Diagnosing risks in new product development

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INTRODUCTION

Operating in highly competitive environments a growing number of companies must regularly launch new products speedily and successfully. Research has found that developing and launching new products are inherently risky endeavors: about 40 percent of such projects fail (cf. Edgett, Shipley, and Forbes, 1992; Page, 1993).

In an effort to enhance the success of new product development projects, firms increasingly use formalized and structured processes. Griffin concludes that the companies, which perform best in NPD focus on improving performance not just in any one aspect of NPD, but on simultaneously improving several managerial aspects of NPD (Griffin, 1997: 452). Among these managerial aspects, researchers have paid relatively little attention to the topic of risk management. The concept of risk has been only loosely defined and little effort has been made to the development and empirical validation of models, metrics and tools to identify, evaluate and manage risks in product development. Since the early nineties a research group at the Eindhoven University of Technology has been working on this gap. In this paper the basic characteristics are described of the Risk Diagnosing Method (RDM), a systematic procedure to identify, evaluate and manage risks in product development. To put the RDM into perspective we will start with relating our approach to other existing methods, then the basics of the RDM will be described, and we will conclude with providing some evidence for the usefulness of the RDM.

DIAGNOSING RISKS METHODS

In the past a few attempts have been made to deal with risks, from which the most widely applied ones are listed below.

Potential Problem Analysis (Kepner and Tregoe, 1965; Ho, 1993). According to Kepner and Tregoe, problems are usually a result of "changes". However, not all changes cause problems. The search for the cause of a problem narrows down to the search for that change which should produce the precise effects observed through some area of distinction. This change may consist of several elements and conditions taken together as a complex change, or it may consist of a simple, single element. But in any case, there is only one change, simple or complex, which can produce the exact effect observed. This change will be found through analyzing the facts used in specifying the problem. Analysis of these facts is thus the crux of problem solving.

Fault Tree Analysis. (Pilot, S. 2002). The fault tree analysis (FTA) was first introduced by Bell Laboratories and is one of the most widely used methods in system reliability, maintainability and safety analysis. It is a deductive procedure used to determine the various combinations of hardware and software failures and human errors that could cause undesired events (referred to as top events) at the system level. The main purpose of the fault tree analysis is to help identify potential causes of system failures before the failures actually occur. It can also be used to evaluate the probability of the top event using analytical or statistical methods. These calculations involve system quantitative reliability and maintainability information, such as failure probability, failure rate and repair rate. After completing an FTA, one can focus your efforts on improving system safety and reliability.

Failure mode and effects analysis (Cotnareanu, 1999) The FMEA is a systemized group of activities intended to recognize and evaluate the potential failure of a product or process, identify actions that could eliminate or reduce the likelihood of the potential failure occurring and document the entire process. FMEAs help manufacturers prevent defects, enhance safety and increase customer satisfaction. Most are conducted in the product design or process development stages, but conducting an FMEA on an existing product and process can also be beneficial.

Next to unmistakable benefits, these methods also show some serious deficiencies. The most apparent ones are:

Data gathering is very often through brainstorming in group sessions. The outcomes of such sessions may be biased by groupthink and escalation of commitment effects introduced through the *composition of the group and the process it is using* (Janis, 1982; Bazerman, 1990; Schmidt & Calantone, 2002). If confronted with persons with different disciplinary backgrounds and or hierarchical levels members of a group session may hesitate to label factors as risky or not risky. Brainstorming is vulnerable as it may fail to trigger people to think of the not obvious risks. Thus in diagnosing risks in NPD, a data gathering procedure is needed that minimizes the social influence on individuals when they give meaning to the risks involved.

Prioritising the list of risks is almost always done by multiplication of occurrence and impact, e.g. what is the probability of occurrence and how severe are its consequences. However, managers do not see risk as a number but deal with risk in terms of losses of meaningful amounts that come from a process over which one can have some control. On the whole, the managers see themselves as risk takers who must continually act to *manage risks*. Thus a third concept is required to define risk, namely: the *influenceability* of the problematic event (Halman & Keizer, 1994; Keizer et al. 2002) or *control of risk* (Shapira, 1995).

Focusing on parts of the risks. These approaches primarily focus on potential failures in the technology of the new product, ignoring organizational and market related risks. The success of product innovation, however, is determined by *both* external influences *and* internal circumstances in which all these factors interact. To be effective, a risk assessment method therefore needs to help identifying potential risks in more domains than the technology domain.

