Journal of the Knowledge Economy (2020) 11:805–824
https://doi.org/10.1007/s13132-018-0576-3

SME Internationalization: the Impact of Information Technology and Innovation

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Received: 27 October 2017 / Accepted: 9 December 2018 / Published online: 3 January 2019

Abstract

Innovation and information technology (IT) are critical to effective knowledge management (KM) This study examines the effects of innovation on small- and medium-sized enterprise (SME) internationalization and the direct and moderating impacts of information and knowledge circulation during IT adoption. The primary data consists of a survey of 612 German SMEs based in the Baden-Württemberg area. The purpose of the survey was to find out to what extent German SMEs had introduced and were using IT tools (electronic customer relationship management [e-CRM] and enterprise resource planning [ERP]), were interested in innovating and how much they valued export turnover. The results show that IT has no direct influence on internationalization. The implementation of ERP and e-CRM acts as a moderator of the innovation–internationalization relationship. The results suggest that developing innovation, while also increasing the level of IT, can improve SME internationalization. Several studies have mentioned that the research findings related to SME internationalization are country-specific. The application of the European Union (UE) classification to define our sample and the use of German SME data makes our empirical evidence comparable at the European level. However, the generalization of our results outside Europe is questionable. Therefore, studies with comparative samples are called upon to extend our results. Moreover, this study is limited to export intensity, leaving out the multiplicity of other factors in internationalization. Thus, the adoption of a dependent variable to test export intensity would extend our results. The results from this study suggest that SMEs might be able to enhance their innovation by implementing comprehensive ERP and e-CRM, leading to higher export intensity. The results support future research related to the functions of IT in the export process of internationalized SMEs.

Keywords Knowledge management · SME · Internationalization · Information technology · ERP · Innovation · Information management

The present study is part of a wider research project that has received financial support through grants from the European Union and the INTERREG (community funds for cross-border, transnational and interregional cooperation) 2012, EM Partenaires, Strasbourg University.

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Introduction

The management literature has paid great interest to knowledge as a source of company success, performance enhancement, and internationalization. However, only a few studies have addressed the relationship between knowledge management (KM) and company internationalization while KM is a critical measure of acquiring competitive advantage in knowledge economy (Pan and Scarbrough 1999). Based on a resource-based view (Penrose 1959), KM focuses on what goes inside a firm. Thus, KM is placed in an important supporting role within the firm. KM is a coordinating mechanism that enables resources to be converted into capabilities (Nelson and Winter 1982). While knowledge is a resource in its own right, the way in which knowledge is managed and used will affect the quality of services that can be leveraged from each resource owned by the firm. KM is defined as the process of creating, sharing, using, and managing the knowledge and information of an organization. It refers to a multidisciplinary approach to achieving organizational objectives by making the best use of knowledge.

Moreover, the goal of KM is to maximize organizational knowledge value through continuously create, accumulate and share organizational knowledge (Wiig 1997). KM was initially used to describe computer applications for information storage and retrieval (Wilson 2002). In order to achieve KM objectives, Information Technology (IT) should be incorporated to a firm's daily operation in order that its members can access, store, retrieve, and make use of organizational knowledge without barriers (Duffy 2000). The conceptualization of KM has also to include innovation (von Krogh et al. 2001), it allows developing new knowledge from identified and defining problems.

This paper focuses on the link between KM and SME internationalization taking innovation and IT important to effective KM and measuring the direct and indirect link between innovation and internationalization using IT as a moderating effect in order to show the complementarity between IT adoption and innovation.

In fact, innovation, in conjunction with IT, can enhance company internationalization (Junnarkar and Brown 1997). A commitment to innovation is considered significant to the intensity of internationalization. Buckley and Casson (1998) demonstrated that innovation is critical for product mobility abroad. Furthermore, innovation represents a basis for competitiveness in both domestic and international markets (Jones 1999, 2001; Guan and Ma 2003). Research has also shown that the overall process of innovation stimulates export activities (Nguyen 2007).

Considered from a resource-based analysis of the company (Barney 1991), efficient innovation depends on organizational capabilities. It has also been confirmed that accurate strategic deployment of IT is essential in developing successful strategies such as innovation or internationalization (Ray et al. 2005). In our research, innovation refers to a significant change in processes, technologies, products, or services. Managing businesses in multiple geographic markets is a complex (Williamson 1975) and expensive task. Thus, the coordination and information management requirements may outweigh the profits. Multimarket businesses enjoy fewer similarities among environmental elements (Aldrich 1979), and IT is often mobilized to control the coordination costs of complex information flows. These results imply that IT offers SMEs the competitive advantage to differentiate themselves in multiple markets through, for example, innovation.

