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RISK MANAGEMENT IN INNOVATIVE SME's: A WEB-BASED MODEL

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ABSTRACT

This work proposes an integrated web-based platform that will provide to Small and Medium Enterprises (SME's) the capability to identify, evaluate and manage risks associated with new product development projects. It will bring forward a proposed tool to help defining and control the new product development management process, from its idealization to its commercialization, helping SME's to improve the management process of innovative products in order to increases their successful rates. This tool was developed in a Portuguese SME company, developer of products and services which conducts research and development in the solar photovoltaic industry, and this paper will also present a brief literature review of risk management models to SME's, as well as it will provide a state of art of similar tools available.

Keywords: risk management, organizational innovation, SME's, new product development.

INTRODUCTION

In a constantly changing and competitive environment at a global scale, enterprises struggle to survive and grow. The quick development of new technology brings difficult challenges however it also introduces opportunities (Yang & Man-li, 2010).

In the increasingly globalized and demanding marketplace, the integrated capability to innovate is becoming a predominant strategy to deal with competition and swift technology changes. Being able to predict and respond to changes has become a solid path for companies to avail the emerging opportunities (Ebrahim, Ahmed, & Taha, 2010).

As refer by Black (2003), according to Oxford dictionary, innovation is the action or process of creating a new method or idea, however in the present assay innovation will be stated as the core capability to master and maintain holistic value, creating dynamics in which the opportunities of change are exploited and new ideas are generated, translated and implemented (Hewitt-Dundas, 2004). This organizational innovation embraces sundry concepts that can be approached through different types of innovative activity: new products; new services; new methods of production; new markets; new sources of supply or new organizing methodologies (Johannessen et al, 2001). However, this paper will be focused on new product development (NPD), as well as the inherent projects associated with the processes of innovative products, and its formalization of conformed procedures, particularly in SME's.

In order to have success in the conception of a new product, it is primordial the utilization of a formal process in the development of new products (Griffin, 1997). Thus, as the essence of product innovation is to create or establish something new, its process will always have one or

more components bonded to an inherent risk of success (Taplin, R., 2005). Thereby, and since the purpose of an integrated risk management process is to facilitate innovation rather than stifle it, innovating firms require a strategy not of risk avoidance, but of early risk diagnosis and management (Keizer, Halman, & Song, 2002). Nevertheless, little effort has been made to develop empirical models, metrics and tools to accurately assist SME's in the risk management of innovative projects. (Aleixo & Tenera, 2009). Plus, relevant empirical studies show severe discrepancies regarding the attitudes towards risk and risk management, between SME's and large firms (Brancia, 2011; Jayathilake, 2012).

SME's, have usually inevitable limitations regarding internal resources constraining the firm's ability to engage in innovative activities (Freel, 2005), because frequently they are fully occupied with solving short-term operational problems, which conducts them to a lack of attention to their long-term strategy and to disregard the risk management importance, remaining stuck in a permanent operational problem solving (Vos, Keizer, & Halman, 1998). Moreover, as the percentage of existing SME's around the world stands over 97% (Brancia, 2011) the lack of studies regarding the risk assessment and management in innovative projects of SME's brings some increased concerns. Therefore, this paper seeks to present a tool to help overcome this lack of attention regarding the risk assessment and management in innovative projects, and aspires to satisfy the necessity of innovative SME's with a useful and pragmatic approach to manage the risks of their innovative projects, providing a NPD risk management methodology. Thus, it will be presented an integrated risk perception, management and response tool, Spotrisk®, designed to SME's and startups, which will provide them an early stage risk assessment throughout a web-based platform

ASSESSING RISKS IN INNOVATIVE SME's

A) Current Methodologies

SMEs are typically characterized with an owner's central role, multiplicity of duties and employees close identity (McKiernan & Morris, 1999). Further, a managing director often engages on overall risk assessment by himself, not discussing risk aspects to any great extent with the employees, due to the lack of knowledge of the methods exercised to identify and assess risks, resulting that enterprises in their starting phase often underestimate risks, ignoring them or generally having only one risk strategy, bearing the risks (Henschel, 2008). Plus, most of SMEs do not have the necessary resources to employ specialists at every position in the firm, focusing on their core business and having generalists for administration functions, such as risk management (Matthews & Scott, 1995). However, apart to the inherent intuition from owners or managers, the induced risk assessment models, when used, are usually based on general project management and strategic practices, such as the use of Balanced Scorecard (BSC).