The RDM, has been developed to overcome these shortcomings. To avoid biases due to group-effects in RDM the risks related to an NPD-project are identified via individual interviews. In these interviews they are invited to formulate the risks they perceive in the project, given their personal task in the team and their individual knowledge, skills and experiences. Within RDM a conception of risk is used that combines occurrence, impact and control. A particular project activity aimed at a specific result of the product to be developed should be seen as "risky" if:

1. The likelihood of a bad result is great
2. The impact on the success of the NPD-project is great
3. The ability to influence it within the time and resource limits of the project is small

To encourage an integral perspective on risks, four risk-domains are taken into account.

1. *Technology*: product design and platform development, manufacturing technology and intellectual property
2. *Market*: consumer and trade acceptance, public acceptance and potential actions of competitors
3. *Finance*: commercial viability
4. *Organization*: internal organization, project team, co-development with external parties and supply and distribution

For all these domains, the principal question is *what is new or different in the knowledge and skills this project requires of the company in general and the project team in particular.*

THE STEPS INVOLVED WITH THE RISK DIAGNOSING METHOD

The purpose of RDM is to provide strategies that will improve the chances of success of NPD-projects by identifying and managing its potential risks. The main steps involved with the diagnosis and management of risks are listed below.

1. *Risk identification* includes the steps whereby the individuals involved are being interviewed individually and systematically by a risk facilitator. This risk facilitator is someone who is *not* a member of the project team and during each interview addresses the perceived technological, organizational and business risks for the project. Larger companies have line or staff persons for whom risk facilitation is (part of) their job. Small companies do not have these resources. In their case a senior colleague from outside the project can be asked to take the role of facilitator.
2. *Risk assessment* includes the steps to design a risk questionnaire, which contains all the critical issues mentioned during the interviews. Through this questionnaire each participant is asked to give a second opinion about all critical issues.
3. *Risk response development and control* include the steps to develop creative and effective action plans for dealing with the risks identified during the risk assessment. The results of the risk assessment are presented to a plenary meeting of those who have been interviewed. In this risk management session the standing project planning and problem solution approaches are evaluated against the risks that have been identified, and new creative directions for problem solving are being generated. This can lead to either to action plans that can result in a revised project planning or in a decision to terminate the project.