Although innovation, IT, and internationalization have been presented as key factors in the literature, their possible relationships have not been studied extensively. IT allows for greater adaptability to the environment (Das et al. 1991) and improves information flow (Hanson 1999), thereby developing international competitiveness. Thus, it has been generally acknowledged that the impact of IT investment is significantly positive (Dedrick et al. 2003). Prior studies have also found evidence that export performance impacts IT investment (Poon and Jevons 1997; Etemad and Wright 1999; Rialp and Rialp 2001; Knight and Liesch 2002). IT has provided new opportunities for SME internationalization by, for instance, offering direct access to foreign markets (Spigarelli 2003). Nonetheless, IT sustains internationalization due to the great cost of innovation. IT reduces the distance and cost of contact creation with potential foreign business partners, allowing SMEs based in several countries to benefit from direct access to local expertise. Despite the evidence for IT's positive impact on innovation and internationalization, substantial questions remain. SMEs tend to invest considerable resources in IT. While their global returns on investment are positive, the variation across companies is considerable. Some companies make vast investments for little return, while others achieve more success. The issue for SMEs is in understanding this heterogeneity. Few empirical studies have analyzed how innovation interacts with IT resources to improve SME internationalization. Our research intends to increase the understanding of the relationships among IT, innovation, and internationalization. This study examines the impact of IT, through enterprise resource planning (ERP) and electronic customer relationship management (e-CRM) functions, on innovation and SME internationalization. Several studies have doubted the value of IT investment. Another issue is the measurement of the time gap between innovation and IT investment, and the internationalization payoff.

The relationship between IT and innovation has been studied profusely (Cepeda Carrion et al. 2012; Koellinger 2008; Tarafdar and Gordon 2007). Previous results have demonstrated the great potential of IT on SME flexibility (Larsen and Lomi 2002). Moreover, Cooper (1998) illustrated the innovation opportunity for SMEs through the combined effects of IT price decreases, quality increases, and an IT-trained workforce. Finally, through the different storage, transmission, communication, and processing of information, IT improves companies' problem-solving capability (Dewett and Jones 2001).

This study makes the following contributions to theory. First, it uses two measures for IT—ERP and e-CRM—instead of considering general IT use, for consistency with previous research that has demonstrated ERP and e-CRM have different impacts on SME activities, such as internationalization (Laudon and Laudon 2006; Holsapple and Sena 2005; Gefen and Ragowsky 2005). The remaining question is not whether to deploy IT but how to deploy it. We separate the impact of IT implementation in different functional areas of the SME. Previous studies have been often performed at the SME level. Thus, we expect to provide original insights into the actual consequences of IT on SMEs. Second, previous research has demonstrated the influence of either innovation or IT on internationalization but few have addressed the effects of those factors, taken together, on SMEs. Third, we adopt a different approach from current analyses. Previous studies have associated IT implementation with the level of investment. However, according to Devaraj and Kohli (2003), the benefits of IT use should be measured separately from investment.

This paper is structured as follows. In "Knowledge Management and SME Internationalization" section we discuss SME internationalization and the KM literature to define the theoretical relationships among innovation, ERP, e-CRM, and internationalization, and we also introduce our hypotheses. In "Data and Variables" section we present the data and variables. We give the results and conclude in "Results" and "Conclusion" sections respectively; in "Practical Contributions and Implications for Future Research" section we provide this study's practical and managerial implications and its limitations and suggestions for future research.

Knowledge Management and SME Internationalization

KM is an integrated approach to technological systems and management (Jashapara 2011). According to Van Beveren (2002, p. 19), KM is "a practice that finds valuable information and transforms it into necessary knowledge critical to decision-making and action." KM performance is achieved when KM processes are efficiently embedded into an organizational system to reduce cost, improve efficiency, and create value (Yu and Zhou 2017). Investing in innovation seems to be a critical determinant of KM performance. According to Laudon and Laudon (2003), knowledge-level decision-making is based on the evaluation of new ideas for products, services, and ways to communicate new knowledge and distribute information throughout the company. Thus, innovation and IT are important to effective KM. Innovation is important to identifying problems, defining them, and developing new knowledge from them (Van Beveren 2002). IT facilitates information circulation, storage management, and access to documents; thus, it can be a major player in companies' ongoing KM efforts (Ray 2008).