The BSC instruments are intended to facilitate the monitoring of a firm's success factors, which can be sighted as opportunities as well as risks at the same time, meaning that the BSC is by nature an instrument contently close to risk's ground. The concept of BSC is based on 4 main perspectives: financial perspective; customer perspective; internal perspective; and Innovation and learning (Wang, Linb, & Huangc, 2010). Regarding a risk assessment, each of the 4 perspectives is extended by a risk aspect, where the corresponding risks and their influencing variables are assigned to the selected goals in the four perspectives, together with a description of the measurement of risks and measures to control them. As soon as the critical target values are reached, a report is generated and the process of preparation and

maintaining of a risk-adjusted BSC is primarily handled by the controlling function (Henschel, 2008). This represents a practical approach and it can be established without any great effort if a BSC has already been implemented. Nevertheless, SMEs do not tend to use special techniques to identify nor manage risks and literature related is quite limited and still in an early phase of development (Jayathilake, 2012). Moreover, due to limitations regarding infrastructure, management, technical expertise, intellectual and financial resources, SME's are far from adopting a positive approach towards risk (Janney & Dess, 2006).

B) Risk Diagnosing Methodology

Risk Diagnosing Methodology (RDM), developed by Jimme A. Keizer, Johannes I.M. Halman and Michael Song, allows a firm to diagnose the technological, organizational and business risks which a project faces, as well as to formulate and implement suitable risk management strategies. This process involves 9 essential steps using a risk facilitator (risk specialist) through risk management process with the following three phase, (Keizer, Halman, & Song, 2002):

Risk Identification
- Step 1: Initial briefing between project manager and risk facilitator;
- Step 2: Kick-Off meeting: project manager & team and risk facilitator;
- Step 3: Individual interviewing of participants by risk facilitator.

Risk assessment
- Step 4: Development of risk questionnaire by risk facilitator;
- Step 5: Answering of risk questionnaire by participants;
- Step 6: Constructing of risk profile by risk facilitator.

Risk Response development and control
- Step 7: Preparation of risk management by project manager & risk facilitator;
- Step 8: Risk management session: project manager & team and risk facilitator;
- Step 9: Drawing up & execution of risk management plan.

In this approach, the team members answer a questionnaire developed by the risk facilitator, a risk profile is then created and later it is performed a risk management session to draw action plans to deal with risks.

Thus, this methodology, conducted for a specific project, generates proactive and cross-functional solutions for managing specific project risks effectively. A company might also use RDM outcomes to search for structural weaknesses in their innovation process. This could yield the necessary data to accelerate learning, to increase a company's innovation capabilities and by this its innovation success (Keizer, Halman, & Song, 2002). Therefore, it is plausible to assume that RDM methodology gathers by far a more extensive list of benefits than the risk-adjusted BSC, as for risk identification/management or for innovative capabilities.

C) Main Assessing Support Tools

As a foundation to the research and development of aftermost presented tool, four existing tools were studied to conduct an analysis of the available responses to the necessities in assessing risks in innovative SME's. The models identified used mainly a qualitative risk approach based on uncertainties and nearly all of them identifies, prioritizes and address the risks. However, none of the tools is suitable per se to SME's.

For instance, tools such as *riskcloud* or *Iris Intelligence*, despite being cloud-based, visually appealing and user-friendly, they are both expensive and targeted to an organizational risk management, instead of focusing on a specific project risk management. On the other hand, versatile tools such as *ProjectFuture* and *RiskyProject*, which are targeted to projects and embrace a list of risk effects, causes and responses, being able to associate them with tasks or dates, are complex, need heavy software installation and involve dilatory and slow processes.

Therefore, from the tools found in research, either are too expensive for the resources usually available to SME's; or too complex, compelling the company to exempt precious time or to channel engaged resources to an activity which, according to the existing mentality of most SME's managers, is not a binding activity.

Ultimately, accordingly to the study performed for SME's developing innovative product development projects it will be useful a risk management tool based on RDM, as this approach merges as a sharp model and robust solution if adapted to a platform where it could drop the existing complexity, time expenditure and facilitator.

PROPOSED TOOL - SPOTRISK®

The Spotrisk® was developed as a web-based platform for, adequately address the conditions and limitations of SME's, seeking to supply an adapted system of risk management that diagnoses thoroughly and methodically the internal and external risks that an innovative project can face.

