

USING CRITICAL SUCCESS FACTORS FOR ASSESSING CRITICAL ACTIVITIES IN ERP IMPLEMENTATION WITHIN SMES

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Keywords: ERP implementation, SMEs, Critical Success factors

Abstract: Aim of this research is the investigation and analysis of the critical success factors (CSF) in the implementation of ERP systems within SMEs. Papers in the ERP research field have focused on successes and failures of implementing systems into large organizations. Within the highly differentiated set of computer based systems available, the ERP systems represent the most common solution adopted by large companies to pursue their strategies. On the contrary, until now small and medium enterprises (SMEs) have shown little interest in ERP systems due to the lack of internal competence and resources that characterize those companies. Nevertheless, now that ERP vendors' offer shows a noteworthy adjustment to SMEs organizational and business characteristics it seems of a certain interest to study and deeply analyze the reasons that can inhibit or foster ERP adoption within SMEs. This approach cannot leave out of consideration the analysis of the CSFs in ERP implementation: despite their wide outline in the most qualified literature, very seldom these research efforts have been addressed to SMEs. This paper aims at proposing a methodology to support the small medium entrepreneur in identifying the critical factors to be monitored along the whole ERP adoption process.

1 INTRODUCTION

ERP systems are customizable, standard software applications (Rosemann, 1999) that seek to integrate the complete range of business processes and functions to present an holistic view of the business from a single information and IT architecture (Gable, 1998). In spite of the benefits potentially offered (Banker, *et al.*, 1998, Davenport, 1998, Gable, 1998), reports from the industry have pointed out that ERP system implementations do not guarantee the business benefits that they promised (Wheatley, 2000).

The obstacles that limited benefit attainment from ERP implementation had seldom little to do with lack of software functionality or major technical issues, but were more often related to

people's change and project management competencies (Davenport, 2000, Mandal and Gunasekaran, 2003).

The complex and pervasive nature of ERP systems makes the above-mentioned issues even more relevant when small and medium enterprises (SMEs) are taken into consideration since many SMEs either do not have *sufficient resources* or are not willing to commit a huge fraction of their resources (Chan, 1999) due to the long implementation times and high fees associated with ERP implementation (Chau, 1995).

Organizational issues are also often claimed to be one of the most important reasons for failures in ERP system adoption (Davenport, 1993). Although the organizational flexibility of SMEs should theoretically favor ERP implementation, on the other hand the low extent of formalization of people's

roles and responsibilities makes the identification of figures, such as the project manager and the key users (Davenport, 2000), extremely difficult to achieve.

Finally, the reinforcement of the concept of *business process* is among the most critical success factors in ERP implementation (Beretta, 2002). Once again, SMEs seem in an unfavorable condition since they generally suffer from a widespread lack of culture as to the concept of business process itself.

Whereas the overall research purpose is to identify the Critical Success Factors (CSF) for ERP implementation within SMEs and define metrics to monitor them, this research work aims at identifying the overall characteristics of SMEs in order to explore their relationships with the CSFs in ERP implementation.

This research project will address the following questions:

RQ1 (step1): is it possible to identify and develop a reference model to properly describe ERP adoption cycle within SMEs?

RQ2 (step2): which are the SMEs' characteristics representing an obstacle to ERP adoption?

RQ3 (step3): which are the critical success factors in ERP system implementation?

RQ4 (step4): in the light of the findings related with step 2, which are the critical success factors in *project management* within SMEs?

RQ5 (step5): is it possible to develop a methodology able to identify the most critical activities along the ERP adoption process?

In this paper the analysis of CSFs for SMEs will focus on the area of project management only (a

complete analysis is available in the Center for Economy and Technology of Information and Communication (CETIC) internal report for 2004).

1.1 The reference model (RQ1)

The literature reports different approaches for process development and improvement, in particular Deming (1986) proposed the PDSA model (Plan-Do-Study(Check)-Act), a four stage representation strictly related to the concept of life-cycle. Its universality allows representing also the different stages typical of the IS management process. Soh and Markus (1995) made use of such a concept of "staged" life-cycle to explain the ability of Information Technology (IT) in creating (or not to) business value. Another similar, but more circumstantiated perspective was added by Markus and Tanis (2000) through the specification of a chartering phase and also by a more precise definition of both the domain and the purpose of each stage.