KM is an important determinant of SME growth (Salojärvi et al. 2005). For SME internationalization, a growing body of research has highlighted the advantages of exporting SMEs compared to non-exporters based on KM. Internationalized SMEs are more capital- and technology-intensive (Bernard and Jensen 1999). Several studies have examined the key factors in internationalization (Westhead et al. 2004; Laanti et al. 2009). For example, Westhead et al. (2004) identified obstacles to internationalization, including operational and logistical obstacles, process-based obstacles, and informational obstacles. Laanti et al. (2009) presented four groups of factors as determinants of internationalization: home country, industrial, company, and host country.

Furthermore, one recurrent issue is a lack of explicit export strategy. A structured management system is essential to sustain internationalization success (Aragón-Sánchez and Sánchez-Marín 2005). Global expansion involves continual mutations to fit into different environments (Lam and White 1999). Thus, adaptability is essential for fast export growth, which also requires clear procedures (McDougall et al. 1994).

In this study, we focus on the importance of KM, in terms of technical adoption and innovation, to the internationalization of SMEs, because the impact of KM on the success of SME internationalization has not yet been sufficiently researched. Advancements in technology and innovations in the ability to automate many types of work processes are contributors to the increased interest in KM (Civi 2000). Likewise, two factors seem to be linked to SME internationalization: innovation and IT adoption. The following section details the direct and indirect links among innovation, IT adoption, and SME internationalization.

Innovation and SME Internationalization

According to the KM literature, innovation is a critical determinant of KM. Desouza and Awazu (2006) conducted a qualitative study of 25 SMEs over 9 months and showed that, due to SME resource constraints, SMEs have to be creative when managing knowledge; they cannot implement KM in the same way as larger companies. The knowledge-based approach has conceptualized the company as a learning organization (Dosi and Malerba 1996; Grant 1996), where innovation is seen as a potential knowledge accumulation channel to improve competitive advantage. Likewise, Zucchella and Siano (2014) showed a positive relationship between innovation and international growth. They also showed the role of key partners as the major sources of information for innovation, driving export performance. According to Van Beveren and Vandenbussche (2010), innovation activities show a positive correlation with export activities. In fact, product innovation encourages SME export activity (Golovko and Valentini 2011; Cassiman and Golovko 2011). Moreover, product innovation enhances the export capacities of German companies (Becker and Egger 2013). This leads us to the following hypothesis:

H1: Innovation is positively associated with SME internationalization.

IT and SME Internationalization

In the KM literature, IT is one of the critical success factors in SME adoption of KM (Wong and Aspinwall 2005). IT is recognized as a key factor for competitiveness when implementing a strategic plan and supporting core competencies (Oh and Pinsonneault 2007). As such, managers have increased their investment in IT considerably over time (Devaraj and Kohli 2003).

According to Coase (1937), when companies expand their internal performance, management control and system implementation activities have lower associated costs. Williamson (1999) highlighted the costs of "contracting," such as information research, negotiation, supervision, and contract application. Technologically separable interfaces are often associated with cost reductions in service or product transfers. However, prior studies have mainly focused on IT adoption as a global process. Supposedly, IT adoption carries transversal utilities representing a wide range of consequences for SMEs. The key question is identifying the correct deployment processes for IT functionalities (Porter 2001).

IT plays a role in developing a positive environment for SME participation in global business. According to Spigarelli (2003) and Dellner and Lundgren (1999), IT is significantly correlated with SME internationalization. Furthermore, Zhang et al. (2008a) revealed that IT spending had a positive impact on the export performance of Chinese SMEs. Acs et al. (2001) found that the main determinant of exporting for SMEs is the development of low-cost technologies. Brock (2001) also demonstrated the positive impact of IT on the inclination, resource, information, and network aspects of export activities. IT facilitates the management of interactions between the company and a set of heterogeneous agents (Shin 2006). Moreover, exporters require a higher level of interfirm and intrafirm coordination. Intrafirm coordination combines

capabilities and resources (Zhang et al. 2008b). Companies employing repeated communication among functional units are better competitors in foreign markets (Cadogan et al. 2005). A great number of studies have demonstrated that IT is efficient in dealing with internal and external coordination management (Chari et al. 2008). Tallon and Pinsonneault (2011) also demonstrated that IT resources sustain organizational ambidexterity. A strategic alignment of IT resources with business strategy improves agility and competitiveness in dynamic environments (Rai et al. 2006).

