ABSTRACT

Several studies have documented that IT projects often do not successfully meet defined objectives regarding time, budget, and functionality. There can be multiple causes for this, and an important factor in this context is the extent to which a company is ready for an IT project. To help understand this dynamic, this paper presents a framework for analyzing 'IT readiness' in SMEs (small and medium-sized enterprises) based on a literature review. The framework is illustrated and investigated by three case studies and shows that the framework of IT readiness in SMEs is useful for assessing company readiness and supporting the management of a project. The framework and case studies provide an improved understanding of how to evaluate readiness of an SME for an IT project and provides a solid basis for SMEs who plan to engage in an IT project and help to increase the chances of success.
1. Introduction

During the last decades, the use of Information Technology (IT) has significantly changed the way in which companies carry out their business processes. In spite of extensive use and investments in IT, IT projects are often not successful in being on-time or on-budget, and they may not operate with full functionality (Clegg et al., 2000; Doherty et al., 2003; Bruque and Moyano, 2007). For instance, an extensive review of systems development practices by Clegg et al. (2000) found that up to 90% of all IT projects fail to meet their goals and that 80% do not meet the deadline and are over budget while 40% are abandoned. To deal with this issue, multiple threads of research within this field exist, and similar conclusions are found by Doherty et al. (2003). One thread is related to identifying the ways in which companies adopt to IT (Swanson and Wang, 2005). Most such research, however, concerns larger companies, and there has been little research in the factors related to introducing IT in small and medium-sized enterprises (SMEs) (Premkumar, 2003; Riemenschneider et al., 2003; Morgan et al., 2006). Thus, this paper aims to contribute to research on IT adoption in SMEs.

There are different definitions of SMEs in relation to the maximum number of employees and the maximum turnover in SMEs. In this paper, the European Commission definition is used. The European Commission definition from 2003 defines an SME as having less than 250 employees and a maximum turnover of 50 million Euros or a balance sheet total of 43 million Euros. SMEs are extremely important for the economies of many countries. In Europe, 99.8% of the companies are SMEs, and these are responsible for two-thirds of the turnover and business employment (Carayannis et al., 2006). In relation to IT projects, SMEs differ from larger companies as they typically have fewer financial resources, have lower IT expertise, have CEOs who are more involved in operational decisions, need their employees to be multi-skilled as they carry on multiple/contradictory roles, and they frequently have a ‘production mode’ focus at the expense of strategic planning (Fink, 1998; Thong, 1999; Utomo and Dodgson, 2001; Huin, 2004; Forsman, 2007; Andersson and Tell, 2009). In fact, literature suggests that information system theories and practices aimed at large companies may not be suitable for smaller firms (Farhoomand and Hrycyk, 1985; Premkumar, 2003; Lee and Runge, 2001).

Different drivers and barriers related to IT implementation in SMEs are reported in literature as the literature study in the following section describes. However, it is not clear which ones are the most important in relation to the success of an IT project. Thus, it may be difficult to estimate the ‘readiness’ of a company for an IT project, i.e., how well a company will adopt a specific kind of IT solution and obtain benefits from it. It may seem obvious that the more well-known the characteristics of the company are, the easier it is to make such an evaluation. However, since not all aspects are of equal importance, the characteristics upon which to focus need to be defined. To deal with this issue, this paper seeks to answer the following research question: ‘What are the main factors that define the readiness for IT in SMEs?’ The question is investigated by converting relevant literature and the experience of the authors into a framework for accessing IT readiness in SMEs. The remainder of the paper is structured as follows: Section 2 summarizes relevant literature reviews, classifies the literature, investigates further literature, and transforms this into a framework for estimating IT readiness of SMEs. Section 3 presents three case studies which illustrate and investigate the proposed framework, and the paper ends with a conclusion in Section 4.
2. Literature review

This section is organized into four sub-sections. First, three literature reviews, which identify relevant IT adoption factors, are described. Second, the IT adoption factors from these reviews are organized into different categories and dimensions. Third, the defined categories are further clarified by additional literature. Finally, the defined categories and dimensions are transformed into a framework for estimating the IT readiness of SMEs.

2.1 Literature reviews of IT adoption

The aim of the literature review is not to identify all factors relevant in relation to IT readiness but, rather, only the most significant ones. In other words, the purpose is to identify the factors which, in general, deserve the most attention. Table 1 lists the factors relevant for IT adoption which have been identified in the three literature reviews. The included factors are subsequently discussed.

