A MATRIX APPROACH FOR THREAT ASSESSMENT ON HUMAN CAPITAL IN SMEs

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─Abstract─
Small and medium sized enterprises represent a pool of economic dynamism and innovation of a country. Indeed, they are at the heart of the economy and induce an important source of knowledge and skills for centuries. If they want to survive, small and medium sized should establish a global protection from risk. In this paper we propose a pre-diagnostic tool to identify critical activities and key people in the company. In a second time, we introduce a matrix approach for threat assessment on the human capital.

Key Words : *SMEs – Human Capital - Decision Making - Risk Assessment*

JEL Classification: J24, D81, P12

1. INTRODUCTION

SMEs are the backbone of the European Union's economy. There are 19 million SMEs in the EU in hugely different sectors and employing nearly 75 million people. They represent a pool of economic dynamism and innovation of a country. Indeed, they are at the heart of the economy and induce an important source of knowledge and skills since centuries SMEs face to situations characterized by rapid change, multiple interests, limited resources, and high complexity (Schulz, 2001). If they want to survive, small and medium sized companies should establish a global protection from risk. Among these questions one major challenge is to know if they can protect their knowledge (Otterson, 2005; (Germon, Laclémence, & Birregah, 2010)). SMEs have very interesting assets such as flexibility, responsiveness, speed of action, to meet the challenges of the economic globalization. These assets must be used to implement a comprehensive strategy to protect the intangible capital. Among the facets of intangible capital human capital have an important place in the daily life of the SMEs. This capital, which includes knowledge, know-how, skills, etc., represents a source of riches for SMEs (Noaka, 1994). Human capital (HC) is a key differentiator for the increase of indicators such as production, quality, and market share. Forget the human capital as a factor in the economic performance of a business is a mistake (Stiglitz, 2009). HC refers to the set of physical skills, like intellectual, an employee contest to economic production (Becker, 1964). Therefore, the added value of a SME is its ability to combine knowledge and know-how simultaneously in production and organizational processes to create value (Prax, 2007). Because of the complexity of each decision, the entrepreneur needs to use efficient decision support tools to help him in strategic decision-making process (Roy, 1996). This paper aims to propose a framework for threat assessment on the human capital in SMEs. Moreover, we consider voluntary (malevolence) and involuntary threats. The paper is structured as follows. At first we will present the issues around the place of human capital in SMEs. The section will be devoted to the description of the components involved in human capital followed by a categorization of the different impacts on the latter. In a second step, we present the matrix approach to threat assessment on human capital. A section will be devoted to a case study. The paper concludes with a discussion of this fresh approach to presenting some perspectives

274

2. THE PLACE OF HUMAN CAPITAL IN SMEs

The purpose of this section is to highlight the contribution of human capital in the performance of SMEs. Then, understand the different components of human capital.

The human capital concept was developed first by Theodore Schultz (Schultz, 1961) and Garry Becker make this theory famous. Human capital is the aggregation of intangibles assets incorporated by individuals, such as knowledge, experience, skills etc. Quite as the other corporate assets, the human capital can be identified or / and materializes, exchangeable and\or exploitable, valorize. Human capital is a set protean and highly volatile as likely to disappear with the departure of those who hold this capital (Bessieux-Ollier, Lacroix, & Walliser, 2006). Based on these features can bring out a typology of human capital. Thus we can decompose human capital into three categories, which are illustrated in

Human Capital		
General human capital	Human capital firm specific	Human capital specific to a task
Individual Capacity	Knowledge	Organization
Discernment	Skills	Réactivity
Analytical Capacity	Experience	Team work etc.
Adaptability etc.	Know-How etc.	

Table 1(Gibbons & Waldman; 2004, Hatch & Dyer, 2004):

_ **General human capital** includes all the generic knowledge and competences an individual that has accumulated during his school career and professional experiences;

_ **Human capital specific to the firm** this capital is the set of skills and knowledge that an individual must master to operate effectively in the firm that employs him. This capital and Organizational capital are interdependent..

_ **Human capital specific to the task** develops through work experience, vocational training. It corresponds to the skills, knowledge that an individual will acquire about and for his job.

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Adaptability etc.	Know-How etc.	