The effectiveness of this approach lies in the fact that its dynamism allows looking at implementation as a sequence of stages and is then able to seek and explain how outcomes develop over time (Boudreau and Robey, 1999). Despite such a capability, the scope of each stage in the Markus and Tanis model still seems not sufficiently detailed when dealing with SMEs. In fact, seeking an increased granularity in detailing each stage could help improving both the definition of the activities performed in each stage and the appointment of people involved. Therefore, the "Proven Path" methodology

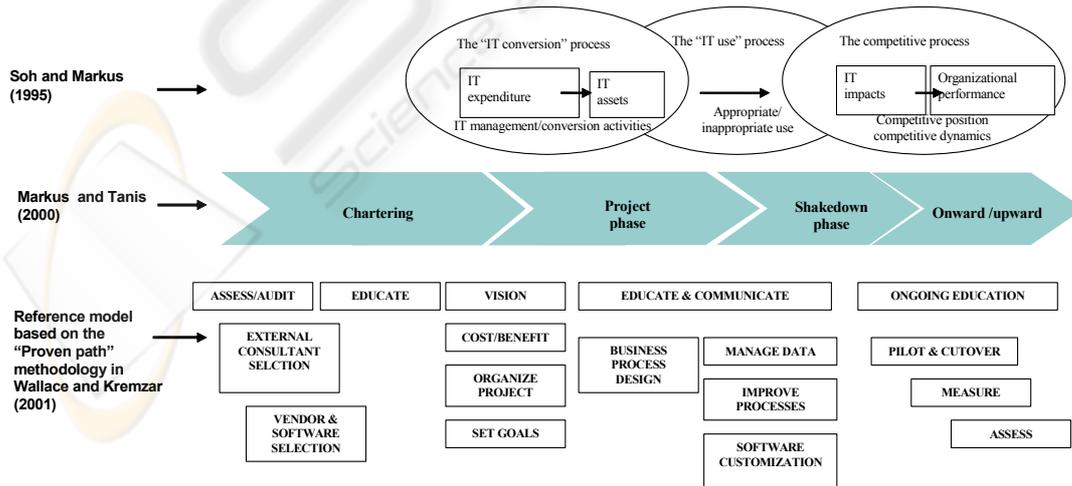


Figure 1: The reference model

(Wallace and Kremzar, 2001) was adopted with some modifications, with the aim of subdividing each stage in its specific sub-activities. A software/vendor selection sub-activity has been added as well as the choice of the external consultant (Figure 1).

Table 1: Classification of SMEs characteristics being an obstacle to ERP adoption