Table 1: IT adoption factors identified in existing literature reviews

<table>
<thead>
<tr>
<th>No.</th>
<th>Source</th>
<th>Factors for IT adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sarosa and Zowghi (2003)</td>
<td>Owner/manager attitude, owner/manager knowledge, owner/manager support, resource availability, employee attitude, employee knowledge, employee acceptance, suppliers, customers, competitors, government IT product vendors, IT consultants</td>
</tr>
<tr>
<td>2</td>
<td>Chan and Ngai (2007)</td>
<td>Relative advantages, costs, organizational factors, technological factors, top management support, external pressures, individual characteristics</td>
</tr>
<tr>
<td>3</td>
<td>Bruque and Moyano (2007)</td>
<td>Management’s direct and explicit support for the adoption of information technology, existence of technology leaders (&quot;champions&quot; or &quot;prominent actors&quot;) who support the technological change, level of technological education of the workers in the technical departments, level of technological education for the rest of the workers, strategy chosen with regard to implementation, level of integration of the information system/information technology in the business strategy, size of firm</td>
</tr>
</tbody>
</table>

2.2 Organization of dimensions from literature reviews

To provide a better overview of the identified factors in relation to IT adoption in Table 1, these are grouped into six dimensions under three overall categories, as shown in Table 2. The numbers in parentheses show the source of the defined characteristics (i.e. Table 1). A few of the factors mentioned in Table 1 only indirectly fit into the classification. These indirect fits of remaining factors are subsequently discussed.

Some of the factors related to IT adoption, described in the three literature reviews, did not fit directly into the six defined dimensions in Table 2. The factors which did not fit are from Chan and Ngai (2007): ‘technological factors’ and ‘organizational factors’ and from Bruque and Moyano (2007): ‘the size of the firm’ and ‘the level of integration of the information system/information technology in the business strategy’.
Table 2: IT adoption factors identified in existing literature reviews

<table>
<thead>
<tr>
<th>IT readiness categories and dimensions</th>
<th>Factors from literature reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C1: Company characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>D1: Pressure to change existing</td>
<td>(1) Suppliers, customers,</td>
</tr>
<tr>
<td>processes</td>
<td>competitors, government, IT</td>
</tr>
<tr>
<td></td>
<td>product vendors, IT consultants</td>
</tr>
<tr>
<td></td>
<td>(2) External pressures</td>
</tr>
<tr>
<td>D2: Room for risks (seen in relation</td>
<td>(1) Resources availability</td>
</tr>
<tr>
<td>to possible benefits)</td>
<td>(2) Relative advantages, costs</td>
</tr>
<tr>
<td><strong>C2: Management characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>D3: IT acquaintance</td>
<td>(1) Owner/manager knowledge</td>
</tr>
<tr>
<td></td>
<td>(2) Individual characteristics</td>
</tr>
<tr>
<td></td>
<td>(3) Existence of technology</td>
</tr>
<tr>
<td></td>
<td>leaders, level of technological</td>
</tr>
<tr>
<td></td>
<td>education</td>
</tr>
<tr>
<td>D4: IT project support</td>
<td>(1) Owner/manager attitude,</td>
</tr>
<tr>
<td></td>
<td>owner/manager support</td>
</tr>
<tr>
<td></td>
<td>(2) Top management support</td>
</tr>
<tr>
<td></td>
<td>(3) Management's direct and</td>
</tr>
<tr>
<td></td>
<td>explicit support</td>
</tr>
<tr>
<td><strong>C3: Employee characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>D5: IT skills</td>
<td>(1) Employee knowledge</td>
</tr>
<tr>
<td></td>
<td>(2) Individual characteristics</td>
</tr>
<tr>
<td></td>
<td>(3) Existence of technology</td>
</tr>
<tr>
<td></td>
<td>leaders, level of technological</td>
</tr>
<tr>
<td></td>
<td>education</td>
</tr>
<tr>
<td>D6: IT project motivation</td>
<td>(1) Employee attitude, employee</td>
</tr>
<tr>
<td></td>
<td>acceptance</td>
</tr>
</tbody>
</table>

Chan and Ngai (2007) describe the relevance of ‘technological factors’ and ‘organizational factors’ in the context of IT being the equivalent of the Internet as “an aggressive technology policy, [and the] compatibility of the internet with organizational culture and infrastructure and top management support were the most significant contingent factors affecting internet adoption”. Thus, it seems that such factors to a great extent overlap the dimensions under ‘management characteristics’ and ‘employee characteristics’.

