in 1998, namely the RAMP (Risk Analysis and Management of Projects) process, and in 2000 the Project Management Institute introduced a substantial standard for managing project risks called the PMBOK (Project Management Body of Knowledge) guide (Chapman & Ward, 2003:65).

To manage project risk through its life cycle, the management process primarily focuses on the following five consecutive managerial phases:

(1) Risk identification represents the first managerial phase, involving the identify-cation of risks to simplify decision-making (Edwards & Bowen, 2005:103). There are various techniques to assist in the identification of project risks. The *HAZOP* (Hazard and Operability studies) *technique* as well as the *FMECA* (Failure Mode and Effects Critically Analysis) *technique* both need the inputs of experts and are most effective in fairly simple flow processes that are of linear kind (Edwards & Bowen, 2005:105). The *Delphi technique* relies on the judgement and experience of experts and can be time consuming and expensive if the experts need to be compensated. (Kerzner, 2006:724). *Brainstorming* is a technique used in a group context to identify risks (Silvers, 2008:36). The group can consist of any number of participants and should preferably include the project team members, higher level of management and stakeholders. Although it is time consuming and requires firm leadership, brainstorming has the advantage of covering a wide variety of risks (Silvers, 2008:36). *Documentation review* involves re-examining documentation such as budgets, job descriptions, contracts, inspection reports, marketing plans, production schedules, emergency plans, insurance policies and personnel policies (Silvers, 2008:36). This technique should assist in exposing areas and activities of concern. The W*ork Breakdown Structure technique* can be used in combination with the *Gap analysis* (Silvers,

2008:38). *Gap analysis* is an analytical tool used to identify inconsistencies or missing components in the plans of the project which could lead to a potential risk. The *Work Breakdown Structure technique* is a swift and cost-effective technique, but may limit the range of potential threats identified. *SWOT analysis* is also an analytical tool that distinguishes the strengths, weaknesses, opportunities and threats of the project (Silvers, 2008:37). Although the strengths and opportunities can lead to positive risks, more attention should be given to the risks that might occur due to the weaknesses and threats. The *Fault Tree analysis* examines the underlying effects of every occurrence by developing a fault tree of events (Edwards & Bowen, 2005:108). *Fault Tree analysis* applies the same principle as a family tree and traces each event to its origin. *Event Tree analysis* also creates a tree of events but are the opposite of fault tree analysis in the sense that inductive reasoning are used to examine the consequences of every event (Edwards & Bowen, 2005:108).

The identification phase, however, does not only involve the search for sources of risk, but also includes the categorisation of those risks (Chapman & Ward, 2000:383). According to Kerzner (2006:725) the predictable external project risks can mainly emerge from economic risks (such as interest rate, inflation rate and foreign exchange rate risks), while the unpredictable external project risks usually surface from natural, political and competitive risks. Internal project risks may be technical of nature according to Kerzner, or may be financial or human resource risks.

(2) Risk analysis occurs when the *probability, impact* and *duration* of the identified risks are determined (Edwards & Bowen, 2005:11). This can happen by means of quantitative models or can be based on human judgement (Frame, 2002:85). The methodologies used to analyse the components of risks include, amongst others, Risk Scales, Risk Mapping matrixes, the Delphi technique and Influence diagrams. It is of utmost importance to use well known and systematic methods to ensure accurate results (Kerzner, 2006:721). An effective guide to articulate the *probability* of an event is by positioning the risk on a five point Likert interval scale using descriptions like rare, unlikely, possible, likely and almost certain (Edwards & Bowen, 2005:117). The *impact* of an event may be described in terms of cost, although the loss may not necessarily be in monetary terms. Assessing the impact of a risk may be done by using a five point Likert scale with intervals like insignificant, minor, moderate, major and catastrophic (Edwards & Bowen, 2005:119). The third component of risk is the *duration* of exposure to the risk. The evaluation of the duration is once again done using a five point Likert interval scale. The period of exposure can be described as short term, medium-short term, medium term, medium-long term and long term (Edwards & Bowen, 2005:121).

