In-house development as an alternative for ERP adoption by SMEs: A critical case study

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IN-HOUSE DEVELOPMENT AS AN ALTERNATIVE FOR ERP ADOPTION BY SMES: A CRITICAL CASE STUDY

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Abstract

ERP systems are increasingly accessible to small and medium-sized enterprises (SMEs). If the potential benefits of these systems are significant, the same applies to the risk associated with their implementation. The majority of ERP studies relate to software packages supplied by large vendors such as SAP and Oracle and by smaller vendors; but until now, few have studied the adoption of ERP systems developed “in-house”. Furthermore, few studies have explicitly focused on minimizing the risk of these systems at the adoption or pre-implementation stage. Presenting a critical case study which analyzes the adoption of an in-house ERP by a SME in the agri-food industry, this article proposes and tests a process framework of ERP systems adoption, based upon a literature review and a conceptual framework centered on risk minimization. The study shows that 1) in-house ERP seems to represent a credible alternative for ERP adoption by SMEs, 2) to minimize risk at the adoption stage, a SME can proceed in a rather intuitive and unstructured manner, based however upon certain principles, policies and practices. The successful ERP implementation in this case indicates that it is not always necessary to resort to formalized project management in order to minimize implementation risk.

Keywords: ERP, in-house development, adoption, implementation risk, SME.

1 INTRODUCTION

Despite the fact that ERP adoption is one of the most important phenomena “in the corporate use of information technology in the 1990s” (Davenport 1998, p. 122), their adoption by small and medium-sized enterprises (SMEs) is a relatively new phenomenon (Everdingen, Hillegersberg and Waarts 2000). Recently, Light and Sawyer (2007) have found some weaknesses in ERP research with regard its theoretical foundation, also noting the scarcity of research focused on non-commercially licensed ERP software such as open source ERP and “in-house” or custom-developed ERP. In this last alternative, the organization develops its own ERP system, made-to-measure to satisfy its specific needs, with or without the assistance of a third party. The availability of new software development tools and methods (Wirfs-Brock 2008) as well as the wide adoption of open standards by developer communities make the in-house development of ERP systems feasible (Olsen and Saetre 2007). Certain characteristics of this alternative make it attractive for SMEs: greater adaptability, no vendor lock-in, property of the source code, cost comparable to the other alternatives (Olsen and Saetre op. cit.). Furthermore, most of the studies on ERP adoption tend to examine large enterprises and their findings cannot easily be extended to SMEs because of the fundamental differences between the two (Dandridge 1979).

The growing importance and risk of ERP projects, in SMEs in particular, imply that researchers must “focus on ways to improve ERP implementation” (Robey, Ross and Boudreau 2002 p. 19). With regard to risk minimization, Kliem (2000) emphasises the efficiency of risk management when it is
introduced at the earliest possible opportunity in the system life cycle. In response to the appeals stated above, and building on past research, the present study attempts to answer the following research question: **What can be done to minimize the risk of ERP system implementation in a small firm, from the adoption stage onwards?** To obtain initial insights on this question, a positivist case study was made of a small firm that has developed and implemented an in-house ERP system. The objective of the study is three-fold: a) contextualize and describe the various stages in the SME’s in-house ERP adoption process, b) identify the firm’s management practices that reduce the ERP development and implementation risk, and c) understand the determinants and effects of these practices. This research builds upon Boudreau and Robey’s (1999) theoretical framework in using four theoretical lenses to discuss the case, that is, organizational change theory (Robey et al. 2002), diffusion of innovation theory (Rogers 2003), complexity theory (Cohen 1999), and the resource-based view (Beard and Sumner 2004).

### 2 RESEARCH FRAMEWORK

While the notion of risk is deemed to be important for IS researchers and practitioners, there is as of yet no consensus on how to define, measure and manage IS risk; and most risk management models do not have a theoretical foundation (Alter and Sherer 2004). In the present study, based upon Barki, Rivard and Talbot’s (2001) model founded on contingency theory, it is proposed that the success of an ERP implementation will be influenced by the degree of alignment or “fit” between the SME’s risk exposure level and its risk management profile.