The mechanism behind the tool aims to stand in for the first and last phases of the RDM approach, replacing both "Risk identification" and "Risk Response development and control" phases, for target adaptability purposes. Thus, the web-based platform provides a particular goal oriented questionnaire, which will be answered by the project manager and each member of project. Each goal oriented question focuses on a particular issue that typically hazards an innovative project.

The nature of each attended issue follows RDM's theoretical basis and covers the domains in which an innovative project stands: technology, market, finance and operations (Keizer, Halman, & Song, 2002) and partially following Ganguly's and original's Wheelwright & Clark's conceptual model of "Innovation Funnel", where a project is divided in 6 main gate-phases, namely: ideas, feasibility, capability, launch preparation, post-launch evaluation and rollout contender.

In our models the project's goal oriented questionnaire was divided in o four main stages: idea conception stage, feasibility stage, capability stage and launch stage, as shown in Fig.1, integrating a classical stage gate approach between phases and considering that post-launch evaluation and rollout contender phases were integrated among the 4 existing stages, planning each issue accordingly.

Between each stage a risk assessment will be done that will determine the viability of the project and a Go/NoGo criterion will be performed. The critical issues are rendered into positive statements of goal objectives, meaning that if every objective is achieved within a project, it translates it as a safe project.

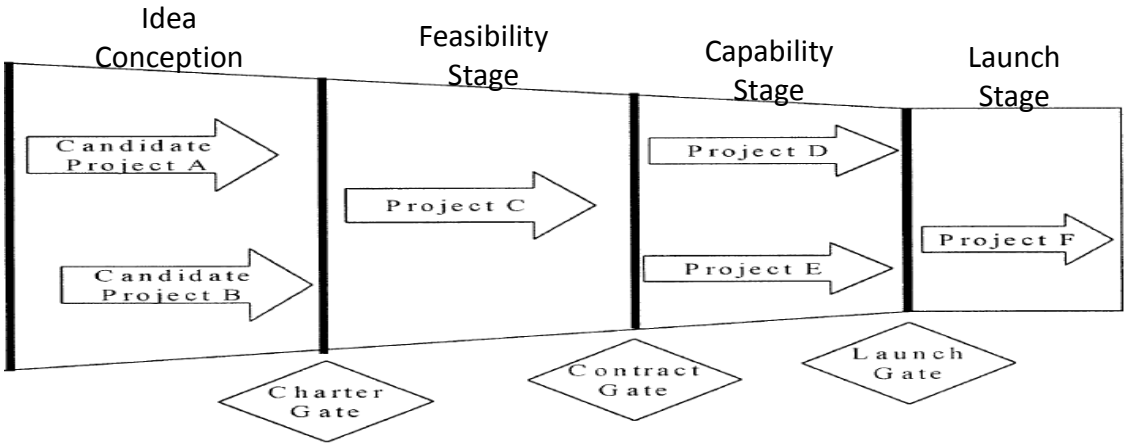

Fig.1 Innovation Funnel; (Wheelwright & Clark, 1992); (Ganguly, 1999)

Each goal/objective from the goal oriented questionnaire is to be responded individually standing on three different parameters:

- Level of implementation – represents how much of the goal, the project sees reflected; or the level of certainty that the objective formulated will be realized. i.e. the strength of the statement's truth, matched with the project's reality.
- Capacity to influence – represents the ability of the project team to influence the project's goal, within the time and resource limits.
- Severity of the consequences – represents the potential impact of the objective's consequences on the project performance.

Each parameter is analyzed and responded on a five-point-scale, as for "Very low" representing the lowest reflection of the analysis and "Very high" being the highest consideration regarding the defined goal, and the responses "Low", "Medium" and "High", will be in between the two extreme responses. Each response represents a numeric quantity to be used in the risk profile calculation, being that the first two variables (level of implementation and capacity to influence) behave according to a "the higher, the better" logic, unlike the third variable (severity of the consequences), which behaves in the opposite purport.

