IDENTIFICATION AND VALIDATION OF CRITICAL SUCCESS FACTORS IN THE IMPLEMENTATION OF AN ENVIRONMENTAL SCANNING SYSTEM

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Abstract

This work presents the methodology and results of a research conducted with the aim of identifying Critical Success Factors (CSF) in the implementation of an Environmental Scanning system. We identified a list of CSF for supervising and monitoring the implementation of an Environmental Scanning System. Experts in environmental scanning then validated this list.

Our aim is to help project managers by highlighting CSF that should be taken into account in managing the implementation of an Environmental Scanning System. Our results are compared to ***practical knowledge*** available for environmental scanning projects managers.

1 Introduction

The survival of organizations largely depends on their aptitude to anticipate external changes and to adapt proactively. "Organizational performance is tightly related to their capacity to align or adapt their strategies and their structure to the environment" [DUNCAN; 1972]. "Alignment depends on the organisational capacity to gather significant information about the current and future environment "[SUBRAMANIAN and al, 1993]

The concept of environmental scanning constitutes a framework addressing the need for strategic forecasts and adaption. As a matter of fact, the purpose of environmental scanning is to reduce environmental uncertainty by detecting early signals (the "weak signals" according to Ansoff; [1975]), and to be prepared to the events they announce.

2 Reports and Research Problem

Environmental scanning is a difficult and complex exercise and raises many questions, primarily coming from the diversity of variables that have to be considered in the brainstorming process of this collective environmental intelligence. Therefore, it is important to note that conceptual developments, as well as operational models, concerning this process remain relatively general and provide no assurance of success for a specific implementation.

Empirical studies carried out in this field highlight the difficulties encountered by firms implementing an environmental scanning system. [KOURTELI; 2000] identified the following problems:

The difficulty encountered by managers and other potential users to utilize relevant information that is disseminated within the firm (lack of organization, bad storing and difficulties in information transmission and utilization).

Managers and other potential users' failure to identify information that will be useful for others (decision makers).

Incapacity to gather information on the environment, which entails long-term strategic implications: "The failure to marshal the external environmental information, especially in relation to information with length-arranges strategic implications " [KOURTELI; 2000].

It is widely acknowledged that environmental scanning is a quite difficult activity to carry on. GHOSHAL and KIM (1986) noticed that many firms set up environmental scanning units, however, in most cases, they did not succeed in reaching the desired level of performance. In addition, many researchers in this field (JAIN; 1984**;** RAYMOND and al; 2001; CHOO; 2002…) concluded that many environmental scanning projects, although finished, have a short-lived impact, regardless to the effort made to set them up. This discussion raises the following questions:

Why do they fail?

More specifically, are there flaws in the managerial process?

If so, can we identify the critical success factors of this process?

To the best of our knowledge, these questions have not been investigated by environmental scanning specialists.

We are therefore faced with an emergent research problem, given the fact that no previous study has defined, empirically of theoretically, critical success factors in the implementation of environmental scanning projects. This has been the case in other fields such as information systems' field (mainly of the information processing systems). However, we should note that many authors examined this type of question in Information System field (primarily in the field of the ICT). In fact many academic and scientific researchers (COOPER; 1999, PALITHA, PURNENDU and ROSS; 2002, PINTO; 2002, LANCINI;

2003) have been interested in examining the failures' reasons of information system implementation projects in organizations and in identifying their critical success factors.
We think that the same issues are relevant to environmental scanning implementation projects. Academics in the project management and information systems fields provide the conceptual foundations of our effort to identify critical success factors for environmental scanning implementation projects.