Bruque and Moyano (2007) describe the factor ‘size of the firm’. This factor is less relevant in the current context because the defined framework is aimed at SMEs, thus already including this aspect. Furthermore, the reasons that company size is important relative to aspects included in the proposed six dimensions are also discussed, i.e., room for risks, employee IT skills, and management IT acquaintance, which in smaller companies are typically lower. The next factor of Bruque and Moyano, which does not directly fit into the framework, is ‘integration of IT into the company strategy’. This factor to some extent relates to the IT familiarity of the management. In other words, if the management is well acquainted with IT, then IT is probably part of the strategy.

2.3 Further clarification of the defined IT-readiness categories

To further investigate the three defined perspectives and the six dimensions for estimating IT readiness of SMEs, this section further investigates relevant literature.
2.3.1 Company-related dimensions

The first defined company-related dimension is the pressure to change existing procedures. Different external factors can put pressure on a company to change existing procedures: competition, suppliers, customers, government, consultants, and vendors. In a competition-oriented perspective, IT projects often have the purpose of gaining competitive advantage or minimizing the gap to competitors (Earl, 1989; Galliers and Sutherland, 1999; Turban et al., 2002). In this context, IT can be aimed at providing new services to the customers or to make the company more efficient. Next, in relation to suppliers and customers, IT can be used to achieve more efficient transaction processing, shorter response time, reduced costs of transactions, etc. (Hollander et al., 2000). Furthermore, customers and suppliers may request particular data formats and types of information and thereby put pressure on the focal company to initiate an IT project. There may also be government regulations which force a company to upgrade their IT systems. For example, the government may require that some type of information is documented which may require that new IT systems are implemented. In relation to IT assistance, this is often provided by consultants and IT product vendors (Fink, 1998; Utomo and Dodgson, 2001). In fact, SMEs are typically more dependent on external expertise and services for information systems than larger companies which have more in-house experts (Premkumar, 2003). Besides providing expertise, consultants and vendors may try to persuade a company to invest in certain IT solutions and thereby produce some form of pressure. But although there may be pressure to initiate an IT project in order to change existing processes, the inertia generated by old technologies may represent a negative adoption factor (Hovav et al., 2004).

The second company-related dimension is the room for running financial risks. This dimension relates to resources available (especially financial) (Chau, 1995; Fink, 1998; Thong, 1999; Utomo and Dodgson, 2001) and also the risk-willingness of a company. In relation to the latter, the relatively limited financial resources in SMEs often imply careful consideration before making a decision and less ambitious projects. In this context, it has been argued that risks of failure can discourage SME management from implementing IT (Agarwal and Prasad, 2000; Love et al., 2001). Furthermore, limited financial means can also imply that adequate external expertise is not obtained (Attewell, 1992; Cragg and King, 1993).

2.3.2 Management-related dimensions

The first management-related dimension is IT acquaintance. Limited knowledge of IT may be a barrier for IT implementation (Venkatesh and Brown, 2001) but, on the other hand, adequate knowledge of IT adoption and its organizational impact may discourage management from an IT project (Agarwal and Prasad, 2000; Love et al., 2001). In addition, the strategy chosen in relation to IT implementation (proactive, reactive, technology leader/follower, etc.) has been defined as a significant factor (Swanson and Ramiller, 1997; Lewis and Cockrill, 2002; Teo and Pian, 2003). Since a company’s management decides on the strategies chosen, the acquaintance with IT of the relevant managers is of major importance. Research indicates that, in large corporations, having IT projects managed by such internal experts plays a critical role for the adoption of IT (Beath, 1991; 1990; Palvia and Chervany, 1995). However, compared to larger companies, SMEs often are not able to afford or attract adequately IT-competent employees.

The second management-related dimension is management support. Managers are responsible for assigning resources to an IT project, for which reason management support is vital to the success of an IT project (Lanz, 2002; Mehrtens et al., 2001; Thong, 1999). The motivating factor
for management initiation of an IT project is to achieve benefits that are greater than the estimated costs, and the risk factor is often what prevents management from initiating such projects. Cragg and King (1993) examined the evolution of IT in small businesses using cases of six small companies. They found that the strongest motivating factor for IT projects was the enthusiasm of the company owners regarding IT. On the other hand, they found that lack of managerial time was one of the strongest impeding factors. Finally, having technology leaders who support the technological change in a company has been argued to be perhaps the most significant factor for project success (Sharma and Rai, 2003; Pitt et al., 2006).