(3) Risk prioritisation involves the conversion of the risk analysis to a corresponding risk level (Kerzner, 2006:721). The prioritisation of a risk is therefore based on the *probability*, *impact* and *duration* of that risk, as described in the previous section. An illustration of the decision-making process is depicted as a cube where the *horizontal* side represents the probability of the risk (ranging from low to high probability), the *vertical* side represents the impact of the risk (ranging from small to large impact), and the *depth* of the cube representing the duration of the risk (ranging from short to long duration). Figure 1 illustrates the decision-making process concerning the prioritisation of risks.

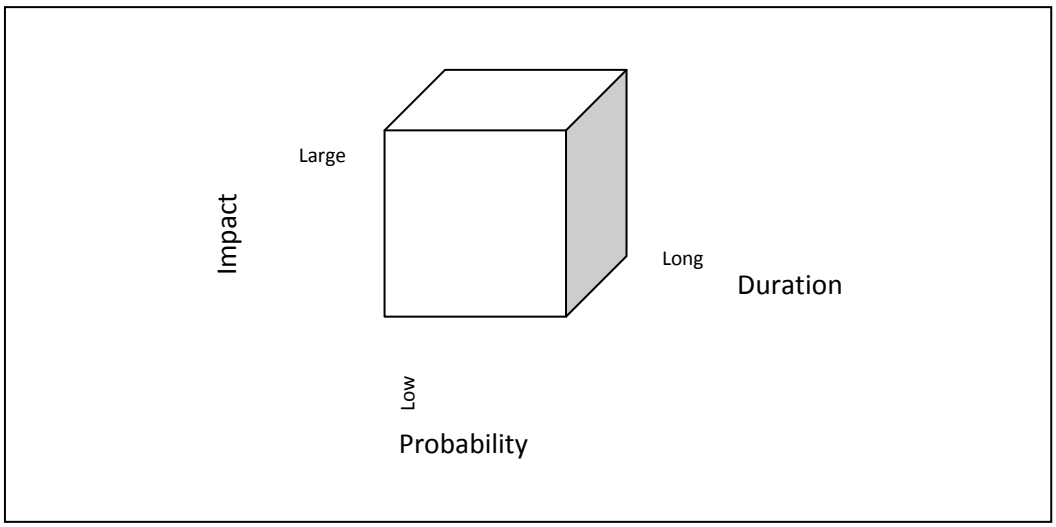

Figure 1. Decision-making process concerning the prioritisation of risks
(Source: Adapted from Edwards & Bowen, 2005:114)

The position of a particular risk within the cube will therefore indicate its risk level, for example a small impact, low probability, short duration risk may indicate a low risk level, compared to a large impact, high probability, long duration risk which may be assessed as a high level of risk. All the risks must thereafter be prioritised according to the acceptability of the various risk levels to a particular enterprise to ensure that the various risks are addressed in a suitable order according to the importance or degree of urgency (Silvers, 2008:38).

(4) The **response strategies** to risks can entail a number of alternatives, for example risk avoidance, risk reduction, risk transfer or risk retention, to name only a few (Edwards & Bowen, 2005:129-130; Frame, 2002:77 & 87). *Risk avoidance* is the most severe response strategy by considering the possibility to abolish the project entirely to avoid the negative impact of risks. Only when the expected extent of the risks is of an extreme nature, will this response strategy be contemplated. *Risk reduction* represents an approach of balancing the extent of the risk with the expected benefits, by trying to mitigate the extent of the risk. *Risk transfer* implies that an enterprise may transfer the actual business activities or the detrimental financial impact of the risks to other enterprises, by paying the enterprises to bear the risk. By applying *risk retention*, an enterprise is merely accepting the possible negative impact of the risks. Planning the application of the responses to the various risks, may lead to the emergence of secondary sources of uncertainties, initiating the reiteration of the management process of project risk from the risk identification phase (Chapman & Ward, 2003:105). According to Lester (2007:71) it is advisable to keep a risk register where each risk, the applicable response strategy and the employee responsible for the execution thereof are recorded.