2 Research Questions

Implementing an environmental scanning mechanism is carried out throughout two consecutive phases: a starting phase labelled "launching" and a systematization and formalization phase labelled "upholding". In this paper we focus only on the starting phase of the environmental scanning implementation project.
According to LESCA and CASTAGNOS; (2000), starting is a specific alternative of the general problem of managing organizational change. Whether it is imposed or emergent, organizational change represents innovations that affect strategic orientations as well as organizational foundations such as structure, culture, representations or management system.
The prerequisites of implementing an environmental scanning system provide fertile grounds for investigation because they strongly and closely determine the implementation success of the environmental scanning project. According to LESCA; (2003) "the chief of environmental scanning project should know all critical factors of success and failure which determine the success of the environmental scanning system, and particularly its starting".
Our research question can be stated as follows:

> Which are the Critical Success Factors that environmental scanning project's managers should take into account during the launch of environmental scanning projects?

So, we have to identify the prerequisites (CSF or CFF) so as if they are not gathered, we can conclude that the system will not work and/or will not continue to work.
Our goal is thus to propose and diffuse practical knowledge (within the meaning of ARGYRIS (1996), i.e. useful, helpful for environmental scanning project's managers to implement this system in the firm.

3 Theoretical underpinnings

3.1 The creditworthiness of the project management field

The framework of our research draws from two fields: the project management and the environmental scanning fields. We should note that some researchers have already developed a similar framework (JAKOBIAK; 1991) but have examined other matters (PERT to implement an environmental scanning system). BALDIT and al (1995) tried to show, that there are analogies of treatment and behaviour between the project manager and the technological watcher by setting up a logical framework of environmental scanning and by specifying that these two disciplines can constructively benefit from each other in terms of necessary tools and methodologies to their development.

According to GAREL and al (2004), "the project management is defined like the actions engaged by an (some) organization (s) in order to demarcate a project, to launch it and to finish it ". The authors are interested here by the projects carried out by people within the organization, in opposition to the "project managing" which focuses on the instrumental functions of managing the project in terms of: Cost - Time - Risk (Standard AFNOR X50-115).
Our research is anchored in the Project Management field, because we suppose that the implementation of an environmental scanning system has the same characteristics as any other organizational change project in the firm. HERRING (1988) points out on this issue that "it is necessary to consider the total cost of implementing an environmental scanning system as an investment for the firm's future success and to think the development of an environmental scanning system as a complex R&D project". BALDIT and al (1995) adds that "the functioning of an environmental scanning unit really represents an entire project which is a part of a strategic policy of firm's restructuring".

3.2 The Critical Success Factors concept

The concept of Critical Success Factors (CSF) is subject to various definitions. It initially emerged in the field of strategic management (ROCKART; 1979) as an approach similar to the firm's strengths and weaknesses analysis in order to identify a better strategic positioning. Its appropriateness for project management especially for implementing information systems consists on necessary conditions (but not sufficient) for project success. For this reason, we will use the concept of CSF in the sense of necessary condition (NC) as it is suggested by REIX R., (2002).
We consider Critical Success Factors as the most significant factors to take into account in managing the implementation of an environmental scanning project within an organization. The importance of a CSF is related to the significant impact that it is likely to have on the system implementation success (or failure).
We identified a CSF as a necessary – but not sufficient – condition (NC) in that way that:

- if this NC is taken into account by the project manager, he will have more chance to succeed, but the success is not guaranteed (NC is not a sufficient condition SC);
- if this NC is not taken into account by the project manager then we can state that the project is more likely to fail (because we are not in exact sciences).

Extant literature in environmental scanning field reveals that Critical Success Factors are not clearly identified. Expressions like “characteristics”, “prerequisites” or “determinants” are sometimes used to indicate CSFs. In this paper we contribute to our field by providing a formal identification of these factors.

4 Research Methodology

In this study we use the hypothetico-deductive approach: the literature review enabled us to identify CSF for implementing an environmental scanning system. These CSF were translated into hypothesis then validated by experts in environmental scanning. Finally these hypotheses are used to carry out an exploratory research.
Throughout our research we adopted a research strategy outlined be the following steps:

- Search for generic critical factors reported by researchers in the field of project management, and information systems. We explored the extant literature and found out a CSF list for implementation information systems;

- Identify CSF found in the previous step in the specific field of environmental scanning (or *Environmental Scanning*, *Competitive Intelligence*, *Business Intelligence*...).
- Review and map the listed CSF;
- Submit the identified CSF for validation by experts in environmental scanning;
- Rank and classify the validated CSF;
- Use of the validated CSF in an exploratory research within firms.