Afterwards, the questionnaire results are conducted into a database, where each goal from each stage is categorized into a risk class, returning from the data base the respective categorization: "*Safety*", "*Low Risk*", "*Medium Risk*", "*High Risk*" or "*Failure*". Also a strategically calculated advice is generated and suggested regarding each goal as shown in Fig.2

Goals	Level of Implementation	Capacity to Influence	Severity of Consequences	Risk	Advice
S3-1	Very High	High	High	Low	Protect
S3-2	Low	Very Low	High	Failure	Go-NoGo
S3-3	Very Low	Very High	Medium	Medium	Focus
S3-4	Very High	Very High	Very Low	Safety	Accept
S3-5	Low	Medium	Very High	High	Go-NoGo
S3-6	Very High	Low	Very Low	Low	Acquire

Fig.2 Table of Results of a Project's Capability Stage

Each generated advice represents the suggested strategy to each issue, e.g. when the advice "*focus*" is generated means that the project team possesses solutions to influence a specific goal but they need to center the resources available on this shortage objective. Finally, through a weighted average it is calculated the qualitative form of the risk to each stage, represented by a scale from 1-5 where "5" represents the most severe risk situation. Also a global average of the project's risk profile is generated for the intended project and in each phase as shown in Fig.3, where a project is "*Excellent*" if the risk profile stands bellow "2"; as "*Viable*" if it stands between 2 - 3; as "*Risky*" if it stands between 3 - 4; and as "*Impracticable*" if it stands above "4".

Risk	1	2	3	4	5	
projectX	5	18	8	2	2	2.37
1 - Idea Stage	1	6	3	1	1	2.58
2 - Feasibility Stage	0	7	2	0	0	2.22
3 - Capability Stage	1	2	1	1	1	2.83
4 - Launch Stage	3	3	2	0	0	1.88

Fig.3 – Table of Results from "*projectX*".

TEST AND MAIN RESULTS

In order to evaluate the overall conditions of the platform, as well as to attained ideas and suitable visions as basis for further processes of strategy development, it was carried out a process of testing the tool, with collaborators within the company where the Spotrisk® was being developed.

Six collaborators were assembled and awarded the task of evaluating different particular projects that each one of them was integrated in. However, the projects evaluated were not as distinct as it would be contended, for they were all internal within the same company. Yet, each project embraced different areas and components from the others, reaching distinct areas such as operational, research & development and financial departments, being able in a first approach to peer and to evidence in a glance the universal content of the goal oriented questionnaire. Thus, each collaborator evaluated the whole 35 identified goals and exchanged with the researchers some appreciations regarding doubts and suggestions, spending in average approximately 45 minutes in the whole process.

The overall risk profiles were around the qualitative rate of "3" but, most importantly were the appreciations collected. In the sample used, the indicators collected supported the initial conjecture regarding the universality of the goals defined. Moreover, feedback was brought driven by the awareness given to the collaborators through the process of answering the goal oriented questionnaire: appreciations were rendered by the participants, affirming that the questionnaire provided them the possibility of meditation of risks and events that they would never have directly thought before. Finally, regarding the *"Advices"* column, appreciations were collected towards a lack of specification regarding factual actions to perform, as well as suggestions addressing a more specific "*to do*" list to each risk strategy.

CONCLUSIONS AND FURTHER RESEARCH

This paper sought to bring forward a diagnosing tool to fill a gap over innovative SME's risk management practices. It was initially proposed to exert a useful and pragmatic approach to assess risks of innovative projects, providing a NPD risk management methodology to small firms. Thus, Spotrisk® - a web based platform intended to provide an integrated and early stage risk perception, management and response tool, designed to SME's and startups - was presented and tested along the collaborators within a Portuguese SME, developer of products and services in the solar photovoltaic industry. The first available results indicates that the web integration of a tool can directly and effectively supports risk management organizational practices, via cloud and with little time expenditure involved, which consists the most suitable approach to SME's.

Through the collected results we can denote that the simple action of answering to the questionnaire per se, can provide the user an important awareness of critical risks inherent to an innovative project. Thus, the risk assessment tool considered can compose a good model for startup incubators, due to the fact that the startup firms associated are promptly the ones with less notion and tangibility with the market. Therefore, besides making a capable risk assessment and generating factual risk strategies, the platform brings important awareness to individuals who, in most of the cases, were never exposed to exerted situations and events within an innovative project.

Nevertheless, the available results are still limited to a short sample of projects in the same economic area. Therefore, it remains as a pending operation to evidence the universality of the goal oriented issues integrated in the platform. Also, it stands as future research to add an adequate strategy of response with an integrated list of specific advices, linked to a group of concrete actions to attend to risks accordingly, so that SME's may be driven thoroughly and systematically to suitable risk management practices.

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