(5) The **monitor and control** phase follows on the response strategies to ensure that effective risk handling actions are taken when necessary (Frame, 2002:87; Kerzner, 2006:747). It is recommended that trigger points are established for every risk, where the activation of a trigger will initiate the predetermined response plan (Silvers, 2008:32). Monitor and control are ongoing activities while a project is in progress.

The five consecutive phases to manage project risk must be applied to the entire project life cycle. This will increase the ability of an enterprise to manage risks on all levels during the project life cycle (Edwards & Bowen, 2005:95). Furthermore, it will prevent that risks are overlooked in earlier stages of the life cycle of a project, which may have more fatal consequences when they emerge during later stages (Chapman & Ward, 2003:20).

4. Research methodology

It was already stated that the objective of this research embodies the improvement of financial decision-making pertaining to the management process of project risk. It is therefore of prime importance to obtain the view of the market leaders in South Africa on the research topic, which provides the actual

frame of mind of the companies concerned. The empirical sample consisted of the top 20 listed South African companies based on their annual turnover for 2008 (Financial Mail, 2009). They are the market leaders of the South African business environment and are considered to set an example for the enterprises in South Africa. As South Africa is a developing country with an emerging market economy, the empirical results should also be valuable to enterprises in similar countries.

The literature study was used to construct a questionnaire, which was sent with covering letters to the executive managers who are responsible for the management of project risk at the 20 companies. Five of them replied that they are not involved in projects at all, due to the fact that they only control financial investments and that the research topic therefore did not apply to them. The actual sample was thus decreased to 15 companies. After following up, 12 completed questionnaires were available. The response rate is consequently equal to 80%. The empirical results obtained are discussed in the next part of this paper.

5. Empirical results

The empirical results are presented in the following sections:

5.1 The importance of the phases of the management process of project risk

Table 1 contains the importance of the five phases of the management process of project risk according to the respondents.

Table 1. The importance (in terms of the monetary amounts involved) of the phases of the management process of project risk, as perceived by the respondents

The phases of the management process of project risk	Extremely important	Highly important	Moderately important	Little important	Not important
Risk identification	10	2			
Risk analysis	7	5			
Risk prioritisation	7	3		2	
Response strategies	8	3	1		
Monitor and control	7	5			

In order to obtain a clear depiction of how important the respondents perceive the five phases of the management process, different weights were assigned to the responses. The various phases were thereafter ranked in a declining order of importance. The application of weights was possible as it was explicitly stated on the questionnaire that the five point Likert interval scale used, forms a continuum whenever it was applied (Albright, Winston & Zappe, 2002:224-229 & 245).

Where applicable in this research paper, the following weights were assigned to the responses received from the respondents:

Assigned a weight of 5 for:	Extremely important /	More than 9 days /	Always
Assigned a weight of 4 for:	Highly important /	7 to 9 days /	Very often
Assigned a weight of 3 for:	Moderately important /	4 to 6 days /	Sometimes
Assigned a weight of 2 for:	Little important /	1 to 3 days /	Seldom
Assigned a weight of 1 for:	Not important /	Less than 1 day /	Never

The weighted responses on the importance of the phases of the management process of project risk as perceived by the respondents, are shown in Table 2.

Table 2. The weighted responses on the importance of the phases of the management process of project risk as perceived by the respondents, in a declining order of importance

Total weighted score calculated	Declining order of importance	The phases of the management process of project risk
58	1	*Risk identification*
55	2	*Risk analysis*
55	2	*Response strategies*
55	2	*Monitor and control*
51	5	*Risk prioritisation*

While the identification of risk is perceived to be the most important phase of the management process of project risk, the following three phases are equally important. They are the phases of risk analysis, response strategies, as well as monitor and control. It is interesting to notice that the first four phases in the declining order of importance are also in a logical sequence. The prioritisation of risk is considered by the respondents to be the phase of the management process which is least important.