Figure 1 recapitulates the aforementioned steps of CSF identification validation:

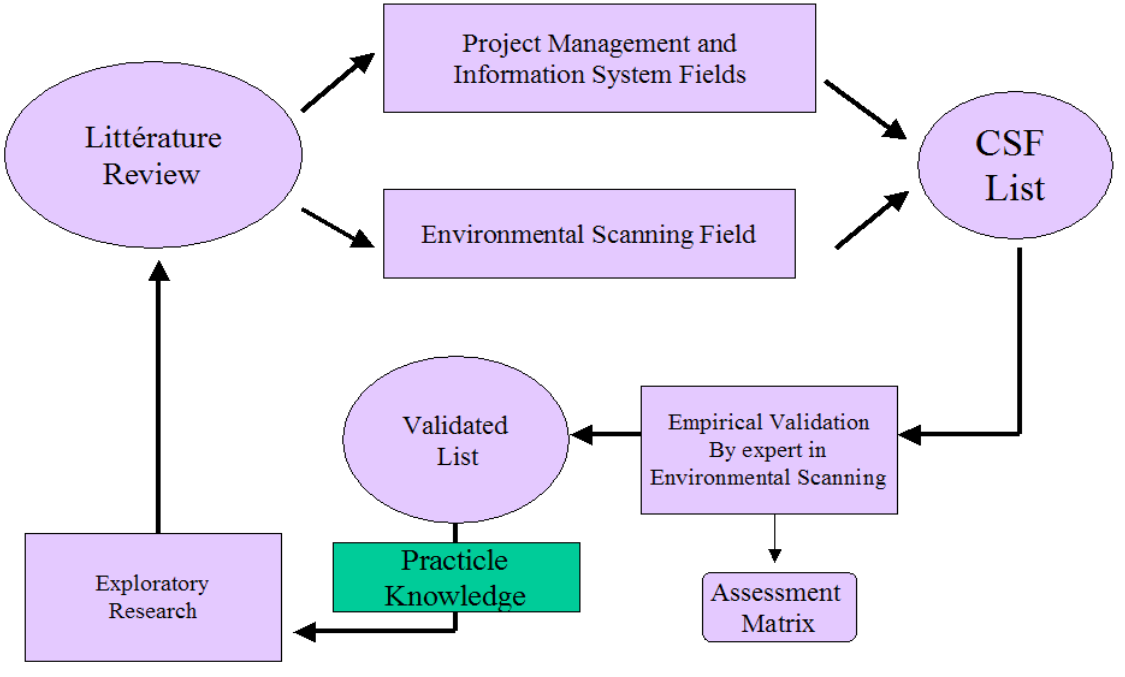

Figure 1: Research Strategy and Empirical Approach

4.1 Validation approach of the identified CSFs

The approach we adopted to validate the identified CSF includes the following steps:

- Setting up a questionnaire, labelled "ASSESSMENT MATRIX", from the CSF list we identified from academic papers in Project Management and Environmental Scanning fields. In this questionnaire we highlighted the various CSF underlining their analysis process.
- Submitting this "ASSESSMENT MATRIX" to experts in environmental scanning, i.e. recognized as experts by their colleague thanks to their large experience in the environmental scanning field and their relationships they established with the environmental scanning CERAG team (Centre d'études et de recherches appliquées à la Gestion – Grenoble – France).

We joined the aforementioned experts either directly in the STES 2004 Conference (Scientific and Technological Environmental Scanning) organized in Toulouse in November 2004 or by emails using the Mailing-List created by the CERAG team set up resulting from relationships they have established with environmental scanning professionals in last years. We reached 72 experts (over a period of two years). We gathered 29 useable answers corresponding to a response rate of 40, 27 per cent.