Table 1 - Typology of human capital

In this paper we will focus on human capital specific to a task as it resume and add more value to generate differentiation factors. The definition of SMEs developed by GREPME (Julien, 1994) was used to show the specificity of human capital in small structures. The mode of management and organization specific SMEs reinforces the importance of human capital. The smallness of the firm induces "effects of enlargement" (Mahé De Boislandelle, 1996, (Torres, 2000). The small number of employees increases the relative importance of each member of the company, also violations affecting human capital can affect the sustainable performance of SMEs. For example, in one multinational of several thousand employees to see one of his employees leaving for a competitor is an insignificant event. However, in a company of 10 employees it is 10 % of the workforce that disappears with know-how, knowledge, skills which sometimes have no equivalence in the company.

In a SME the external and internal system of information is simple and little organized. In general the three component of the human capital specific to a task taking forms more or less informal. The lack of formalization often results in volatility of human capital. It's important for the CEO to know the relative weight of each employee in his company. The Table 2 introduces a scale to assess the relative weight of each employee:

Enterprise	Sub-system	Activity
X	Production	Engineering new product
Level		
1	Everybody can do this activity easily	
2	It's difficult and time consuming to train people to do this activity	
3	It's difficult to find people to do this activity	
4	This activity is difficult to learn because is tacit (implicit) rather codified (explicit)	
5	Only a relatively small number of staff know how to do this activity	

Table 2 - Employee relative weight

The crossing of the relative weight of each employee and the importance of the activity helps to identify the critical workstation.

Activities vary in their capacity to create value for the firm (Barney, 2001) and, therefore, some are more important than others. Each activity is weighted with respect to it's importance on a scale from 1 to 5, where 1= not at all important and 5 = extremely important. This leads to a 3-dimensions graph to highlight the critical set: activity / employee / importance.
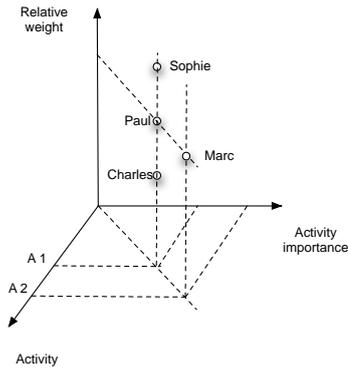
Graph 1 - Prediagnostic tool

With this tool introduce in the Graph 1 the entrepreneur have a global vision of the importance of the activities and employees. He can make a decision base on his business priority. For example, in the graph we observe for a given activity A1 the employees Charles, Paul and Sophie have a different relative weight in this company. Furthermore, the activities A2 is more important than A1, however the employees Paul and Marc have the same relative weight.

2.1. Categorization of the different impacts on human capital

The direct consequences of the occurrence of an unwanted event on the human capital can take many forms: poaching of employee, decrease of production and quality etc.
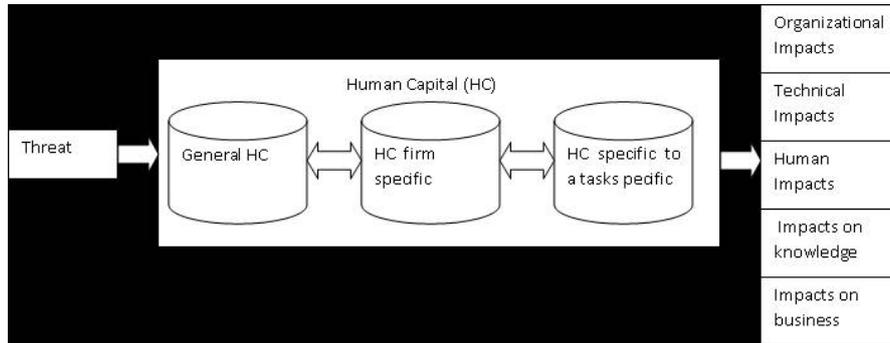

Figure 1 - Impact on Human capital in SME's

All these threats can lead to a change in the business strategy it's knowledge creation, and induce financial losses. These changes can affect more or less long

277

time on the company. The Figure 1shows a part of different impact possible on SMEs.

Weight determination of a threat allows the company to develop or adapt its business continuity plans to increase its resilience.

3. THE MATRIX APPROACH TO THREAT ASSESSMENT ON HUMAN CAPITAL

After the description of the components involved in human capital and the categorization of the different impacts. We introduce the matrix approach to threat assessment on human capital.

3.1. Formalization

With the rating scale, one can evaluate the impact of a threat on the human taking into account three "aspects" **the productive force,** t**he development of the organization,** and **Knowledge, Know-How and skills production and transmission**. Depending on the answers to these various threats impact on the human capital in the enterprise is calibrated according to five levels: minor, major, moderate, critical, catastrophic. Each level of qualification corresponds to a value of impact assessment matrix as shown in Table 3.