Specificity	Classification of SMEs characteristics being an obstacle to ERP adoption
Organizational	<ol style="list-style-type: none"> 1. Low extent of formalization of people's roles and responsibilities that is expressed by their continuous re-shuffle (Dutta and Evrard, 1999)** 2. The shift from a functional structure to a process-based view of the organization also requires the verification of the alignment between both the IS and ICT architectures and the current organizational structure (Luftman and Brier, 1999). ** 3. It is often difficult to successfully implement a process-based approach, since it requires a lot of time and money and results in a tremendous amount of change within the organization (Shields, 2001)** 4. SMEs are "resource poor" in human terms* 5. SMEs face a greater environmental uncertainty, as they have a lower measure of control over their extraorganizational situation *
Decisional	<ol style="list-style-type: none"> 6. The decision-making process of small business is less reliant on formal information and decision models * 7. The strategic decision cycle or time frame of the SMEs is characterized as being: generally short term, with a reactive rather than a proactive orientation; and less formal, using fewer formal management techniques.*
Psycho-Sociological	<ol style="list-style-type: none"> 8. Owner-managers of SMEs are less prone to sharing information and delegating decision-making * 9. The decision-making process of small business managers is more intuitive and judgemental*
Information Systems	<ol style="list-style-type: none"> 10. Limited resources in IS, including implementation and training (Levy and Powell, 2000) ** 11. Need for skilled manpower involved in implementing and operating IS (Thong, 2001)** 12. SMEs underestimate the amount of time and effort required for IS implementation (Yap, 1989)** 13. lack of strategic planning of IS (Levy and Powell, 2000, Sweeny, 1999, Zinatelli, et al., 1996)** 14. Organizational information systems are generally under-utilized by SME managers.* 15. Within SMEs the non-development of adequate internal competencies limits the development of real policies of IT specification and selection supporting the IS (Monsted, 1993; Schleich, et al., 1990) ** 16. SMEs are characterized by an underdevelopment of the IS with regard to the organizational requirements (Cragg and Zinatelli, 1995; Lai, 1995; Lang, et al., 1997) ** 17. IS planning within SMEs becomes more critical as technology becomes more central to SME products and processes, and needs to be integrated with the business strategy (Billi and Raymond, 1993)** 18. The main objective for managers is to spend available financial resources on supporting management systems that would improve day-to-day operations (Levy and Powell, 2000)** 19. Managers in SMEs tend to have less computer experience and training * 20. The information systems function in most SMEs is typically: in an early stage of evolution; subordinated to the accounting function; lacking managerial expertise to plan, organize and control the use of information resources of the firm; and possessing of a relatively low level of technical systems development sophistication** 21. SMEs have limited expertise in IT (Levy and Powell, 2000)** 22. SMEs usually devote scarce resources to the IS department and, whenever they do, the IS staff competence is strictly narrowed to technical issues (Palvia, et al., 1994, Soh, et al., 1994, Zinatelli, et al., 1996)** 23. Lack of policies of IT specification and selection supporting the IS (Monsted, 1993; Schleich, et al., 1990)**
Financial	<ol style="list-style-type: none"> 24. The configuration and implementation of ERP systems still remain an expensive task for SMEs (Mabert, et al., 2001)** 25. There are more barriers to IS implementation in small businesses than in large businesses due to the high capital investment involved in implementing and operating IS (Thong, 2001)** 26. Small-medium entrepreneurs tend to choose the cheapest system which may be inadequate for their purpose (Yap, 1989)** 27. Small- and medium-sized enterprises are not able to pay consultants millions of dollars for ERP implementation (Scheer and Habermann, 2000)** 28. Significant lead times and high fees associated with ERP implementation (Chau and Patrick, 1995, Hochberg, 1998)** 29. However, unlike large enterprises, small and medium-size enterprises (SME) cannot afford to spend years on a software project (Al-Mudimigh, et al., 2001)**
<p>** New factor identified * Factor already present in Gable and Stewart's classification (1999)</p>	

1.2 ERP adoption obstacles within SMEs (RQ2)

The capability of Enterprise Resource Planning (ERP) systems to efficiently and effectively manage company's resources by providing a total, integrated solution for its information processing needs (Nah, et al., 2001) has persuaded both practitioners and managers of the importance of integrated systems, not only for large multinational organizations but for small and medium-sized firms too (Everdingen, et al., 2000). Unlike large companies which often own both the managerial competencies and adequate financial resources, other studies (Raymond, 1992)

stressed out the weaknesses of SMEs in properly managing the technology innovation. A previous research by Gable and Stewart (1999) classified the structural and managerial characteristics of SMEs that hampers ERP adoption by the four specificities they belong to. This classification was enriched with a fifth specificity, the *financial* one, while a literature review was performed to verify if other factors could be relevant as to the original taxonomy. 29 SMEs' characteristics are reported in Table 1 including the original factors identified by Gable and Stewart.

1.3 CSFs in ERP implementation (RQ3)

Despite the numerous benefits and promises of ERP adoption (Davenport, 1998, Gable, 1998), great concerns have been expressed on the ability to translate the potentials of an integrated information system into a success story (Davenport, 1998). Even though rather high levels of customization are possible, enterprise systems push toward their "logic" and the underneath best practice models. Nevertheless, this may conflict with an organization's way of doing business and, as a result, it can compromise or lead to the failure of the ERP project. Hence, a considerable amount of interest has been devoted to the identification of critical success factors (CSFs) in ERP adoption (Nah, et al., 2001, Somers and Nelson, 2004). These studies used different approaches to classify the most important CSFs in ERP implementation by highlighting, alternatively:

1. their *positioning along the ERP adoption cycle* (Esteves and Pastor, 1999, Markus and Tanis, 2000);
2. the *relationships between the identified CSFs and specific dimensions* of ERP adoption (Motwani, et al., 2002, Umble, et al., 2003)
3. the *strategic or tactical* role of CSFs in ERP adoption and implementation (Esteves and Pastor, 2000, Stefanou, 2001).