IT offers different types of market research support, though the Internet or specific functions such as customer relationship management, data warehouse, and data mining systems. The availability of information allows for a considerable decrease in the uncertainty of foreign markets (Petersen et al. 2002) and an increase in the awareness of economic opportunities. Mass customization, increased transaction speed, and access to global markets benefit new customers. Furthermore, transaction costs are reduced when data errors are minimized, reducing labor costs and allowing for the reassignment of internal resources. Moreover, by offering direct access to foreign markets, IT decreases the number of intermediaries (Quelch and Klein 1996). However, increasing opportunities in foreign markets is a double-edged sword. Fillis (2002) demonstrated that exporting companies based in Ireland and the UK faced strong international price and promotion competition after IT development.

According to Prashantham and Berry (2004), IT develops network facilities and broadens interactions. As such, SME visibility leverages network relationships at a lower cost (Spigarelli 2003). Communication and information accessibility, based on universal standards and remote electronic access, enhance company visibility and the efficiency of business and collaboration (Tiessen et al. 2001). Furthermore, SMEs can benefit from IT in the development of strategic alliances (Soliman and Janz 2004).

To summarize, we focus on the impact of IT on export performances through the measurement of output controls in management-CRM and operation processes. On the one hand, IT and enterprise application systems (EAS) are keys to global competition. To improve organizational efficiency, ERP supports coordination and integration processes. Several company functions are covered by ERP, including internal and external management processes (Hitt et al. 2002). When essential business processes are detailed in a software system, information is made available to the company as a whole, thereby improving coordination and efficiency (Laudon and Laudon 2006).

H2a: ERP is positively associated with SME internationalization.

On the other hand, e-CRM improves the quality and timing of shipments, decreasing costs and optimizing customer satisfaction. Thanks to e-CRM, business processes such as marketing, sales, and customer services are coordinated. Such organization attracts profit through customer satisfaction and retention. EAS, combined with the Internet (e-CRM and ERP), allows for the traceability of operational tasks and a systematic correction of inaccuracy. According to Rigby et al. (2002), e-CRM is about aligning business processes with strategies. Given this, we predict the following:

H3a: e-CRM is positively associated with SME internationalization.

IT, Innovation, and SME Internationalization

In the KM literature, innovation, in conjunction with IT, can help a company to achieve better internationalization (Junnarkar and Brown 1997). In fact, Junnarkar and Brown (1997) argued that IT can be used to support the creation and continuance of knowledge communities with members in multiple geographic locations, as well as provide tools for decision support for more organizational members. Thus, while IT is a key enabler of knowledge creation, IT alone is insufficient for increasing a company's collective knowledge. Benitez-Amado et al. (2010) demonstrated that the relationship between IT resources and innovation performance remains a key area for future research (2010). Recognized as critical to competitive advantage (Dess and Picken 2000), innovation is related to the development of new processes or products (O'Regan et al. 2006). Schumpeter (1934) introduced the idea that innovation can arise at the process, product, market, and organizational levels. Nevertheless, the whole company has to sustain such innovation to succeed (Nelson and Winter 1982; Yam et al. 2011). According to Nelson and Winter (1982), innovation emerges from an organizational breakdown, which leads to aspirations of improved efficiency. Moreover, innovation performance is associated with internal capability (Jaffe 1986, 1989) but also with external factors.

The innovative system is defined as a set of interrelated components described by their characteristics and connections (Carlsson et al. 2002). Such a system is illustrated by essential relationships or connections, such as technology acquisition or transfer (Carlsson et al. 2002). A company's mutation dynamism depends on the knowledge capacity to stream through multiple actors. Nevertheless, very few innovations are successfully implemented. According to Carlsson et al. (2002), flexibility and environment evolution adaptability are critical factors for an innovative system. Environment evolution may depend on endogenous components (actors) or exogenous components, such as the impact of IT on the nature of interaction.

In the resource-based view (RBV) of the company (Barney 1991), successful innovation requires company-specific skills and capabilities. However, a company's dynamic capabilities can overcome RBV to generate a new start in resources development (Eisenhardt and Martin 2000; Teece 2007). These capabilities can adjust a company's skills, resources, and competences to the business environment (Teece et al. 1997). According to Eisenhardt and Martin (2000), dynamic capabilities allow companies to obtain, integrate, and reconfigure resources. According to the knowledge-based perspective, dynamic capabilities support the integration and reconfiguration of capacities (Verona and Ravasi 2003). External sources of knowledge become critical through the globalization of the value chain and the emergence of specialized knowledge clusters (Porter and Stern 2001).

Wade and Hulland (2004) classified resources into three different categories:

- Inside-out: IT infrastructure, development, and skills, and efficient operations;
- Outside-in: market responsiveness and relationship management;
- Spanning: IT–business partnerships and IT planning.