2.3.3 Employee-related dimensions

The first employee-related dimension is IT skills, which can be related to software technical skills or simply refer to a user perspective. IT skills of the employees are related to their IT acquaintance, which in SMEs has a positive impact in relation to IT implementation (Fink, 1998; Lanz, 2002). It has been argued that employees are likely to accept and support IT projects if they are convinced of the advantage and are confident that they can use the IT (Davis, 1989). Furthermore, training often has a positive impact on the attitude towards an IT system and the usage of it (Attewell, 1992; Love et al., 2001). In this context it should be noted that SMEs often have difficulties in recruiting and retaining internal experts, among other things, because of limited career advancement opportunities in SMEs (Kuan and Chau, 2001).

The second employee-related dimension relates to the motivation of the employees. Besides feeling confident that they are capable of using an IT system, this also refers to how they imagine that the future will be as a consequence of the IT system. More specifically, this aspect often relates to fear of job loss (Love et al., 2001) and reluctance to change work routines (Drew, 2003; Love et al., 2001).

2.4 A framework for assessing the IT readiness of SMEs

The six dimensions for assessing the IT readiness of SMEs, defined based on the literature review, are summarized and exemplified in Table 3.

Table 3: Dimensions for assessing IT readiness of SMEs

<table>
<thead>
<tr>
<th>Company characteristics</th>
<th>Examples of determinant factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure to change existing processes</td>
<td>Technological abilities of competitors</td>
</tr>
<tr>
<td>Ability to manage information internally</td>
<td></td>
</tr>
<tr>
<td>Demands from customers and suppliers</td>
<td></td>
</tr>
<tr>
<td>Room for risks</td>
<td>Profit ratio</td>
</tr>
<tr>
<td>Net capital</td>
<td></td>
</tr>
<tr>
<td>Banking relations</td>
<td></td>
</tr>
<tr>
<td>Management characteristics</td>
<td>Examples of determinant factors</td>
</tr>
<tr>
<td>IT acquaintance</td>
<td>IT-related education</td>
</tr>
<tr>
<td>Experience from participation in IT projects</td>
<td></td>
</tr>
<tr>
<td>Experience from using IT</td>
<td></td>
</tr>
<tr>
<td>IT project support</td>
<td>Time for carrying out existing responsibilities</td>
</tr>
<tr>
<td>Experience from IT projects</td>
<td></td>
</tr>
</tbody>
</table>
Table 3 is transformed into the framework shown in Figure 1. The framework is subsequently discussed.

**Figure 1: IT readiness dimensions**

In the company-related matrix in Figure 1, the combination of strong 'pressure to change processes' and much 'room for risks' is defined as 'high IT readiness'. On the other hand, if the processes are already considered efficient and there is room for some risk, it is less likely that
such a company would initiate an IT project right away. However, there is a need to maintain this efficiency in the long run, for which reason IT investments still need consideration. When there is a great need to change processes, but there is little room for risks, projects need to be initiated with some precaution in order to minimize risks and ensure short payback periods. If there is no great need for process change along with little room for such investments, such companies are categorized as having 'little IT readiness'. In both company-related dimensions, there may be dissimilarity between how the management of the company perceives the situation compared to how independent experts would categorize the company. In the 'room for risk' dimension, the company may have a large net capital but believe that this money should not be put at risk, for which reason there is little room for initiating IT projects. However, if a company achieves a better understanding of the possibilities of IT and potential benefits, this may change their perception of the 'room for risks' for IT projects, since such projects may appear less risky than originally anticipated. In a similar manner, the company may believe that its processes are satisfactory, although an external expert observer may classify them as inefficient.

From a management perspective, the company has 'high IT readiness' if management support is strong together with high IT acquaintance of the management. On the other hand, if one of these two dimensions is missing, this is categorized as 'moderate IT readiness'. If there is a lack of support among management, this is better changed before initiating a project. Such motivation can come from giving the relevant managers adequate time to plan the projects and obtain the necessary information about technological possibilities. If management has sufficient motivation but IT knowledge is missing, there is a great risk of poor decision-making during the project. In order to prevent this, it is necessary to educate existing managers or to employ new managers who possess this kind of insight. If neither the motivation nor the insight is present among the managers, the chance that IT projects will be successful are slim.

From an employee perspective, good IT skills together with high motivation are considered to indicate 'high IT readiness'. On the other hand, since IT solutions most often have the purpose of automating parts of some processes, this may involve some employees adopting new job routines or even being dismissed. In such cases, to ensure employee commitment, it is essential that they have a clear vision of the future situation. If the employees do not fear redundancies or changed job routines but have little IT acquaintance, training and education may be essential to ensure that they are capable of using the IT systems efficiently. If employees both fear process changes and have little IT acquaintance, it will often be difficult to carry out an IT project.