In reviewing the literature on ERP system adoption, we found that most of the models are without any theoretical foundation with the exception of Verville and Halingten’s (2003) model. The framework developed for the present study is thus based on this model because of its theoretical and empirical foundation and on Esteves and Pastor’s (1999) because it is somewhat complementary to the first.

A number of IT implementation studies have used Tornatsky and Fleischer's (1990) technology-organization-environment (TOE) framework to characterize the implementation context, emphasizing three groups of contextual factors: 1) characteristics of the environmental context such as external pressures from the firm's business partners, 2) characteristics of the organizational context such as the firm's structure, and resources, including managerial and entrepreneurial (in the case of SMEs) factors, given the key role played by certain individuals in the implementation process, and 3) characteristics of the technological context, including the information technologies already implemented by the firm.

Given the lack of consensus on the nature of IS risk factors and on the principal components of such factors (Alter and Scherer 2004), a review of prior studies led to the identification of six categories of risk exposure, namely organizational, business, technological, entrepreneurial or managerial, contractual and financial risk (Austin and Nolan 1999, O'Leary 2000, Caldeira and Ward 2003, Bernard, Rivard and Aubert 2002, Ariss, Raghunathan and Kunnathar 2000).

Figure 1 presents the initial research framework derived from a review of the scientific and empirical literature. The framework was initially validated by 13 academic and professional ERP experts through a two-round Delphi procedure. According to this framework, the ERP adoption process in a SME is influenced by a general context and a specific context (Ross and Vitale 2002, Kumar, Maheshwari, and Kumar 2003). The process itself can be broken down into seven stages (Verville and Halingten 2003). The dynamics of change that allow the organization to move from one stage to the next is explained by “motors” of organizational change and by the form of the change (Boudreau and Robey 1999). The choices available as a result of the process are the six alternatives proposed in the framework (Alshaw, Themistocleous and Almadami 2005), one of which is in-house ERP development. Lastly, the fit between exposure to risk and risk management profile (Barki et al. 2001) has an impact on the quality of the new system, on user satisfaction, on individual managers and employees, and on the organization (Gable, Sedera and Chan 2003).
3 CASE STUDY RESEARCH METHOD

The field of knowledge on ERP, while continuing to grow, had achieved a certain level of maturity (Botta-Genoulaz, Millet and Grabot 2005). Chen and Hirschheim (2004) note that when a field becomes more mature, one expects that research efforts will tend more to “theory-testing” than to “theory-building”. The present test of a research framework on the adoption of in-house ERP thus seems opportune. As the phenomenon under study is hardly separable from its context (Ross and Vitale 2000) and the adoption of in-house ERP is relatively recent and rare, a single “critical” case design was taken (Gallivan and Keil 2003). As is shown in Table 1, the firm selected for the case study, Bio-Epsilon, a small (31 employees) Canadian firm in the agri-food industry, adopted its ERP system at the end of a 6-month process.

<table>
<thead>
<tr>
<th>Date</th>
<th>November 2005 to March 2006</th>
<th>March 2006</th>
<th>July 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events</td>
<td>Decision to acquire an ERP to support the firm’s operations in the new building</td>
<td>Collection of information on ERP systems from five main sources</td>
<td>Evaluation of two ERP solutions from a de facto short list</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluation based on a consensus</td>
<td>First functionalities of the ERP are put into service (end of implementation planned for December 2006)</td>
</tr>
<tr>
<td>Phases</td>
<td>Decision to adopt Planning</td>
<td>Search for information</td>
<td>Evaluation</td>
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Table 1. Adoption of an in-house ERP solution at Bio-Epsilon.

1 This case is based on actual facts and existing firms. A transposition has been made to preserve the anonymity of these firms and the confidentiality of the data.
For purposes of internal validity in case study research, evidence was obtained from three different sources: semi-structured interviews, written documents, and a questionnaire (Dubé and Paré 2003). The main source of the data collected consisted of four interviews conducted at Bio-Epsilon’s premises in August 2006 by one of the researchers. The four “key informants” met were the owner-manager, the marketing manager, the quality control manager, and the sales manager (Patton, 1990). Each interview lasted approximately one hour and a half. The selection of these informants was based on a “snowball” sampling procedure. Saturation was achieved at the third interview (Lincoln and Guba 1985).