To address RQ3, a wide literature review on CSFs in ERP implementation has been performed. The 26 identified CSFs have been classified according to a bi-dimensional scheme based on the *organizational* and the *technological* domains (Esteves and Pastor, 2000).

The organizational domain has been further specified by highlighting four typical dimensions of ERP implementation such as process management, project management, change management and people's dimension (Esteves and Pastor, 2001, Mandal and Gunasekaran, 2003) (Table 2).

Table 2: CSFs in ERP implementation

Dimension	Area	CSFs
Organizational	process management	<ul style="list-style-type: none"> • Need for establishing the process owner role (Davenport, 2000b) • Reinforcement of the concept of business process (Beretta, 2002) • Business Process Change (BPC) team (Beretta, 2002, Motwani, <i>et al.</i>, 2002) • Business Process Reengineering (Davenport, 1993, Hammer, 1999, Hammer and Champy, 1993, Lucas, <i>et al.</i>, 1988) • Adequate IT infrastructure supporting knowledge sharing and communication (Motwani, <i>et al.</i>, 2002)
	project management	<ul style="list-style-type: none"> • Project evaluation measures (Umble <i>et al.</i>, 2003) • Project manager/leader profile and skills (Wallace and Kremzar, 2001; Willcocks and Sykes, 2000) • Presence of super-users (Davenport, 2000b) • Recruitment, selection and training of personnel for the project team (Mandal and Gunasekaran, 2003) • Clear definition of project objectives (Umble <i>et al.</i>, 2003; Nelson and Somers, 2004) • Steering committee's tasks and responsibilities (Welti, 1999; Nelson and Somers, 2004) • Initial detailed project plan or overall schedule for the entire project (Wallace and Kremzar, 2001; Nelson and Somers, 2004)
	change management	<ul style="list-style-type: none"> • Presence of an executive-level project champion (Mandal and Gunasekaran, 2003) • Commitment by top management (Esteves, <i>et al.</i>, 2002; Somers and Nelson, 2004; Umble, <i>et al.</i>, 2003) • Clear understanding of strategic goals (Mandal and Gunasekaran, 2003; Umble, <i>et al.</i>, 2003) • Open communication and information sharing (Aladwani, 2001; Motwani, <i>et al.</i>, 2002; Somers and Nelson, 2004)
	People dimension	<ul style="list-style-type: none"> • Extensive education and training (Umble <i>et al.</i>, 2003) • Cross functional training and personnel movement within the organization (Motwani, <i>et al.</i>, 2002) • hands-on training (Aladwani, 2001) • Commitment and motivation of users toward the innovation (Mandal and Gunasekaran, 2003)
Dimension		CSFs
Technological		<ul style="list-style-type: none"> • Legacy systems knowledge (Esteves and Pastor, 2000; Themistocleous and Irami, 2001) • Presence of internal IT capabilities/characteristics (Willcocks and Sykes, 2000; Mandal and Gunasekaran, 2003) • Adequate ERP implementation strategy (Davenport, 1998; Esteves and Pastor, 2000; Markus, <i>et al.</i>, 2000; Somers and Nelson, 2004; Umble, <i>et al.</i>, 2003) • Establish ERP selection and evaluation criteria (Esteves and Pastor, 2000; Somers and Nelson, 2004; Willcocks and Sykes, 2000; Verville and Haltingen, 2003) • Implementation consultants (Davenport, 2000; Somers and Nelson, 2004) • Data accuracy/integrity (Umble <i>et al.</i>, 2003; Somers and Nelson, 2004; K.M. Kapp, 1998)

1.4 CSFs in project management (RQ4)

Although a number of research works have previously dealt with CSFs in ERP implementations using the organizational and technological dimensions as reading keys (Esteves and Pastor, 2000), so far none of these studies has focused the analysis on SMEs. The reference model showed in paragraph 1.1 allows classifying the CSFs' along the ERP life-cycle rather than by simply grouping the identified CSFs as to the dimension they belong to. The selection of CSFs in the light of the characteristics of SMEs is only an intermediate goal, since the final aim is to provide a comprehensive framework and the related methodological steps to support the evaluation of the most critical issues in ERP implementation.