Several studies have also highlighted the importance of IT in the innovation process (Dibrell et al. 2008; Koellinger 2008; Tarafdar and Gordon 2007; Pavlou and El Sawy 2006). According to Skorupinska and Toreent-Sellens (2017), IT use and innovation

enhance productivity indirectly. Teece (2007) found that "sensing opportunities" involved local and distant access (Nelson and Winter 1982) to technologies, markets, customers, demands, suppliers, and industry evolution information. To benefit from new commercialization opportunities, information such as internal and external research and development (R&D), or customer needs, are critical.

Capability-building allows companies to sustain competitive advantage (Makadok 2001), and IT extends organizational capabilities (Dale Stoel and Muhanna 2009; Melville et al. 2004). According to Sambamurthy et al. (2003), IT improves company flexibility, reactivity, and knowledge. As a knowledge-intensive process, innovation is enhanced by IT, which facilitates information flow through the company (Alavi and Leidner 2001).

Environment adaptability and innovation reactivity, combined with efficient capabilities and competences management, allow SMEs to develop competitive advantage (Zahra et al. 2007; Tanabe and Watanbe 2005). ERP facilitates industry best practices, in conjunction with consultants and other partners. IT resources also influence market orientation through improved capabilities of efficient information circulation. We believe that the arguments developed in the aforementioned studies also suggest the existence of moderating effects. We therefore predict the following:

H2b: ERP positively moderates the relationship between innovation and internationalization.
H3b: e-CRM positively moderates the relationship between innovation and internationalization.

Figure 1 illustrates the framework followed in our research. As discussed in the previous section, we study the potential association between SME internationalization and innovation. We also explore the direct and indirect effects of ERP and e-CRM.

Data and Variables

In the KM literature, there is a lack of analytical methods use, which is needed so that management may add a quantitative dimension to qualitative KM approach (Preiss 1999). It is difficult to identify and measure KM, a relatively new discipline. This paper will empirically examine the link between IT and innovation, important to effective KM, and SME internationalization using data gathered from SMEs based in Germany.

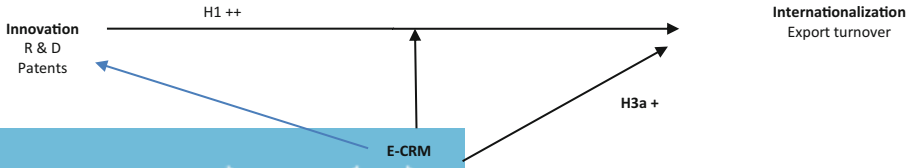

Fig. 1 The framework for the relationships among IT, innovation, and internationalization

Data

The data for this study were collected from 1783 independent SMEs based in Germany, on the cross-border area of Baden-Württemberg, through a standardized survey. The purpose of the survey was to determine to what extent German SMEs had introduced and were using IT tools, were interested in innovating, and placed importance on export turnover. The development of the survey required a multistage method. The broad literature review led us to develop the initial questions on IT, innovation practices, and demographics. Five academics and practitioners reviewed the documents before a pretest on 40 SMEs. Minor corrections then allowed us to run this study without major issues. In 2011, the computer-assisted survey was sent out to 1783 German SMEs with 6 to 499 employees (European Commission specifications 2002); key respondents were chief executive officers, export directors, or any knowledgeable managers. We received 612 valid responses, a response rate of 34%.

The 612 companies operated in the industries shown in Table 1. The table also provides the size, IT adoption, innovation, and exports of the companies. To ensure a high degree of representativeness, we used stratified random sampling.

Table 1 Descriptive statistics

	%
Industry	
Manufacturing	65.69
Construction activities	8.82
Publishing	2.94
Computer programming	5.88
Consulting activities	12.75
Scientific and technical activities	2.94
Creative arts and entertainment	0.98
Number of employees	
6 to 30	9.80
31 to 99	30.39
100 to 499	59.80
ERP	11
e-CRM	16
Export turnover > 3%	42
Innovators (1 patent min. within the last 5 years)	33
R&D budget per employee > 500 K€	30
Exporters (20% most exporting)	
Innovators (1 patent min. within the last 5 years)	35
R&D budget per employee > 500 K€	
ERP	9
e-CRM	17
Innovators (20% most innovative SMEs)	
ERP	13
e-CRM	9

Variables

Dependent variable: SME Internationalization

Exporting is the most common internationalization strategy for SMEs (Wolff and Pett 2000) and the most common measure of internationalization (Shrader et al. 2000). Three dimensions of exporting have been studied in previous research (Zucchella et al. 2007): geographic scope measures the number of countries composing the SME's market, and the precocity and speed of internationalization focus on the evolution of foreign sales. In this study, we used export intensity to measure SME internationalization, and we use the ratio of export sales over total sales to indicate export intensity. These export measures have been commonly used in the literature (Leonidou et al. 2002). However, the proportion of export sales to total sales is efficient in representing the extended SME performance (Ramaswamy et al. 1996). We assessed export intensity using a binary variable ratio that captures when export sales levels reach 3%.