Similarly to Sarker and Lee (2001), an informal interview was also held with the consultant who accompanied Bio-Epsilon along the adoption process. The documents consulted were essentially promotional material on the firm’s activities and products, information on its markets, project documentation and documentation from the consulted ERP suppliers. The questionnaire was filled out immediately after the interview by both, the owner-manager and the marketing manager with the assistance of the researcher.

Data processing and analysis were based on the interactive model proposed by Miles and Huberman (2003). Prior to data collection, a list of four pre-determined categories and eleven sub-categories was established from the literature review and the initial research framework (Paré 2004). Given the flexibility inherent to the case study method (Dubé and Paré 2003), this list was modified during and after data collection and “room was made for modifications dictated by the data itself” (Lapointe and Rivard 2005, p. 470). Coding was done initially by the researcher who did the interviews, then done anew by a second researcher, following which discrepancies were resolved. Use was also made of “pattern matching” (Yin 2003) as well as the following process data analysis strategies: narrative, visual mapping, quantification, and temporal bracketing (Langley 1999).

4 RESULTS

Bio-Epsilon is a Canadian SME specialised in the commercialisation and distribution of food products originating in biological agriculture. Created in 1996 by a conglomerate on the initiative of two entrepreneurs, Bio-Epsilon was a subsidiary of Global-Delta until June 2005. That same year, for financial and fiscal reasons, the chief executive and until then minority shareholder bought back the greater part of the shares from the parent firm and thus became majority shareholder. Today, 96% of the equity is held by the management team and 4% by the ex-parent firm.

4.1 Global and specific contexts of ERP adoption at Bio-Epsilon

Bio-Epsilon has two types of customers. On one hand, food retailers specialised in the selling of food products originating in biological agriculture to which it sells finished products constitute approximately 80% of its turnover. On the other hand, it sells semi-finished products to a number of craft or industrial producers in the biological agri-food sector. From these semi-finished products, these last customers make biological food products that compete with those of Bio-Epsilon. This relationship based on simultaneous cooperation and competition (Shen 1997) is accepted by Bio-Epsilon’s owner-manager. The firm’s business environment is characterised by strong pressures with regard to the price of products sold and to ever-increasing requirements with regard to the quality of products and services. The customers’ demands manifest themselves in terms of time of delivery and availability of products.

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2 The interview guide and the questionnaire are available from the authors upon request.
Bio-Epsilon is a firm whose commercial dependency upon its customers is rather weak, but it is rather strong upon the Global-Delta firm, which is its main supplier. The ex-parent firm provides 77% of its supplies. Today, Bio-Epsilon processes over 30,000 order lines per year and forecasts an annual growth rate of 15%. With such growth objectives and also with objectives of increasing the quality of services rendered to its customers, the firm decided to invest in the construction of a new building adapted to its operational needs. The acquisition of a new ERP system is part of this organisational project. This investment is accompanied by quantified objectives in terms of customer satisfaction. More precisely, these objectives should translate into fewer complaints lodged by customers and in the delivery of products within no more than 24 hours after reception of a customer’s order.

Bio-Epsilon is an organisation whose size is small and whose organisational structure is simple and decentralised. Certain important decisions are taken jointly by the owner-manager and the marketing director or on the basis of a consensus. Bio-Epsilon has 31 salaried employees, including five managers, and had a turnover of 14 million dollars in 2006. Due to its strong growth, this number of personnel has doubled in the last three years. To increase the flexibility of its operations, Bio-Epsilon out-sources the transportation and delivery of its products to three firms.

To do business, Bio-Epsilon mainly relies on a “niche” type strategy. The firm distinguishes itself from its competitors by its responsiveness and the diversity and quality of its products, whose brand is recognised, and by the quality of services rendered to customers. It also distinguishes itself by its marketing, justifying its employment of a full-time graphic artist dedicated to designing the products’ packaging and leaflets and to the firm’s marketing communication.

The owner-manager and marketing director both have university degrees and more than twenty years’ professional experience in the commercialisation of food products. The owner-manager has a positive attitude toward IT and IT management procedures. His management style is of the participative-management type.

As soon as the new building construction project started to take form, Mr. Nelson, Bio-Epsilon’s owner-manager, mandated an outside consultant to assist the firm in formalising the new work organisation and the new workstations. This project lasted for approximately 12 months.