Project management deals with all aspects of the project, such as planning, organisation, information system acquisition, personnel selection, and management and monitoring of software implementation (Al-Mudimigh, *et al.*, 2001). The project team's business and technological competence play a fundamental part in settling ERP implementation success or failure (Somers and Nelson, 2004) since the ERP projects may have to contend with issues such as:

1. scope, time, cost, and quality.
2. stakeholders with differing needs and expectations.

3. identified requirements (needs) and unidentified requirements (expectations).

1.4.1 Recruitment, selection and training of personnel for the project team.

The structure of the project team deeply influences the implementation process (Esteves and Pastor, 2000) since skills and knowledge of the project team are critical in providing expertise in areas where team members lack knowledge (Somers and Nelson, 2004). Therefore project team composition demands multiple skills covering functional, technical, and interpersonal areas (Al-Mashari, *et al.*, 2003) and top-notch people who are chosen for their past accomplishments, reputation, and flexibility (Umble, *et al.*, 2003). A multifunctional composition should also count key users, people with bridge-building interpersonal skills, together with in-house and in-sourcing of IT specialists (Willcocks and Sykes, 2000) and third-party consultants (Welti, 1999).

Esteves and Pastor (2000) propose that also consultants should be involved in a way that helps the implementation process, in particular by sharing their expertise and skills with the internal staff through an adequate knowledge transfer mechanism (Al-Mashari, *et al.*, 2003). On the other hand, Welti (1999) warns that even though the resort to external consultants reduces the internal workload it also drains financial resources from the company.

It's very difficult to say which strategy fits better with SMEs' characteristics since the financial constraints and the available organizational skills are inevitably context-dependent. Nevertheless, since managers in SMEs tend to have less computer experience and training (19), the resort to external consultants seems not only advisable but even mandatory. Finally, the limited resources, both human and financial, devoted by SMEs to the IS department and the scarce attitude of owner-managers in sharing information and delegating decision-making (8) are both reasons that suggest that this CSF must be seriously kept in consideration.

1.4.2 Initial, detailed project plan or overall schedule for the entire project

A proper assignment of responsibilities and due dates among the project team members also guarantee the availability of key users for those activities in which they are involved (Wu, *et al.*, 2002). Also unforeseen changes in the people joining the team and in the operating environment are both threats for an ERP implementation. Wallace and Kremzar (2001) noticed that since companies' attention span is limited, as the project priority drops, so the odds for success. Overlooking this issue may be dangerous in particular

within SMEs, given that the amount of time and effort required for IS implementation (12) is often already underestimated and the decision cycle or time frame is generally short term and with a reactive rather than a proactive orientation (7). In conclusion, a proper and timely project plan definition should be seen as a preventive measure by owner-managers, since it could prevent the project from suffering from extra-organizational situation over which SMEs have a lower measure of control (5).

1.4.3 Project manager's profile and skills

In order to manage a project successfully, project managers have to be experienced both in strategic and tactical project management activities. In particular, the project manager should be full-time, from within the company and own an operational background (Wallace and Kremzar, 2001).