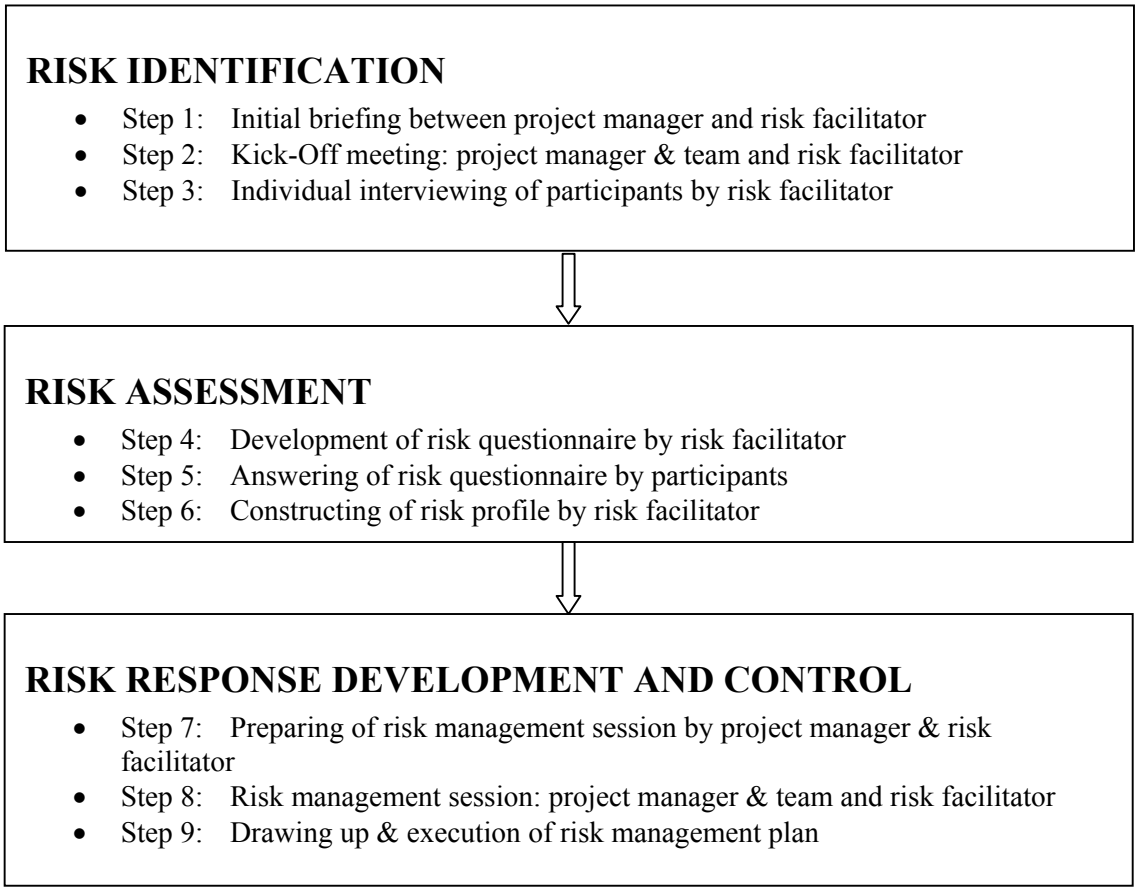

Figure 1: Outline of RDM

EXPERIENCED VALUE OF RDM

Over the past ten years, RDM has been applied extensively in developing such products as automobile tires, ship propellers, printing equipment, landing gear systems, audio and video equipment, and fast-moving consumer goods like lamps, shampoo, margarine and detergents. Results from working with RDM suggest that professionals participating in the area of NPD are satisfied with the way RDM allows them to identify, confront and manage risks in their projects. This is the main conclusion from an evaluation study carried out among nine project managers, who were interviewed about their experiences with RDM.

The detailed results from the evaluation study are summarized in table 2.

Issues	Projects								
	1	2	3	4	5	6	7	8	9
Phase in product development process	F	I	F	F	F	C	I	F	F
Would you use RDM again?	y	y	y	y	y	y	y	y	y
Did RDM change your thoughts on the project?	n	n	y	y	n	y	y	y	n
Did the triggerlist help to elicit risks you had not thought of before?	n	n	y	y	n	y	y	n	n
Did the interview help to elicit risks you had not thought of before?	y	n	y	y	y	y	y	y	y
Was the risk management session useful?	y	n.c	y	y	n.c	y	y	y	y
By hindsight, did RDM elicit all main risks?	y	y	n	n	y	y	n	y	y
Did RDM contribute to the management of the project? (scale 1 – 10)	6	4	7	7	5	7	7	7	3
Personal time required to perform the RDM? (scale 1 = OK, 5 = too much)	1	1	1	1	1	1	1	1	2
Overall technical success of the project (scale 1 – 10)	?	8	4	8	6	8	8	no intro	?
Overall market success of the project (scale 1 – 10)	?	7	6	8	5	8	5	no intro	?

Table 2: Results from 9 RDM applications in evaluation study

(F: feasibility phase; I: implementation phase; C: capability phase; n: no; y: yes; n.c: no plenary session carried out; no intro: product has not been launched yet; ?: product was launched but success could not yet been judged)

The evaluation study shows that the project managers perceived RDM overall as a useful contribution to the management of their projects. All of them would have RDM applied to their future projects. And they perceive the time required to perform the RDM as quite reasonable.

On the question whether applying the RDM did change thoughts on the project, four project managers say 'no' and five say 'yes'. This difference seems not to be related to the scores on the other questions. There is not a specific profile of those who indicate change of thought opposed to those who did not. Apparently the value attributed to RDM stems not from its ability to change project managers' thoughts. This reaction may be due to different mechanisms: maybe managers find it difficult to recognize or admit that an intervention from outside makes them change their thoughts. It is also possible that other revenues compensate for not gaining new thoughts, for example the experience that the project team is teaming up more than before.

Within the RDM risks are being identified through individual interviews with members of the project team and relevant persons outside the team. A triggerlist with potential critical issues has been developed and is used in the identification process. The RDM interview protocol implies that before respondents are interviewed the triggerlist is provided to them. The list is meant as a stimulus for recognizing the risks in the project they are interviewed for. At the end of the interview the interviewer asks the respondent to look once more at the triggerlist to see whether there are still issues that require to be addressed. The evaluation study shows that the interview is a powerful stimulus to think of risks people had not thought of before. Comments project managers made support this outcome. They said: "The non-judgmental role of interviewer was very stimulating", "I was forced to explain the project".