From an operational perspective, a company needs some degree of IT readiness in all three dimensions to be ready for a project. Depending on the particular use of the IT readiness framework, it may be used to reflect the perception of the company itself or that of external observers. From the viewpoint of an external observer (e.g. a consultant), the proposed framework can serve as an indicator of how close a company is to being highly IT ready. From the perspective of the company itself, the framework may be used as a basis for self-evaluation and as a basis for a decision to select or initiate an IT project. In addition, the framework may be used for identifying differentiating views between the company and external experts. To investigate and demonstrate the use of the framework, in the next section the framework is subjected to a case study of an SME.
3. Case studies

3.1 Research method

Three longitudinal case studies of IT implementation projects in SMEs were carried out from mid-2009 to mid-2010. The cases were studied from the initial awareness of the need for new IT systems through preparation, design, implementation, and operation phases. The three cases were selected based on their status as SMEs and their immediate plans to carry out IT projects. Thus, all three cases were seen as typical cases representing companies relevant to the research question. Furthermore, the three companies had different IT projects with different scopes affecting different employees in the companies. Therefore, the three cases made it possible to investigate the framework in different SME settings. The characteristics of the cases and the persons interviewed/observed are shown in Table 4.

Table 4: Case characteristics

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company type</td>
<td>Supplier of rubber parts</td>
<td>Supplier of plastics packaging</td>
<td>Supplier of plastic and metal parts</td>
</tr>
<tr>
<td>Employees</td>
<td>29 (25 full time)</td>
<td>54</td>
<td>33</td>
</tr>
<tr>
<td>Turnover 2008</td>
<td>€2.8 mill.</td>
<td>€8.7 mill.</td>
<td>€5.6 mill.</td>
</tr>
<tr>
<td>Project focus</td>
<td>Implementation of CRM-module in C5</td>
<td>Implementation of barcode system</td>
<td>Implementation of new cost calculation methods in XAL</td>
</tr>
<tr>
<td>Persons to use IT solution</td>
<td>Sales and administration employees</td>
<td>Warehouse employees Production employees</td>
<td>Production employees Production manager Finance manager</td>
</tr>
<tr>
<td>Persons involved in the initiation phase</td>
<td>Managing director Project manager (sales coordinator) Sales and administration employees</td>
<td>Project manager (finance manager) Warehouse manager Administration employees.</td>
<td>Managing director Project manager (finance manager) Production manager Customer manager</td>
</tr>
<tr>
<td>Persons interviewed/observed</td>
<td>External IT consultant Project manager (sales coordinator) Sales and administration employees</td>
<td>External IT consultant Project manager (finance manager) Administration employee</td>
<td>External IT consultant Project manager (finance manager) Production manager</td>
</tr>
</tbody>
</table>

During the interviews, a case study protocol was used which contained the overall research question, a log for completed interviews, field notes, minutes of meetings, and secondary information received. The observations were carried out as participating observations. A participant observer is typically engaged in a group for a considerable period of time while the behavior of the group is explored by observing conversations within the group and with the researcher (Pålsson, 2007).
3.2 Overview of the IT readiness transformations of the three companies

The initial and transformed IT readiness of the three companies is illustrated in Figure 2. As seen, all companies improved their IT readiness during their projects. In the following sections, the three cases are described from the viewpoint of an external expert observer.

Figure 2: The IT readiness transformation at the three companies

3.3 Company 1

3.3.1 Initial IT readiness

In the process of preparation for the implementation, company 1’s overall IT readiness was identified in order to define the type of IT project suitable for this company.

First, IT readiness from a company perspective was identified. In the dimension ‘pressure to change processes’, company 1 was at a high level if seen from an external observer’s point of view. Over the last year, the company realized that their canvassing and follow-up of sales
prospects was deficient and that they had a substantial amount of excess production capacity. However, the company was limited by low explicit awareness of improvement opportunities and a rather reactive way of dealing with IT. Thus, in the dimension ‘pressure to change processes’, company 1 had moderate pressure to change processes and, in the dimension ‘room for risks’, the company had ‘little room for failed projects’. More specifically, the willingness to invest in IT in financial terms was low since the company had a high cost-focus and little awareness of the payoff from IT investments. Based on this, the company’s IT readiness was categorized as being ‘little-to-moderate’.

Next, the managers’ IT readiness was identified. The management consisted of the owner of the company, and in the dimension ‘IT acquaintance’, he was at a low level. The managing director seemed to have little understanding of the technological opportunities of IT, and his use of IT in the daily operations was limited. The managing director had moderate support towards the project. He seemed hesitant towards the project due to a focus on costs rather than benefits, but he did allocate a large amount of human resources to the preliminary meetings, and his willingness to meet with the IT consultant showed that he had some support. Based on this, the managers’ IT readiness was categorized as being ‘little-to-moderate’.