Previously, the firm’s applications portfolio consisted of a “best of breed” ERP (Light, Holland and Wills 2001), composed of the following elements: marketing and sales, and financial management modules provided by a large software supplier, Bestofapps. It also included a specific application developed in the 4D technology environment to complement the functionalities of the Bestofapps software with regard to warehousing management. Payroll processing is out-sourced. There are no personnel dedicated to IT, but most employees use IT tools intensely. As a result, Bio-Epsilon’s level of IT use and IT management sophistication is high. Most management processes are automated through a relatively rich but poorly-integrated applications portfolio. Thus data are captured more than once in the various administrative units, generating numerous errors despite multiple redundant verifications. The information system had thus become an obstacle to the attainment of the firm’s quality objectives. One example illustrates this:

The marketing director indicates that when promotional materials are to be posted to customers, only 50% of these appear automatically due to database inconsistency. “For example, when we want to send promotional materials, half of our customers do not appear because they are not all entered in the same way in the database. This looks trivial but the consequences are enormous. It’s of great concern because we have to manually process more than 1000 records each month.”

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3 4D is a software publisher (integrated development environment, data bases, application servers and web servers) whose products are meant to accelerate the development and deployment cycles for professional applications (www.4D.fr).
The triggering factor in the idea to adopt an ERP system lies in moving to a new building especially constructed to house Bio-Epsilon’s head office and warehouse. Initial motivations to acquire such a software package were operational in nature (Ross and Vitale 2000). Management wants to be able to localise product batches in the new three-storey warehouse in a more precise manner.

In addition to the essentially operational motivations previously cited, objectives of a strategic and technical nature also appeared. Bio-Epsilon’s management hoped that a new ERP system would also allow it to improve the quality of services rendered to customers. It also wanted to avail itself of a unique technical platform to manage all of the firm’s activities.

Eight organisational stakeholders participated in the process of identifying the needs relative to the new ERP system, as mentioned by Mr. Nelson: “7 or 8 out of 31 employees, that’s not too bad, that means a quarter, knowing that the firm’s small size allowed everyone to express themselves”. User participation was organised at two levels. First, in each department, one or two representative users were charged with gathering the users’ needs and assure the liaison between the project and the latter. Then, information and consultation meetings with the representative users were held.

During the adoption process, Bio-Epsilon followed one guiding principle: adapting the system to the organization. The principles represent the highest level of abstraction for an architectural approach composed of three levels, that is, principles, policies and practices (Colbert 2004).

4.2 The ERP adoption process at Bio-Epsilon

As presented in Figure 2, the ERP adoption process at Bio-Epsilon can be decomposed into six phases: the adoption decision, planning, search for information, evaluation of the proposed solutions, choice of the best solution, and negotiation.

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**Figure 2. Dynamic of ERP adoption at Bio-Epsilon.**
In the first phase, the decision was jointly taken by the owner-manager and the marketing director, given the limitations of the present (legacy) information system to support Bio-Epsilon’s operations, limitations that would be accentuated when the firm moves to its new building. These two individuals were guided by one principle, that is, “the new system must be adapted to the organisation”, and by five policies, that is “no operating system other than Mac OS”, “work with an ERP supplier that can assure the system’s continuity”, “work with partners whose size is small”, “work with people we know”, and “work with a responsive supplier”.

In the second phase neither the budget nor the schedule of the next phases of the ERP adoption project were formally planned. However, management fixed an objective of deciding on the choice of an ERP system no later than March 2006 in order to dispose of sufficient time to implement it. This milestone allowed Bio-Epsilon to put the new system into service during the summer of 2006 such that it would be up-and-running by the time the firm moved into the new building, planned for November 2\textsuperscript{nd}, 2006. While the amount of investment had not been formally estimated, Mr. Nelson had estimated the time required by the ERP adoption process. The budget for the acquisition of the new system was to be in the 75 000$ to 90 000$ (CAD) range.