Independent Variables

This study analyzed the direct and moderating relationships between innovation and SME internationalization. The variables of interest were innovation and IT adoption. Innovation was measured by R&D investment and patents. The types of IT used in this study were e-CRM and ERP.

Innovation Performance The multi-dimensional nature of innovation comes with measurement difficulties (Adams et al. 2006). R&D budget allows for the measurement of inputs to the technological process. In line with previous research, we used R&D expenditure per employee (Hill and Snell 1989). The high fluctuation of annual sales within the last 5 years makes it a less reliable variable. Thus, we used a scale from 1 (no R&D budget) to 4 (a high R&D budget). In addition to input evaluation, measuring innovation output improved the coverage of our study (Lefebvre et al. 1998).

Patents are used to evaluate the intermediate output of R&D activities. Patents are seen by high-technology industries as strategic tools for developing and maintaining competitiveness (Gringley and Teece 1997). Small companies tend to view patents in the same way (Kortum and Lerner 1998). Following other small business studies using patents (Stuart et al. 1999) to measure internationalization activities (Mudambi and Zahra 2007; Lee et al. 2012), we studied innovation resources according to patent counts. We used a scale from 1 (no patents within the last 5 years) to 5 (more than 30 patents within the last 5 years).

Information Technology We conceptualized the use of ERP and e-CRM as key parts of IT integration. The Information Technology Association of America defined IT in a business context as the study, design, development, application, implementation, support, or management of computer-based information systems.

Enterprise Resource Management II We measured ERP II resources through multiple items. In the 1970s, material requirement planning (MRP) supported manufacturing processes for subassemblies, components, materials planning, and procurement (Yen

et al. 2002), and the master production schedule (MPS) included a control process (Chen 2001). In the 1980s, MRP expanded from production activities to marketing and finance (Jacobs and Weston 2007). In the 1990s, all resources were included in the material planning, product design, Human Resources (HR), finance, logistics, and capacity planning components of ERP (Umble et al. 2003). Our measures of ERP comprised MPS, MRP, HR, supply chain management (SCM), supplier relationship management (SRM), and corporate performance measurement (CPM), including the "ERP portal" (Moller 2005) e-business layer that allows for communication with external actors. Our measure of ERP excluded CRM functionality.

e-CRM Technology plays a fundamental role in CRM efforts. e-CRM is applied to identify, attract, and develop customer value over time through Internet-based media. More than a simple application, e-CRM is a combination of hardware, software, human skills, processes, applications, and management commitment (Fjermestad and Romano 2003). The variable was defined in our SME survey by offering a combination of website interactivity, shopping convenience, customer care and service, and relationship cultivation, collaboration, and personalization through IT.

Control Variables

We also included controls for company size, turnover level, and industry type. A number of scholars have demonstrated a positive relationship between company size and internationalization (Kalika 1995; Chandler 1986; Doz et al. 2001). We measured company size using a natural logarithm of the number of full-time employees, and we used a natural logarithm for a company's turnover level. Finally, as industries vary in their export intensity, we added this variable in our study.

Results

The purpose of this study was to measure the impact of innovation (R&D and patents), and ERP and e-CRM on SME internationalization. A logistic regression analysis with interaction terms was used to assess the hypothesized relationships. The means, standard deviations, and correlations of the independent variables are presented in Table 2. Multicollinearity did not represent a considerable issue in the correlation analysis. Company size and turnover showed a moderate correlation.

To assess the relative importance of the various determinants, we conducted a multivariate analysis. Given the binary character of the dependent variable, we assessed a probit model with the maximum likelihood technique. Because the variables were not linear, we could not apply least square regression techniques or their derivatives. Thus, the maximum likelihood was valid because it offered converging estimators. We expected the dependent variable (export intensity) to relate conditionally to the independent variables in a logistic functional form. According to this assumption, the estimated parameters were those that maximized the conditional likelihood of the sample. We used a probit model in which the conditional expectation for the dependent variable was the repartition function of the reduced centered normal law.