Finally, the employees’ IT readiness was identified. The employees’ IT skills were generally low. The employees seemed to possess little knowledge about IT, and the use of IT was restricted to simple systems and operations. On the other hand, the employees’ motivation towards IT projects was high. They acknowledged that IT could improve their daily operations throughout the meetings with IT consultants, and their job security after the implementation of IT seemed high. The individuals most affected by the project were the three owners of the company, several highly-trusted employees, and one relatively new employee. The organizational boundaries in the company were rather indistinct meaning that, if one daily task was taken away from an employee, the employee could take on a new one. The staff related to the IT project performed a large multitude of daily tasks. Based on this, the ‘employee IT readiness’ was categorized as ‘moderate’.

3.3.2 Using IT readiness in IT project selection

At the preliminary meetings, four IT-related improvements were identified as being valuable for the company: 1) an IT system improving the production process specifications, 2) an IT system controlling and managing sales propositions and orders, 3) a solution for synchronization of email records, and 4) an IT system improving the production planning. Based on the identification of IT readiness in the company, it was advised to initiate an implementation of a CRM-module. This project covered improvement area 2, thus being strategically important, and it was expected to result in short-term results. However, the main criterion for advising the company to choose this project was the suitability with the company’s overall IT readiness. The CRM-module was perceived to be an affordable and low-risk project for the company and suitable in relation to the low levels of IT acquaintance of the managing director and the employees’ poor IT skills. The fact that it was considered to show visible short-term results was also considered important in maintaining the managing director’s support towards the IT project on at least a moderate level.

3.3.3 Improving IT readiness

From a company perspective, IT readiness initially was ‘little-to-moderate’. The company realized, however, that the pressure to change processes was higher than initially recognized. This insight was obtained by inviting external experts inside and letting them examine the
company’s existing business processes. The room for financial risk remained low and almost led to a cancellation of the project. However, advisement from an external expert convinced the company that the project would pay off in the short term. Thus, it was accepted in the company that the pressure to change processes was high, and the room for risk was improved. Overall the company’s IT readiness can be seen as having improved from ‘little-to-moderate’ to ‘moderate-to-high’.

The managing director’s IT readiness was ‘little-to-moderate’ before initiating the project. The managing director compensated for his lack of IT acquaintance by inviting the staff related to the IT project to the meetings and cooperating with experts that he trusted. His IT acquaintance was not directly affected by this, but the employees’ motivation for the project affected his. After initiating the project, the managing director’s IT readiness seemed to have improved from ‘little-to-moderate’ to ‘moderate’.

The employees’ IT readiness was identified as ‘moderate’ before initiating the project, and employee lack of IT skills was an important factor in the decision to choose a simple project. A heavy emphasis on information, training, and creation of simple routines was used to improve the IT skills of the employees. The motivation was at a high level even at the preliminary meetings, but one employee had only been at the company for half a year. His job security was made clear by appointing him project manager of the IT project. He was made responsible for executing the project, and the training for use of the CRM-module was anchored at him. Thus, ‘employee IT readiness’ was improved from ‘moderate’ to ‘high’.

3.3.4 Results of the IT project

In its evaluation of the IT project, the company perceived it to be a success. The advisement based on identification of IT readiness before initiating the project and using this identification in the selection of the project contributed to choosing and scoping a suitable project for the company. The success of the project is defined by two parameters: 1) the company achieved business results from new sales opportunities that the CRM-module generated, and 2) the company’s IT readiness improved as employees gained IT training and experience from participating in the IT project. For the first parameter, before implementing the CRM-module, the company did not canvas and systematically follow up on sales prospects even though they had a substantial amount of excess production capacity. After the implementation, canvassing and follow-up of sales prospects were implemented in the daily operations. Furthermore, and not less importantly for the company, the CRM-module eliminated a number of manual daily operations which resulted in fewer daily frustrations and gave the employees time to spend on more value-creating operations. In relation to improved IT readiness, the company began planning their next IT project even before the project was finished. Thus, this short-term pay off from the project increased the room for risks of IT projects. The knowledge of the pressure to change processes remained intact at a high level after consulting external experts and seeing the pay offs from the project. The implementation of the new CRM-module increased the manager’s acquaintance with IT, and pay off from the project strengthened his motivation for IT. Although the project did not lead to a high level of IT acquaintance for the manager, the project did, however, lead to a significant strengthening of this aspect, not least in relation to understanding potential benefits of the use of IT. The same was the case regarding the employees’ IT readiness. The employees received training as well as experience in using IT at a higher level. Finally, the company gained experience in carrying out an IT project, and none of the employees lost their jobs after the implementation, i.e., their job security was intact.
3.4. Company 2