In the third phase, the search for information was made “on the fly” in the words of the owner-manager. In total, Bio-Epsilon collected information on ERPs from five main sources:

- Contacts with the ex-parent firm, Global-Delta. This organisation had been using AlphaMIS’s ERP for the last six years. AlphaMIS is one of the three largest ERP suppliers in the world. For Mr. Nelson, while the implementation was done “without pain”, a lot of work and investment was needed as it took a number of years before the system performed adequately. He took from this experience that the implementation of an ERP system provided by a large supplier such as AlphaMIS would be a complex task for Bio-Epsilon. Nonetheless, he was attracted by the idea of adopting the same ERP as Global-Delta to benefit from the compatibility between systems supplied by the same provider, and from an online access to Global-Delta’s inventory and other information. For this reason, he then contacted AlphaMIS.

- Contacts with a large supplier. Mr. Nelson sent an email to AlphaMIS. A few days later, he was contacted by a sales representative who presented him with AlphaMIS product offer to SMEs. It came out from this discussion that Bio-Epsilon could acquire an ERP system for approximately 75 000 dollars (CAD). In concluding, the sales representative promised to send a proposal to Bio-Epsilon.

- Contacts with the informal network. Mr. Nelson’s discussions with other owner-managers of SMEs that have implemented an ERP in their firm seem to have confirmed his worries. Two points come out of these discussions, one being that the choices made when initially setting the system’s parameters are difficult to change afterwards, and the other being that the cost of implementing an ERP is quite high. In relation to this last point, certain accounts of other owner-managers made him remember his own bad experience with Bestofapps with regard to the quality of service provided.

- Contacts with SMESoft, a firm that had implemented the Bestofapps software package at Bio-Epsilon. On one hand, given the difficulties encountered in the search for information on Mac OS-compatible ERP systems, and on the other hand given the good quality of the relationship with this partner, Mr. Nelson has decided to seek advice from SMESoft. Besides, it is this firm that had always been charged with maintaining Bio-Epsilon’s applications portfolio, computer network and workstations. It had been SMESoft that had implemented the first Macintosh computer at Bio-Epsilon, eleven years before. SMESoft’s chief executive indicated that they could develop a solution to respond to Bio-Epsilon’s requirements because, as software developers, they knew how to do so.

The ERP proposed by SMESoft, a small firm, was the only solution found by both the CEO and the marketing manager to be truly attractive and Mac OS-compatible. While he was interested at the outset to work anew with a service provider and software developer that knew his firm « on the tip of its fingers » and with which he had had close collaboration in the last eleven years, Mr. Nelson
thought that it would be rather imprudent to make such an important investment simply on this basis: “So I was keen on that solution, except that I said to myself, for such an important investment, it would be irresponsible to start out only with a ‘feeling’.”

- Call to an experienced outside consultant. Being uncertain of his choice, Mr. Nelson called upon an outside consultant within his informal network to give him advice on the adequacy of the ERP system proposed by SMESoft, given Bio-Epsilon’s needs. As the consultant was employed by OpenSoft, an integrator of open source solutions, he seized this occasion to propose OpenSoft ERP, an open source software package, to Bio-Epsilon. Consequently, the mission of the consultant was transformed into assistance in the choice between two ERP solutions: SpecificSoft ERP (in-house development) and OpenSoft ERP (open source).

Another consultant from OpenSoft was given the task of preparing the integrator’s proposal to Bio-Epsilon. So, Bio-Epsilon met itself with a de facto shortlist made up of two alternatives: an in-house ERP or an open source ERP. Afterward, both systems were evaluated by the external consultant and Bio-Epsilon’s eight user representatives. Detailed specifications were prepared by the consultant and sent to each supplier along with an invitation to proceed to a demonstration of their product. The functional scope of the ERP system as defined in the specifications covered the following functions: customer relationship management, sales administration, purchasing, quality and control, warehouse management and accounting.

During the demonstration, Bio-Epsilon representatives asked questions principally related to firm’s core activities. The result of this initial demonstration favoured OpenSoft which differentiated itself from its competitor by the quality of its presentation, particularly its scenarios, and the extent of its ERP system’s functional coverage. Having noticed that a number of important questions had remained unanswered by both candidates at the end of this demonstration, it was decided to send them renewed specifications in order to have another demonstration. After the second demonstration, Bio-Epsilon’s management and user representatives as well as the consultant prepared a list of about twenty selection criteria to enlighten the decision. Both suppliers were then evaluated on the basis of these criteria and on the impression made during the demonstration. Following several discussions, a consensus emerged in favour of SpecificSoft, the in-house ERP development solution.