The project leader should also have a track record of success with the size and type of the project he's going to deal with (Willcocks and Sykes, 2000). Furthermore, proven skills in managing both external consultants and the inter-functional conflicts arising from ERP implementation are required. Since an ERP implementation should be business driven and directed by business requirements, and not by the IT department (Umble, *et al.*, 2003), then internal IT managers should be at least knowledgeable about how the new technology could be affecting their business (Willcocks and Sykes, 2000). The traditional structure of an ERP project is quite complex since it demands high coordination skills from several actors, such as the **project champion**, the **executive steering committee** and the **project manager/team**. But also a different project configuration (**entrepreneur**, **CIO** and the **project team**) which can realistically fit with SMEs' characteristics may cause an equal or maybe higher degree of complexity since it overloads a flatter and less responsive organizational structure. This last structure compels the entrepreneur and the CIO to carry out tasks that are often not compatible with the time constraints typical of SMEs (Thong, 2001). That's why some authors (Loh and Koh, 2004) suggest that it should be advisable to hire an **external consultant** having project management responsibilities thus overcoming the organizational overload and making up for any lack in project management competences. Undoubtedly, the degree of technical overspecialization of IS staff's competences (22) and the widespread lack of IS strategic planning (13,17,20) are sufficient reasons for small-medium entrepreneurs to carefully evaluate this as a viable option.

1.4.4 Definition of project scope and objectives

This critical success factor is related with concerns of project goals clarification and their correspondence with the organizational mission and the identified strategic goals (Esteves and Pastor, 2000). Scope specifies the degree to which the ERP system will change managerial autonomy, task coordination, and process integration in the business units of the enterprise (Markus, *et al.*, 2000) and implies the definition by the highest authority of the project organization, the steering committee, of the objectives for the overall project (Welti, 1999). It implies the definition of the scope of business processes and business units involved, ERP functionality implemented, technology to be replaced/upgraded/integrated, and exchange of data (Esteves and Pastor, 2000).

Timeliness of project should be managed (Rosario, 2000) by creating aggressive but achievable schedules (Umble, *et al.*, 2003). This task requires a detailed implementation schedule, better if created by external consultants who are more experienced with software and project scheduling (Welti, 1999). Since a different scope in ERP projects requires different levels of organizational authority and organizational participation (Markus, *et al.*, 2000), SMEs have also to discount the need for more formal information and decision models (6,7,9) with respect to the project scope definition and objectives outlining activity. Independently of the adopted implementation approach (simultaneous, step by step, incremental), owner-managers must also realize that sharing information and delegating decision-making during the definition of project scope and objectives is vital (8), so that the centralization of decisions doesn't turn out to be a bottleneck during system implementation.

1.4.5 Project and system evaluation measures

Although most project goals can be measured only after project implementation because they ask for results based on the implementation, or aim at organizational changes, nevertheless all the actors taking part in ERP implementation must share a clear understanding of the goals (Umble, *et al.*, 2003). Specific and detailed performance targets for the system are also required (Wallace and Kremzar, 2001).

On the other hand, project development must be closely monitored too: consulting fees, replacing of legacy systems and user training are some of the areas evaluators should not ignore, while other authors (Somers and Nelson, 2001) suggest the need for

multiple management tools such as external and internal integration devices and formal planning and results-controls. This remark collides with the relatively low level of sophistication of the decision-making process within SMEs, being more intuitive and judgmental, less formal and using fewer formal management techniques (8,9). Then, SMEs should consider the opportunity of adopting rapid implementation tools (i.e. AcceleratedSAP) which are commonly provided by consulting package vendors, VARs and implementation partners (Chan, 1999). SMEs could benefit of reinforced implementation methodologies and also of the embedded project and system performance evaluation measures.

1.4.6 Presence of key users

Key users’ tasks include determining how the system will affect the procedures of the organization and recommending system configuration and design detail to the external contractor (Davenport, 2000, Wu, et al., 2002). The criticality of such a role requires key users to be chosen among the best performers in the function or department they belong to (Davenport, 2000). Since SMEs are “resource poor” in human resources (4), a first challenge is to free them up from their daily routine by appointing new employees or temporary staff (Wallace and Kremzar, 2001). Anyway the replacement of key users with new/other employees could be a minor issue within SMEs since the availability of key users is de facto uncertain and must be carefully evaluated by the entrepreneur. In particular, the verification of the available skills among the likely candidates could reveal the scarcity of project and teamwork competences which are typical of SMEs (15).