We can identify a **consequence** when any change can be observed on human capital it's a short term vision while **questioning** is medium-term vision it marks the beginning of a structural change and **disruption** very deep and important transformation it's a long term vision.

For each threat, we proceed by crossing the set $I = \{Consequences, Questioning, Disruption\}$ of generic impacts with the set $\Sigma = \{Individual, Knowledge, Skills, Experiences, Know-How\}$ of the enterprise's HC components (see table3).

		Impacts (x)		
		Consequences (C)	Questioning (Q)	Disruption (D)
HC components (y)	Individual Capabilities			
	Knowledge			
	Skills			
	Experiences			
	Know-How			

Table 3 - Threat matrix on Human Capital

278

The consequences of the impacts are defined in the table 4**Hata! Başvuru kaynağı bulunamadı.** .

Score	Level	Meaning
1	Minor	The threat did not affect force production, organizational development and capacity to produce knowledge
2	Moderate	There was no questioning force production, organizational development and capacity to produce knowledge
3	Major	The threat provokes a questioning force production, organizational development and capacity to produce knowledge
4	Critical	There is a disruption force production, organizational development and capacity to produce knowledge
5	Catastrophic	Strongly impact the threat of force production, organizational development and capacity to produce knowledge

Table 4 - Impact consequences

Given a threat (denoted by T), we define a threat matrix, also denoted by T, as follow:

$$\forall (x, y) \in I \times \Sigma, T(x, y) = \begin{cases} 1 & \text{if } T \text{ produce the impact } x \text{ on the component } y \\ 0 & \text{otherwise} \end{cases}$$

One defines then five reference matrices (RMs) corresponding to five thresholds ordered from Minor to Catastrophic as described in Table 5.

	RM_1			RM_2			RM_3			RM_4			RM_5		
Reference Matrix (RM_k)	0	0	0	1	0	0	1	0	0	1	1	0	1	1	1
	0	0	0	1	0	0	1	0	0	1	1	0	1	1	1
	0	0	0	1	0	0	1	1	0	1	1	0	1	1	1
	0	0	0	1	0	0	1	1	0	1	1	0	1	1	1
	0	0	0	1	0	0	1	1	0	1	1	0	1	1	1
Level (L^k)	Minor			Major			Moderate			Critical			Catastrophic		

Table 5 - Reference level impacts

The level of impact due to a given threat T will be L^k if:

$$T \approx RM_k \quad (1)$$

3.2. Case study

Now consider the case of an SME with 20 employees that exports part of its products internationally. We can observe the impact of various threats to human capital. After an audit conducted by an expert group we notice that the capital of this company is exposed to a number of threats presented in the Table 6.

Activity	Threat	Activity importance	Employee weight
Certification of material	Retirement without replacement planned	2	2
Technical support	Unavailability of long-term	3	3
Engineering new product	Recruitment by a competitor	4	5

Table 6 - Study of the threats on Human Capital

We note that the company is exposed unevenly to danger. And the relative weight of each activity and each employee is different. We will seek to understand the impact of each hazard on the different elements of human capital mobilized in Table 7.

Enterprise		Sub-system		Activity	
X		Production		Engineering new product	
Employee	Mister Z				
Threat	Recruitment by a competitor				
Activity importance		4	**Employee weight**		5
		Impacts			
		Consequence	Questionning	Disruption	
Human Capital	Individual capabilities	1	1	1	
	Knowledge	1	1	1	
	Know-How	1	1	1	
	Skills	1	1	1	
	Experience	1	1	1	

Table 7 - Form to assess threat on Human Capital

In the case studied, the occurrence of this threat will have an impact catastrophic for the activity of designing a new product. Affecting both the strength of production, organizational development and capacity to produce knowledge. This employee is a key resource for this company, because a relatively small number of people can do this activity which is of great importance for the company. The company must decrease the severity of this threat to his business.

3. CONCLUSION

Human capital is a component of intangible assets of the company. The recent global economic crisis gave rise to the central role of human capital in the sustainable performance of organizations. To remain competitive significance firms must constantly innovate, produce better and be responsive. In this paper, we proposed a methodology for threat analysis and vulnerability assessment of the level of human capital for SMEs. Initially proposes a framework for threat

assessment On The human capital in SMEs. In a second step, this weekend The Matrix Approach to Threat Assessment on human capital. Our approach provides a framework for preventing and / or mitigate the effects of a threat to the human capital of an enterprise.

ACKNOWLEGDMENT

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