Prior to initiating the implementation of the new ERP system, the owner-manager engaged in negotiations with SpecificSoft to obtain a fixed price that included not only the system’s development and configuration but also the training of all system users. The contract signed between both parties granted the property of the source code to Bio-Epsilon.

The system was put in service during the summer, a more tranquil period for Bio-Epsilon in terms of customer orders. The new system functioned in parallel with the legacy system for one month after going live. Overall, users show themselves very satisfied with the ERP system adopted. They are most satisfied with the system’s user-friendliness and comprehensibility, and with the support provided by the supplier. At the organizational level, it is the integration of business processes that is perceived as being the most important impact of the new ERP system. At the individual level, it is the productivity gains generated by the system via the elimination of redundant tasks that are most valued.

5 DISCUSSION

During the ERP adoption process, Bio-Epsilon seems to have been attracted by the “shared vision” (Slevin and Pinto 1987) of its functioning in the new building that would be enabled by the new system. In fact, photos and plans were sited on the walls of most of the headquarter offices. At Bio-Epsilon, the consideration of the risk of implementation from the adoption stage was based on a reactive, informal, intuitive and incremental approach (Bili and Raymond 1993). Bio-Epsilon’s risk management profile can be described as an intuitive, fairly informal and apparently unstructured approach to risk, based on specific principles, policies and practices. An assertion of the owner-
manager illustrates this fact: “I was guided by events ‘on the fly’. I gathered information right and left. It was difficult to obtain information on MacOS-compatible ERP systems because 95% of companies use PCs.”

Such as presented in Table 2, the principles, policies and practices employed by Bio-Epsilon had an effect at different stages in the adoption process, on the envisaged alternatives and on the firm’s exposure to ERP implementation risk.

<table>
<thead>
<tr>
<th>Phases in the adoption process</th>
<th>Alternatives envisaged</th>
<th>Risk exposure</th>
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</thead>
<tbody>
<tr>
<td><strong>Practices</strong></td>
<td></td>
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<tr>
<td>Involves end-users</td>
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<tr>
<td>Name 1 or 2 representatives per unit</td>
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<tr>
<td>Organize workshops between unit representatives</td>
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<tr>
<td>Structure the need</td>
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<tr>
<td>Estimate budget and timeframe</td>
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<tr>
<td>Negotiate fixed price</td>
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<tr>
<td>Contact personal network</td>
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<tr>
<td>Prepare a complete RFP</td>
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<tr>
<td>Organize demonstrations</td>
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<tr>
<td>Ask for field questions</td>
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<tr>
<td>Plan to experiment with the system one month before go-live</td>
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<tr>
<td><strong>Policies</strong></td>
<td></td>
<td></td>
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<tr>
<td>Work with a supplier whose size is small</td>
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<tr>
<td>Work with a supplier that assures the ERP system’s failure</td>
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<td></td>
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<tr>
<td>Work with people we know</td>
<td></td>
<td></td>
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<tr>
<td>Work with a responsive supplier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No operating system other than MacOS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Principles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The system is adapted to the organization</td>
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</tbody>
</table>

Table 2. Effects of principles, practices and policies on ERP adoption at Bio-Epsilon.

The ERP systems supplied by large vendors such as AlphaMIS were definitively eliminated from consideration, as they were perceived to be in conflict with the “ERP system is adapted to the organization” principle and the “work with a small-sized supplier” policy. The competition between the two remaining potential solutions brought to the foreground the most adequate choice for Bio-Epsilon. Furthermore, the answers to “field questions” put between both demonstrations as well as the work realized by the competitors between the two demonstrations allowed Bio-Epsilon to measure the responsiveness of every supplier. SpecificSoft’s and OpenSoft’s ERP solution were both in accordance with the previous principle and policy as well as with the “no operating system other than MacOS” policy. On the other hand, only SpecificSoft’s solution turned out to be more in accordance with the “work with a responsive supplier” and “work with people we know” policies. As an organizational metaphor can be a powerful yet subtle way of conveying meaning to results (Patton 1990), one can say that SpecificSoft was more capable than OpenSoft of overcoming the “virtual barrier” protecting the organization against ERP implementation risk, that is a barrier whose architecture was made-up of the principles, policies and practices employed by Bio-Epsilon during its ERP adoption process. Data analysis indicates that the architecture of principles policies and practices employed by Bio-Epsilon to minimize risk forms a whole, a “configuration” (Fiss 2007) whose internal consistency led to a successful implementation of the ERP system. Consequently, rather than the “profile deviation” alignment perspective posited initially, following Barki et al. (2001), it is the “gestalt” alignment perspective (Viliyath and Srinivasan 1995) that seems more appropriate to the case studied. In this perspective, equifinality is assumed in that different internally consistent
configurations of risk exposure and risk management profile may be equally effective, that is, may minimize ERP implementation risk.