The experts we directly joined at the STES Conference (2004) filled in the ASSESSMENT MATRIX after they were acquainted to our research work through a presentation we made at this conference (LESCA and BOULIFA; 2004). Experts we joined by emails, received the ASSESSMENT MATRIX with a letter describing our research subject and objectives.

Aiming at reaching a consensus for the relevance of a Factor Criticizes given, the joined experts had to give their opinions on CSF we identified by ranking on a 4-point Likert-type scale (Lickert 1932) the strength of their agreement (Strongly disagree, Moderately Disagree, Moderately agree, Strongly agree).

This scale initially included several items which collectively describe an attitude. We chose to work on a five-level scale: Strongly Disagree, Moderately Disagree, Undecided, Moderately agree, Strongly Agree. (JOLIBERT and JOURDAN; 2006)

We purposely eliminated from this scale the "undecided" item to avoid gathering answers that could cause bias in interpretation (previous studies carried out in our field have usually removed the "undecided" level). As we joined environmental scanning field's experts who are supposed to have a quite precise idea on necessary conditions for an environmental scanning project' successes, we have taken for granted that they can easily express their opinion on the investigated CSF.

We sorted and examined experts' answers according to two aspects: their level of agreement (Strongly disagree, Moderately Disagree, Moderately agree, Strongly agree) and the factor to which they relate, so as to depict the experts-answers' spectrum for each factor.

Subsequently, we calculated a consensus level for each factor, which is the percentage of experts who agree (moderately or strongly) with the importance of this factor.

We finally calculated scores to rank CSFs. For this purpose, we respectively assigned the coefficient -2, -1, +1, +2 to the items Strongly disagree, Moderately Disagree, Moderately agree, Strongly agree.

The score is obtained by multiplying the number of experts' answers in each category by the coefficient (weighting) related to it. For example, an according to the CSF number one, the experts'answers were : 1 for Strongly disagree, 1 for Moderately Disagree, 13 for Moderately agree and 14 for Strongly agree. The score of this factor is 38 = (-2)*1+(-1)*1+1*13+2*14

5 Results

The findings enabled us to consider experts' opinions in order to revise each critical factor description and to assess each CSF importance degree for the surveyed experts. We will use tables to display these findings.

5.1 Ranking the validated CSF

Table 1 shows the CSF ranking according to the scores.

Table 1: CSF ranking according to the calculated scores

Critical Success Factors	Score	Rank
CSF11 - Top managers attitude, willingness and support have a great impact on environmental scanning system success	**51**	**1**
CSF15 – Continuous motivation of environmental scanning unit's members and stimulating transparency and recognition.	**51**	**1**
CSF14 - Appointing a manager who will be responsible for resources allocation and project members' assistance by motivating them and ensuring communication and cooperation.	**48**	**3**
CSF6 – Ensuring the involvement of all environmental scanning project members.	**39**	**4**
CSF1 - Start with a small size for the Environmental scanning system, and after that varying the size on according to the learning process.	**38**	**5**
CSF10 - Activating the innovation process and research and development in the firm stimulates the environmental scanning system and supports its "outputs" use.	**38**	**5**
CSF3 – Improving the quality of transverse interactions between the project members of the environmental scanning system.	**37**	**7**
CSF12 - Developing individual and collective learning about environmental scanning among the project members.	**36**	**8**
CSF13 - Organizing and setting up the environmental scanning process: defining tasks, creating broadsheet to optimize various stages of environmental scanning process and to manage communication between all members of the future system.	**35**	**9**
CSF8 - Contributing to maximum reduction of "managerial myopia" of top managers by supporting a vision anchored towards the future.	**35**	**9**
CSF9 – Using appropriately information and communication technologies facilitates gathering, storage and the exploitation of useful anticipatory information for the environmental scanning process.	**35**	**9**
CSF2 - Carrying out an effective information/communication campaign before starting the environmental scanning project.	**33**	**12**
CSF4 - Preparing supports for transverse interactions, these supports must be appropriate for information type and exchanged comments. (Especially in the case of practical information).	**33**	**12**
CSF5 - Identifying the firm's culture characteristics and taking them into account as well as possible.	**32**	**14**
CSF7 – Organizing appropriate training for the positions which will be held by members of the future system.	**28**	**15**

Results show an important score for the quality of transverse interactions between the environmental scanning project unit members which supports information sharing and flow. The identification of the firm's culture characteristics is less significant than all the other factors, but was not rejected as a CSF. This finding can be explained as follows: the environmental scanning project manager does not have the possibility to influence this factor at least in the short-term. He should identify it and take it into account for the achievement of his assignment.