Table 2 Means, standard deviations, and correlations

Mean (SD)		1	2	3	4	5
1. Patent	1.62 (0.91)					
2. R&D	2.16 (1.12)	0.26**				
3. ERP	1.10 (0.31)	0.20**				
4. e-CRM	0.15 (0.36)	− 0.06**	− 0.10**	0.25**		
5. Turnover	10.18 (0.94)	0.06**	− 0.29**	0.15**	0.16**	
6. Company size	4.74 (1.03)	0.19**	− 0.27**	0.12**	0.00**	0.49**

SD standard deviation. $^{**}p < 0.01$

A company's export intensity depends on several factors. The links among export performance and the independent variables (patents, R&D, ERP, and e-CRM) were tested through the following formula:

$$E(CAX = caxi/Xi = xi) = \exp(x'ib0)/[1 + \exp(x'ib0)]$$

where caxi is the export performance for an SME at point I, X is a vector of independent variables taken at point xi, and b0 is the vector with coefficients to be assessed.

Thus, formally:

$$E(CAX = caxi/X = xi) = \Phi(x'ib0)$$

where Φ is the repartition function of the reduced centered normal law. We noticed that the densities of the two previous models were always between 0 and 1. A series of tests was conducted by exploiting the previously indicated variables using STATA software with preprogrammed procedures.

Our first measure tested the direct relationship between the independent variable, innovation, and the dependent variable, export intensity. The results of the first hypothesis are presented in Table 3.

H1 predicted a positive direct relationship between innovation and internationalization and was supported through the innovation process output measure: patents ($p < 0.01$). The input measure, R&D budget, did not present a significant contribution.

Table 3 The effects of innovation on SME internationalization

	Coef.	Std. err.	*Z*	95% conf. interval	
Turnover	0.190*	0.121	1.57	0.042826	0.546831
Employee	0.272*	0.110	2.47	0.055885	0.489342
Patent	0.859*	0.207	5.57	0.750694	1.565763
R&D	0.262	0.103	2.52	0.058616	0.465912
Constant	1.206	1.239	0.97	0.635765	3.222588

$^{*}p < 0.01$, $^{**}p < 0.001$; LR chi-square 105.90; prob > chi-square 0.0000; pseudo *R* square 0.3446; log likelihood − 100.69463

The results of the direct and moderating effects of IT related to ERP on SME internationalization are presented in Table 4. The results revealed that ERP implementation is not significant in the internationalization process. This implies a lack of significant support for H2a, which predicted a direct effect of ERP on internationalization. H2b was supported with the measure of innovation output using patents ($p < 0.001$). However, the R&D measure did not demonstrate any significant correlation with the internationalization process.

Table 5 presents the direct and moderating effects of e-CRM on internationalization. The direct effect of e-CRM was not significant, demonstrating a lack of support for H3a. However, patents by e-CRM and R&D by e-CRM, $p < 0.001$ and $p < 0.001$, respectively, supported H3b. Thus, the moderating effect of e-CRM on internationalization was supported.

Conclusion

Through the results of a survey of German SMEs, this study shows an indirect link between IT adoption and SME internationalization, moderated by innovation. Very little published research has empirically investigated this link. Thus, the answer to the main research question, whether KM is correlated with SME internationalization, is yes.

The results suggest that developing innovation, while increasing the level of IT, can improve internationalization. Our findings extend the KM literature by offering a foundation for comprehensive analysis of the relationship between IT implementation and internationalization. Our empirical results support current frameworks in the field, particularly the positive link between innovation and internationalization (Van Beveren 2002; Junnarkar and Brown 1997) and the positive link between IT adoption and internationalization (Ray 2008; Wong and Aspinwall 2005). The data also show complementarity between innovation and IT.

First, the significance of innovation input variation on export intensity is indirect and improved by e-CRM. The effects of IT and R&D are complementary. The optimization of innovation input requires alignment with IT strategy. As such, innovation in conjunction with IT can help a company to achieve better internationalization (Junnarkar and Brown 1997).

Moreover, SMEs implementing IT are more efficient in competing with large international companies (Desouza and Awazu 2006). Thus, managers should focus on implementing IT in global strategic initiatives. The literature on KM and

Table 4 The direct and moderating effects of ERP on SME internationalization

	Coef.	Std. err.	Z	95% conf. interval	
ERP	0.388	0.613	6.33	0.268120	0.508657
Patent by ERP	0.809**	0.390	2.08	0.574659	1.045282
R&D by ERP	0.243	0.506	0.48	0.035672	0.748146
Constant	0.069	0.097	0.71	0.002608	0.122695

*$p < 0.01$, **$p < 0.001$; LR chi-square 45.12; prob > chi-square 0.0000; pseudo R square: 0.3880; log likelihood −°233.85439