According to Rogers (2003), five characteristics of innovations may affect their rate of adoption: relative advantage, compatibility, complexity, trialability, observability. Evidence from this case confirms the influence of three characteristics of the “in-house” ERP solution that turned out to be most important: greater compatibility with the firm’s processes and business model, less complexity; better trialability and greater evolutionary capability. The requirement for an evolutionary capability of the ERP system originates in Bio-Epsilon’s previous ERP experience and in the firm’s growth perspectives. Finally, diffusion of innovation theory explains neither the firm’s search for compatibility with regard to the size of organization (small size), nor with regard to a dominant trait of its strategic orientation (responsiveness) as indicated by the case data. This interpretation suggests that diffusion of innovation theory needs to be extended when applied to the adoption of a complex innovation such as an ERP system, in the context of SMEs.

According to Cole (2002), social processes constitute examples of complex phenomena. As ERP adoption is a social process in which the technology represents only one of the dimensions (Jones and Hughes 2001), it is thus a complex process. Consequently, the ERP adoption process may exhibit observable patterns of behaviour (Choi, Dooley and Rungtusanathan 2001). Data from the case indicate a pattern composed of five phases. With regard to Bio-Epsilon’s evolution from phase to phase along the adoption process, it is the shared vision of the functioning of the organization in the new building that acted as “an attractive vision of the future” (Elenkov, Judge and Wright 2005, p. 668) and urged it to look for a new ERP system. This vision was also a referred to all during the adoption process. Hence the “strange-attractor” motor stemming from complexity theory (Nutt and Backoff 1997) appears to be adequate in explaining the dynamic that moved Bio-Epsilon from one phase to another during the adoption process. The strange attractor is a configuration towards which tends the behaviour of a complex system in the long term (Capra 2005). Similarly, the “evolutionist” motor (Boudreau and Robey 1999) appears to be relevant in explaining the emergence of SpecificSoft and its ERP system as the suitable choice for Bio-Epsilon, as the result of competition during the adoption process.

As one can say that the “attractive future” of the organization envisioned by Bio-Epsilon’s CEO is made-up of a combination of experience, physical infrastructure, human capital resources, organizational resources, and business results, it appear that the resource-based view as applied to ERP (Beard and Sumner 2004) is a complementary theoretical lens for explaining what happened in this case. In summary, following Caldeira and Ward (2003), the outcome of the adoption process at Bio-Epsilon is valuable because adopting the ERP system applied to the core competitive processes of the business. It is also rare because it is based on a “custom” ERP system integrated in an enterprise vision. It is imperfectly imitable because of a personal relationship/partnership with the IT supplier for mutual long-term benefits. It is non-substitutable because of Bio-Epsilon’s continuous incremental innovation in partnership with IT suppliers to enhance its products and the services.

6 CONCLUSION

In an environment characterised by globalisation and based on knowledge, many SMEs are subjected to increased pressures with regard to competitiveness, innovation, flexibility, quality, and information processing capability. In attempting to respond to these challenges, a number of these firms have adopted an ERP system, and some of them are doing so by developing their system in-house. As a complex evolutionary phenomenon, ERP adoption is deemed by common wisdom to involve substantial risk. This study has demonstrated that it is nonetheless possible for SMEs to manage this risk, albeit through a single case. In attempting to describe and understand the dynamics of the ERP adoption process within change management and risk management perspectives, it is hoped that this study has provided a significant conceptual and practical contribution.
References