5.2 The duration of the phases of the management process of project risk

The duration of the five phases of the management process of project risk is addressed in Table 3.

Table 3. The duration in total working days (not necessarily on a continuous basis) spent on the phases of the management process of project risk, as perceived by the respondents

The phases of the manage-ment process of project risk	Less than 1 day	1 to 3 days	4 to 6 days	7 to 9 days	More than 9 days
Risk identification	1	6	2	2	1
Risk analysis	2	5	1	3	1
Risk prioritisation	6	4		1	1
Response strategies	4	5		1	2
Monitor and control	1	4	3	1	2

Note: One of the respondents did not provide answers to all the alternatives.

The responses of the 11 respondents who provided answers to all the alternatives according to Table 3 were weighted as discussed previously, and the weighted responses are shown in Table 4. It should be kept in mind that "more than 9 days" has a score of five, while "less than 1 day" has a score of only one.

Table 4. Weighted responses on the duration in total working days (not necessarily on a continuous basis) spent on the phases of the management process of project risk, in a declining order of duration

Total weighted score calculated	Declining order of duration	The phases of the management process of project risk.
32	1	*Monitor and control*
31	2	*Risk identification*
31	2	*Risk analysis*
27	4	*Response strategies*
22	5	*Risk prioritisation*

Note: As one of the respondents did not provide answers to all the alternatives of Table 3, the weighted responses are based on the answers of the 11 companies who did answer all the alternatives.

The monitor and control phase has the highest weighted score and thus receives the most working days. Risk identification and risk analysis are the phases which receive the second most working days according to the respondents. It should be mentioned that the prioritisation of risks receives the lowest number of working days which corresponds with the results of Table 2 where this particular phase of the management process was also considered by the respondents to be the phase which is least important. It is interesting to note that the response strategies phase receives less working days than risk analysis as well as monitor and control, even though these phases are ranked as equally important in Table 2.

5.3 The frequency of the re-evaluation of the phases of the management process of project risk

The frequency with which the respondents re-evaluate the phases of the management process of project risk is provided in Table 5.

Table 5. The responses on the frequency of the re-evaluation of the phases of the management process of project risk, as perceived by the respondents

The phases of the management process of project risk	Always	Very often	Sometimes	Seldom	Never
Risk identification	4	7	1		
Risk analysis	4	4	3	1	
Risk prioritisation	2	3	5	2	
Response strategies	3	6	3		
Monitor and control	5	3	3		

Note: One of the respondents did not provide answers to all the alternatives.

Eleven respondents provided answers to all the alternatives which appear in the preceding table. These responses were weighted as described previously and the weighted responses are depicted in Table 6.

Table 6. Weighted responses on the frequency of the re-evaluation of the phases of the management process of project risk, in a declining order of frequency

Total weighted score calculated	Declining order of frequency	The phases of the management process of project risk.
47	1	*Risk identification*
46	2	*Monitor and control*
44	3	*Response strategies*
43	4	*Risk analysis*
37	5	*Risk prioritisation*

Note: As one of the respondents did not provide answers to all the alternatives of Table 5, the weighted responses are based on the answers of the 11 companies who did answer all the alternatives.

It is important to notice that the first as well as the final phase of the management process of project risk are most frequently re-evaluated, while the response strategies and risk analysis are also frequently re-assessed. It seems that risk prioritisation is not so often re-evaluated as the other four phases of the management process of project risk. As risk identification is the particular phase which is most frequently re-assessed, it is appropriate that the techniques which are applied in this phase receive due attention in the next section.

5.4 The techniques used to identify possible project risks

As it is important to identify project risks, the following table shows how frequently the techniques are used.