1.4.7 Steering committee’s tasks and responsibilities

Previous researches outlined the importance of the of Executive Steering Committee in ERP implementation (Somers and Nelson, 2004) since it

should be the highest authority of the project organization and must be responsible for setting the objectives for the overall project by a precise visioning and planning of implementation (Al-Mashari, et al., 2003). Somers and Nelson (2004) suggest that the Executive Steering Committee should also be involved in system selection, monitoring during implementation, and management of external consultants. Other studies privilege the relevance for the support by top management (Esteves and Pastor, 2000, Nah, et al., 2001) more than the deployment of an official and dedicated board supporting and leveraging ERP change and project management. The short term and reactive more than proactive orientation of strategic decision-making within SMEs (7) should make the creation of a formal board supporting implementation a favorable option, but it’s also true that the organizational heterogeneity of SMEs, in addition to other factors (12,13,18), suggest this is possible and advisable just only when this prerequisite are met.

According to the characteristics of each CSF, it’s possible to evaluate their criticality with regard to different organizational and managerial configurations of SMEs (Figure 2). In fact, the achievement of the CSFs should be *mandatory*, *context-dependent* or *negligible* depending on since SMEs have remarkable differences as to the organizational structure, internal competencies and the human and financial resources available (Buonanno, et al., 2005). In particular, *mandatory* means that the company, owing the adequate organizational and financial resources, should be able to successfully implement the CSF. Finally, in the case of a CSF labeled as *context-dependent*, SMEs should theoretically deserve the maximum attention, also acknowledging that the actions to be undertaken need to be carefully evaluated in the light of the resource and skills available. Finally, *negligible* is related to the CSFs that rely on the participation of actors from outside of the organization to be achieved (i.e. an external consultant).

Medium-sized company with adequate internal competencies and a structured organizational profile			Medium-sized company with flat organizational structure and no relevant internal competencies			Small company		
Mandatory	Context dependent	Negligible	Mandatory	Context dependent	Negligible	Mandatory	Context dependent	Negligible
1				1				1
2			2			2		
3			3					3
4			4			4		
5				5			5	
6				6				6
	7				7			7

Figure 2: Relevance of the identified CSFs as to the different organizational and managerial configurations of SMEs

1.5 Assessment of critical activities along the ERP life-cycle (RQ5)

To evaluate possible critical activities along ERP implementation, an “ex-ante/ex-post” approach has been developed. The identified CSFs have been placed along the reference model and, in particular, along those sub-activities on which their effect is supposed to disclose. The logic underneath this choice is that often issues in ERP implementation are caused just by the erroneous perceptions as to the relevance of the CSFs themselves. Making use of a gap analysis on ten-point Likert scale, the methodology aims at highlighting inconsistencies between the “ex-ante” and “ex-post” CSFs’ evaluation, thus revealing if no adequate attention, human resources and money have been deployed in performing the CSF-related activities. The project leader has been identified as the person in charge of the evaluation of the CSFs since he is supposed to own the most visibility of the ex-ante situation (e.g. the operational and strategic choices on which the project is based on) as well as the ex-post state of the project (i.e. the actual efforts and activities made to successfully implement the CSFs).

Two medium companies belonging to different industries were requested to evaluate the relevance of each CSF before implementation took place as well as at the end of it.

Despite the differences related to the platform adopted (SAP R/3 vs Oracle Business Suite) and the business requirements, both business cases have proven the methodology to be reliable in identifying the inconsistent evaluation of CSFs’ relevance being the cause of the issues, delays and bottlenecks observed during the implementation process. The detailed results of the model application are not reported in the present work due to the limited space.

2 CONCLUSIONS AND FURTHER RESEARCH

Despite the development of products with a range of functionalities on a smaller scale as well as vertical solutions to achieve a concrete reduction in customization costs, there is not a general agreement on the effectiveness of such systems within SMEs. The methodology herein presented aims at making ERP implementation a smoother process within SMEs and its application in two business cases proved the methodology to be very reliable in identifying the reasons behind delays and bottlenecks. This result also confirms that CSFs are not only a slogan but a useful tool for preventing and

investigating critical issues in ERP implementation. Further research will consist in other applications of the methodology in order to verify and establish the set of CSFs, their metrics and the related sources and, moreover, to explore the possibility of highlighting critical patterns in ERP implementations within SMEs.

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