3.4.1 Initial IT readiness

The initial step in the process of preparation for IT implementation in company 2 was identification of IT readiness. The company's IT readiness was categorized as high in the dimension ‘pressure to change processes’ due to demands for traceability in the food industry which involved a large share of company 2's product sales. Furthermore, the company experienced a problematic amount of waste and was not able to locate the source of this waste. In the dimension ‘room for risks’, company 2 was identified as high as well. The management of the company had discussed this project for a couple of years and had placed it on the budget for the year 2009. The focus was on the results of the project and not purely on costs. Based on this, the company’s IT readiness was categorized as being ‘high’.

Next, management’s IT readiness was identified. The managers responsible for decisions related to IT investments were the managing director and the finance manager. Their IT acquaintance was high. The managing director had considerable knowledge of IT and related opportunities, and the finance manager also demonstrated considerable IT knowledge. In addition, management seemed to have strong support for IT projects. The challenges with the traceability issue and locating the source of waste had a high priority among management. Based on this, the ‘management IT readiness’ was categorized as ‘high’.

Finally, employee IT readiness was identified. The IT skills among the employees were generally low. The warehouse manager had some experience in using IT, but most of the warehouse employees and production employees had poor IT skills. Their use was restricted to simple operations such as email and printing documents, and their motivation was perceived as moderate. The job security for employees was perceived as high as the objective with the barcode system was traceability and locating the source for waste and not eliminating work processes resulting in staff reduction. However, some employees were reluctant about the changes they believed the barcode system would cause. Based on this, employee IT readiness was categorized as being ‘little-to-moderate’.

3.4.2 Using IT readiness in IT project selection

At the preliminary meetings, a need for the barcode system was identified as the main priority. The IT consultants stressed, however, that barcode systems could take on a number of forms and complexities. Thus the challenge was to select a type of barcode implementation project suitable for the company. In the discussion of scoping a suitable IT project, the constraining factor was the employees’ lack of IT skills. The other factors indicated some IT readiness. Based on this discussion, simplicity of use was a key factor in the IT project. A decision was made to limit project involvement to warehouse and administration employees only and to create simple routines for the production employees even though it was technically possible to integrate it into production planning and involve the production manager as well.

3.4.3 Improving IT readiness

Four of the six defined characteristics related to IT readiness were high at company 2, whereas IT skills among the employees were improved by training and field visits at other companies with the barcode system already implemented. The motivation among the employees was improved when the barcode system was introduced and implemented in the warehouse by the physical presence of the project manager and an administrative employee who were deeply involved in
the project. They also offered the warehouse and production employees their help both day and night.

3.4.4 Results of the IT project

The implementation of the barcode system was perceived as a success by company 2. The process of analyzing IT readiness for the company and using this identification in the selection of the project resulted in a suitable project for the company. The project’s success is defined by three parameters: 1) the company lowered the costs of living up to the industry standards regarding traceability, 2) manual operations were significantly lowered, and 3) the employees’ IT readiness was strengthened and they gained experience from participating in the IT project. This company actually replicated this IT project and implemented the barcode system in new production facilities shortly after this successful IT project.

3.5 Company 3

3.5.1 Initial IT readiness

In the process of preparation for implementation, company 3’s overall IT readiness was first identified in order to define the type of IT project suitable for this company. In the dimension ‘pressure to change processes’, company 3 was at a high level. The company had appointed a new managing director, and he stressed the importance of implementing new cost calculation methods. The cost calculations were not valid prior to the project, and company 3 had ‘moderate room for risk’. The company did perceive the IT project as being essential to their strategy, and they were willing to allocate financial resources to the project. However, the company had some reluctance because of the insecurity of the size of the investment. Based on this, the company’s IT readiness was categorized as being ‘moderate-to-high’.

Next, the managers’ IT readiness was identified. The management consisted of the managing director, the finance manager, the customer manager, and the production manager. The customer manager and the production manager both partly owned the company, and management’s IT acquaintance seemed to vary but overall it was moderate. The support for the project seemed to vary as well among the management but, overall, it was also moderate. One of the managers was reluctant to the IT project but most of the management showed strong support. Based on this, the manager’s IT readiness was categorized as being ‘little-to-moderate’.