On the stimulating effect of the trigger list project managers have a much more differentiated image. Five out of the nine replied that the trigger list did not stimulate them to think of risks they had not been thinking of before. Explanations included for the no's: "No, but it clarified what I was thinking already", "No, the risks were already clear from my perspective". And for the yes's: "Yes, forced me to think about everything that can go wrong, rather than only about the area I am familiar with", "Yes, helps people to think also of all the awkward questions about areas they do not know anything about", "Yes, forces you to think cross-functionally".

For specific reasons the plenary risk management session has not been carried out in two out of the nine projects. The seven project managers who reported that such a session was part of their process, were unanimously positive on the usefulness of the meeting. Comments: "We got everyone together again and we had an open discussion"; "Extremely useful; dragged out a lot of new information for the project team; input form lonely voices became known".

A question of special importance in this evaluation relates to the extent that RDM did elicit all the main risks. Three out of the nine project managers said that by hindsight not all the main risks were anticipated by RDM.

In the first of these projects two risks were not anticipated: Two projects were fighting in an unmanaged way for the same market window, and how well founded the concept for the new product was. The reasons why these risks were not identified were, concerning the rivalry issue: "The focus was on our project; asked much about details of project instead of about broader issues", and regarding the concept issue: "Too emerged in project. Took it for granted". Could the issues have been anticipated at that moment in time? Project manager: "Yes, they could have". Did missing these issues affect the success of the project? Project manager: 3 on a scale from 1 – 10.

In the second of the three projects for which a project manager indicated that the RDM failed to elicit all risks, one main risk was not anticipated: Problems regarding regulatory approval in different countries. By hindsight the reason was lack of experience within the team with this item. Could the issue have been anticipated at that moment? Project manager: "We did not make as much use of external experts as should have been done".

Impact on the success of the project: 3 on a scale from 1 – 10. “The delay was not crucial in the end.”

In the last of the three projects two risks were not anticipated: Not recognizing that consumers do not like big packs for the product involved, and not having foreseen that competitors would challenge the product function. According to the project manager the consumer acceptance issue was not seen because of a cultural problem: There was a strong habit to walk away after launch without looking into the future; as a consequence no plans had been made to develop a more acceptable pack. The competitor’s challenge was not anticipated because the team had no proactive approach for legal challenges. Could these issues have been foreseen? Project manager: “Yes, because we make these mistakes all the time.” The impact of the first issue: 9 (out of 10) and of the second issue: 3.

The project managers were also asked to formulate what they see as the benefits of RDM. Their answers are summarized in table 3.

1. Interviews are key. RDM should be integrated into full project life cycle
2. Involvement of senior management in process gave a broader perspective to potential risks. Surprised that so many high level people were forced to sit down for two hours to think about the project
3. It is a formal and non-blame way of getting out risk issues
4. Essential team tool for identifying and managing risks
5. One of the most useful initiatives we have had. Tool for focusing project team’s minds and communicating things in an effective manner
6. RDM helps to get team ownership of problems and faces problems in holistic way.
7. A safety net to slow the business down in a positive way; it stops teams who mean hurting the company
8. It gives all the team members an equal say in what the risks are; it makes it difficult for problems to be ignored
9. It gets the team talking

Table 3: Testimonials about benefits of RDM from nine project managers

The overall conclusion of the evaluation study can be that users see the RDM as useful for the performance of their new product development project. The method helps teams recognize most of the risks and focus minds. The RDM could be blamed for not having recognized all main risks in all projects. But this omission could also be seen in another perspective. Risk identification is inherently subjective, bound as it is to the ability and readiness of members of the organization to perceive and report potential threats. The project managers report that they perceive very positive group effects: individuals say what they think and teams develop more focus after RDM has been applied to their project. The assumption might be that the greatest problem in risk identification is not people’s readiness but their ability to perceive and report risks. When the project manager of the above mentioned project states that there is a cultural problem, he refers to the need to reflect on the organizational routines. RDM has deliberately been designed to encourage individuals and teams to do so. The evaluated cases show that this is difficult to achieve. Those who are responsible for risk identification and risk management in complex projects have to recognize that absolute certainty about risks is beyond reach. Repeatedly applying RDM and critically evaluating the results after projects have been completed - with success or failure – provides knowledge about the risks that are company specific and can highlight the blind spots members of the company family inevitably incur after longer or shorter time.

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