Table 7. The responses on the frequency of the techniques used to *identify* possible project risks, as perceived by the respondents

Techniques	Always	Very often	Sometimes	Seldom	Never
HAZOP (Hazard and Operability studies)	2	2	3		5
FMECA (Failure Mode and Effects Critical Analysis)	1	2	2	2	5
Delphi technique	2	3	5		2
Brainstorming	5	7			
Documentation review	4	7	1		
WBS (Work Breakdown Structure)	2	3	3		3
Gap analysis	2	5	2	1	2
SWOT analysis	5	3	3	1	
Fault Tree analysis	1		6	3	2
Event Tree analysis	1		5	4	2

Note: One of the respondents did not provide answers to all the alternatives.

The responses of the 11 respondents who answered all the alternatives of the preceding table, were consequently weighted by using the weights that were previously discussed. The weighted responses appear in Table 8.

Table 8. Weighted responses on the frequency of the techniques used to identify possible project risk, in a declining order of frequency

Total weighted score calculated	Declining order of frequency	The techniques used to identify possible project risk
48	1	*Brainstorming*
47	2	*Documentation review*
44	3	*SWOT analysis*
36	4	*Gap analysis*
35	5	*Delphi technique*
34	6	*WBS (Work Breakdown Structure)*
31	7	*HAZOP (Hazard and operability studies)*
28	8	*Fault Tree analysis*
27	9	*FMECA (Failure Mode and Effects Critical Analysis)*
27	9	*Event tree analysis*

Note: As one of the respondents did not provide answers to all the alternatives of Table 7, the weighted responses are based on the answers of the 11 companies who did answer all the alternatives.

According to the preceding table, *Brainstorming* is the technique most often used to identify project risk. As *Brainstorming* is applied in a group context, it is time consuming, but a variety of risks can evolve due to the contribution of the different project members, higher level of management and other stakeholders. By re-examining available documentation concerning various functional areas in an enterprise, the application of the *Documentation review* has the ability to draw attention to a range of areas and activities of concern. The technique which is third in line concerning the frequency used to identify project risks, is the *SWOT analysis*. This technique focuses on the strengths, weaknesses, opportunities and threats of an enterprise, where the weaknesses and threats should receive special attention.

Although some of the techniques are used more often than others to identify project risks, it is important to notice that each one of the 10 techniques are used by the market leaders of the South African business environment. The executive managers of the business community should therefore have adequate knowledge and skills to apply these 10 techniques, which should be to the benefit of the business community at large.

5.5 The techniques used to analyse possible project risks

Enterprises can utilise various techniques to analyse project risks which were identified. Table 9 provides the responses on the frequency of the techniques used to analyse possible project risks, as perceived by the respondents.

Table 9. Responses on the frequency of the techniques used to *analyse* possible project risks, as perceived by the respondents

Techniques	Always	Very often	Sometimes	Seldom	Never
Risk Scales	3	2	3	4	
Risk Mapping matrixes	2	3	3	4	
Delphi technique	2	3	5		2
Influence diagrams	1	1	4	2	3

Note: One of the respondents did not provide answers to all the alternatives.

The responses were once again weighted to obtain a clear picture of the results. This was done as previously described. The weighted responses on the frequency of the techniques used to analyse possible project risks appear in the following table.

Table 10. Weighted responses on the frequency of the techniques used to analyse possible project risks, in a declining order of frequency

Total weighted score calculated	Declining order of frequency	The techniques used to analyse possible project risks
35	1	*Risk Scales*
35	1	*Delphi technique*
34	3	*Risk Mapping matrixes*
28	4	*Influence diagrams*

Note: As one of the respondents did not provide answers to all the alternatives of Table 9, the weighted responses are based on the answers of the 11 companies who did answer all the alternatives.

It is clear from Table 10 that three techniques are almost equally popular in practice. They are the *Risk Scales, Delphi technique* and the *Risk Mapping matrixes*. Emphasis should therefore be placed on these three techniques when enterprises are analysing possible project risks.