Finally, employees IT readiness was identified. The employees who would use the IT solution generally had poor IT skills. Only the finance manager seemed to have good IT skills. The employees also seemed to have low motivation towards IT and again, the finance manager was the only one that seemed to have high motivation. Based on this, the company was categorized as having ‘little IT readiness’ in the employee dimension.

3.5.2 Using IT readiness in IT project selection

It was decided that the project should focus on cost calculations. That involved a reprogramming in XAL, implementing clock-ins of working time by the production employees, and a new method for registering use of raw materials. The critical factor in this project was recognized to be the employees’ low IT readiness and the production manager’s lack of support of the project whereas the finance manager seemed to have strong support for the project and good IT skills. Another issue was the company’s reluctance towards the insecurity of the size of investment. These factors resulted in a scope of the project that focused on creating simple procedures for
the production employees, motivating the production manager, utilize the finance manager’s good IT skills and strong support, and reducing insecurity about the size of the investment. In order for production employees to use and welcome the new procedures, the company decided to introduce a manual paper-based system of the procedures before initiating the project. This was done in order to keep the changes for the employees incremental and secure a gradual transition.

3.5.3 Improving IT readiness

From a company perspective, the initial IT readiness was ‘moderate-to-high’. The company improved the dimension ‘room for risks’ by agreeing on a fixed price for the project. This required extra resources in developing the contract with IT consultants, but the benefit was that the insecurity regarding the size of the investment was reduced. Thus the company’s IT readiness was improved from ‘moderate-to-high’ to ‘high’.

The managers’ IT readiness was ‘little-to-moderate’ before initiating the project. The managers’ IT acquaintance was not affected by the project, but the support was strengthened. This was done by inviting the hesitant manager to the scoping meetings with the IT consultant. At these meetings discussion was carried out, and on a few occasions the manager said that he was going to work around the system. In the end, however, a consensus on the scope of the project was reached and the support was strengthened. Thus the managers’ IT readiness was improved from ‘little-to-moderate’ to ‘moderate-to-high’.

The participation of this manager in the scoping meetings also influenced the employees’ motivation towards IT as he was one the users. The production employees’ motivation was improved by first introducing the manual paper-based system and showing them how their clock-ins of working time and registering use of raw materials helped make more valid cost calculations. The employees’ IT readiness was improved from ‘little’ to ‘little-to-moderate’.

3.5.4 Results of the IT project

The evaluation of the IT project in company 3 revealed the scope of the IT project to be a success. The actions taken toward addressing the critical factors in IT readiness and improving the IT readiness were beneficial to the success of the project. After the implementation of the project, the company was able to make more valid cost calculations, and the clock-ins and raw material use registration was made more accurate and efficient. The company actually used the finance manager’s high IT readiness to carry out a side project. She was responsible for the payroll process at the company and, as she was considered to be IT ready, this process was automated as a part of the IT implementation project.

4. Conclusions

Based on a literature review, the main identified factors in relation to IT adoption were divided into six dimensions which were organised into three overall categories. The three overall categories and their dimensions are: 1. Company (1A - pressure to change existing processes, 1B - perceived costs/benefits vs. room for risks); 2. Management (2A - IT acquaintance, 2B - IT project support); and 3. Employee (3A - IT skills, 3B - IT project attitude). To investigate the usefulness of the framework in a SME context, three SME implementation projects using the IT readiness framework were studied.
The framework was illustrated by conducting three case studies. Case 1 showed that the proposed framework can be used to select a suitable IT project for a company. In this case, the company's overall IT readiness resulted in a selection of a small and simple IT project as the company on several dimensions was not IT ready. Along with the process of implementing the IT system, the company’s overall IT readiness improved, meaning that it became ready for bigger and more complex future IT projects. Case 2 showed how the framework can be applied in order to scope a suitable IT project for a company. In this case, the IT skills of employees turned out to be the main concern, for which reason this was given extra attention in the project and in general. Thus, during the case study, the company advanced to being IT ready in all three dimensions. Case 3 also showed how IT readiness can be used to scope the project. Initially, the company had some insecurity regarding the size of the investment which limited the company IT readiness. This was resolved by agreeing to a fixed price with the IT consultants.

To sum up, the case studies illustrated that the framework serves both as a tool for identifying problematic areas in relation to IT projects and for illustrating the development of IT readiness within a company. Furthermore, the cases exemplify how the IT readiness of a company can be increased. Although it may be possible to highlight other characteristics than the six defined in the framework, literature and case studies indicate that the selected six dimensions provide a solid basis for an IT readiness evaluation. Thus, the paper provides insight into the concept of IT readiness in SMEs for use in both academia and practice. The task for future research is to further investigate the framework by empirical studies.

References