5.2 Answers' Examination

Examining experts' answers according to the item "strongly agree", enabled us to appreciate the factors' importance according to:

- **The top management support for** the environmental scanning implementation project;
- **The motivation of the** project members;
- **The appointment of a project manager** responsible of project supervision is also a significant factor.

We noticed the dominance of the previously identified three factors (CSF11, CSF14, and CSF15). Indeed 100% of experts who answered to our questionnaire considered of an utmost importance: the support of top management team, appointment of a project manager responsible for supervising and the permanent motivating of all project members.
The identification of firm's culture (CSF5) remains the weakest consensus degree's factor.

5.3 Ranking the validated CSF by category

We tried to gather the identified factors in three main categories on the basis of their a priori similitude. This is the second contribution of this research. Three main categories of factors are identified:

- **Organisational factors**: Firm's Culture, Structures, Process…
- **Human Resources Factors**: Competences, Profiles, Motivation…
- **Material factors**: Material supports, communication tools, storage and diffusion devices…

On the basis of these three categories of CSF for managing an environmental scanning project, we classify in table 2, the validated CSF in their respective category according to the obtained score.

Table 2: Ranked categories of CSF for managing an environmental scanning project

Categories	Critical Success Factors
Organisational Factors	**1** – Defining **the boundary** of the Environmental scanning system: starting with a small sized perimeter and then varying the size according to the learning process. **2** - Activating **the innovation process** and Research and Development in the firm maintain the environmental scanning system. **3** – Improving the quality of **transverse interactions** between members of the environmental scanning project. **4** - Developing **individual and collective learning about** environmental scanning activity among project members. **5 - Organizing and** setting up the environmental scanning process: defining tasks, creating broadsheet to optimize various stages of environmental scanning process and to manage communication between all members of the future system. **6** – Sustaining suitable **culture** and values for the project success: Participative culture and information sharing.
Human Resources Factors	**1** - **Top management supporting for the project** and willingness to make necessary actions. **2** - **Continuous motivation** of environmental scanning unit's members and stimulating transparency and recognition. **3**- Appointing a **chief for the environmental scanning project** who will be responsible for resources allocation and project members' assistance by motivating them and ensuring communication and cooperation. **4** - Ensuring the **involvement** of all environmental scanning project members. **5** - Contributing to maximum reduction of "managerial myopia" of top managers by supporting a **vision anchored towards the future**. **6** - Carrying out an effective information/communication campaign before starting the environmental scanning project. **7** - Organizing **appropriate training** for the positions which will be held by members of the future system.
Tangible Factors	**1** - Using appropriately **information and communication technologies** facilitates gathering, storage and the exploitation of useful anticipatory information for the environmental scanning process. **2** - Preparing supports for transverse interactions, these supports must be appropriate for information type and exchanged comments.

The CSF allocation in these three categories let us notice a prevalence of organisational and human resources factors. Only two tangible factors were identified.

6 Conclusion

This paper presents the findings of a study in which we identified the Critical Success Factors expected to determine the implementation success of an environmental scanning system. We proposed useful practical knowledge: A list of CSF for implementing an environmental scanning system, validated by experts in environmental scanning. This practical knowledge should help environmental scanning project managers' in implementing this process in their respective firms.

Thanks to the creditworthiness of Project Management field and particularly the Information System field and throughout an ongoing approach we answered our research question, which we tested within an empirical study.

The CSF that have been identified, and then validated by experts in environmental scanning, should be used by environmental scanning projects' managers to manage these projects.

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