5.6 Response strategies used for handling project risks

The final part of this research paper pays attention to the response strategies which are employed when enterprises are handling project risks. Table 11 contains the frequency of response strategies used by the respondents in connection with the handling of project risks.

Table 11. Responses on the frequency of the response strategies used when handling project risks, as perceived by the respondents

Response strategies	Always	Very often	Sometimes	Seldom	Never
Risk avoidance	5	4	3		
Risk reduction	6	5	1		
Risk transfer	3	3	4	2	
Risk retention	1	4	4	2	1

As previously discussed, the responses were weighted. The weighted responses on the frequency of the response strategies employed by the respondents when handling project risks, are depicted in the following table.

Table 12. Weighted responses on the frequency of the response strategies used when handling project risks, in a declining order of frequency

Total weighted score calculated	Declining order of frequency	The response strategies used when handling project risks
53	1	*Risk reduction*
50	2	*Risk avoidance*
43	3	*Risk transfer*
38	4	*Risk retention*

It is not surprising that risk reduction is the response strategy that is most often used by the respondents when they are handling project risks. This is due to the fact that risk reduction strives to balance the extent of the risk with the anticipated benefits from the project, thus making an effort to mitigate the extent of the risk without losing the financial return on the project.

It is, however, an unexpected finding that risk avoidance is applied more frequently than risk transfer and risk retention. By considering the chance to lose the financial benefits of a project due to an unacceptable risk, risk avoidance focuses the attention on the expected impact of risks which must be of an extreme nature.

Although risk transfer does not seem to be utilised so frequently as risk reduction or risk avoidance, it represents a viable response strategy by either transferring the business activities or the adverse financial impact of the risks to other enterprises. These enterprises will then carry out the business activities or bear the detrimental financial impact of the risks while earning compensation for their business involvement.

6. Conclusions

The objective of this research embodies on the improvement of financial decision-making concerning the management process of project risk. The empirical survey was done in South Africa, and as this country is a developing country with an emerging market economy, the conclusions of this paper should also be valuable to enterprises in other developing countries. The findings of this research paper emphasise the following important conclusions:

(1) The identification of risk is seen as the most *important* phase of the management process of project risk by the respondents, while the phases of risk analysis, response strategies, as well as monitor and control, are perceived to be equally important. Enterprises should benefit by viewing risk prioritisation in a more important light, as this phase is considered by the respondents to be least important.

(2) The monitor and control phase has the highest weighted score and thus receives the most *working days*. Risk identification and risk analysis are the phases which receive the second most working days according to the respondents. It should be mentioned that the phases of response strategies and risk prioritisation do not receive equal attention from the respondents, which should be rectified as they are also vital phases in the management process of project risk.

(3) It is important to notice that the first as well as the final phase of the management process of project risk, viz. risk identification as well as monitor and control, are most frequently *re-evaluated*, while the response strategies and risk analysis are also frequently re-assessed. It is clear that risk prioritisation is not so frequently re-evaluated as what it should be.

(4) According to this research, *Brainstorming*, *Documentation review* and the *SWOT analysis* are the techniques most often used to *identify* project risk. It is, however, important to notice that each one of the 10 techniques are to a certain extent applied by the respondents when identifying project risks. Knowledge and skills concerning these techniques should be valuable to executive managers of the business community.

(5) *Risk Scales,* the *Delphi technique* and the *Risk Mapping matrixes* are the techniques most often used to *analyse* project risk. It is therefore recommended that emphasis should be placed on these techniques when enterprises are analysing possible project risk.

(6) While it is not surprising that risk reduction is the *response strategy* that is most often used by the respondents when they are handling project risks, it is an unexpected finding that risk avoidance is applied more frequently than risk transfer or risk retention.

This focuses the attention on the anticipated impact of risks of such an extreme nature, that enterprises are considering the chance to lose the financial benefits of a project by avoiding the risks.

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