Table 5 The direct and moderating effects of e-CRM on SME internationalization

	Coef.	Std. err.	*Z*	95% conf. interval	
e-CRM	0.485	0.078	6.20	0.332073	0.638722
Patent by e-CRM	0.913**	0.414	6.30	0.042676	1.800736
R&D by e-CRM	0.675**	0.443	1.07	0.345136	1.393416
Constant	0.002	0.116	0.02	0.000302	0.225552

*$p < 0.01$, ** $p < 0$ 001; LR chi-square 102.87; prob > chi-square 0.0000; pseudo *R* square: 0.2006; log likelihood: − 204.98042

internationalization has demonstrated that through investment in R&D, SMEs increase their capabilities in international market penetration and competitiveness through knowledge and skills development (Ray et al. 2005). Our research supports that export intensification is related to input intensification in the innovation process. The indirect influence of innovation on internationalization supports the investment strategy on R&D, even when the inputs are not directly related to export intensity.

Furthermore, innovation outputs (patents) show direct and indirect impacts on internationalization. Our results illustrate the indirect influence of patent intensity, fueled by ERP and e-CRM development, on export activities. The improvement of innovative capabilities, whether in input or output intensity, offers SMEs a range of strategic possibilities optimized by anticipating customer expectations (Bowman and Hurry 1993) and the company's resource management.

On the other hand, our results show that a failure by SMEs to invest in IT makes them less efficient in taking advantage of innovative capabilities to respond to international market opportunities. Associating innovation and technological advances in a dynamic market confers first-mover advantages (Christensen 1998). A lack of investment may prevent SMEs from responding efficiently to competitors' innovation.

Concerning IT, our results support those from Ravichandran and Lertwongsatien (2005), Junnarkar and Brown (1997), and Wong and Aspinwall (2005). SMEs that combine IT and core competencies benefit from competitive advantage. From our perspective, managers integrating innovation input and output intensification with IT processes are likely to improve their export activities.

Practical Contributions and Implications for Future Research

Although innovation, IT, and internationalization have been presented as key factors in the literature, their possible relationships have not been studied extensively. This paper supports the role of innovation in the export process of internationalized SMEs when implementing comprehensive ERP and e-CRM which leads to higher export intensity.

This research makes the following contributions to the literature on SME internationalization and innovation. First, our results reveal that innovation input does not necessarily improve the export performance of SMEs. Rather than directly increasing internationalization, this expensive strategy requires alignment with IT implementation to provide internationalization opportunities. Moreover, there is evidence that innovation output helps export activities both directly and indirectly. Although this resource-

based analysis highlights the importance of company capabilities (Barney 1991), IT may offer strategic resources for SMEs operating in international markets. Combined with past results, our research highlights the necessity for SMEs to invest in IT and to develop the required competences.

Finally, the results have both practical and policy implications. The results provide insights into the impact of ERP and e-CRM on management practices. SME managers should consider the importance of the strategic relationship between innovation and IT development in the internationalization process instead of considering only innovation (Desouza and Awazu 2006; Zucchella and Siano 2014) or IT (Spigarelli 2003; Dellner and Lundgren 1999; Zhang et al. 2008a, b) separately. The success of implementing innovation is positively linked to IT adoption. Companies with comprehensive KM export more than those with less inclusive approaches. This trend is rising under the influence of globalization and the increase in technological complexity.

The policy implications of the results are related to the promotion of IT and innovation development in SMEs. Policy-makers should be aware that both strategies are required to improve internationalization. Policies enabling IT implementation in relation to innovation intensification can promote greater international competitiveness for SMEs. Our results reveal how KM might be an instrument for transforming a large group of German SMEs into more internationalized companies. These SMEs would be able to improve their export performance and global competitive advantage through the implementation of systematic ERPs related to IT investment. This would strengthen the country's economy and lead to a healthier global business environment.

As with any study, our results have some limitations that present opportunities for future research. First, several studies have mentioned that the findings of research related to SME internationalization are country-specific (Lu and Beamish 2001). While the application of EU classification to define our sample and the use of German SMEs data makes our results comparable at the European level, the generalization of our results outside of Europe is questionable. Therefore, studies with comparative samples are called upon to extend our results. Moreover, the use of a five-year period in our measurement of innovation allowed us to increase the accuracy of our results, but it would be interesting to extend this scale to other variables, such as ERP or e-CRM implementation. Finally, this study is limited to export intensity and does not address the multiplicity of other factors in internationalization. Thus, the adoption of a dependent variable to testing for export intensity would extend our results.

References

Acs, Z. J., Morck, R. K., & Yeung, B. (2001). Entrepreneurship, globalization, and public policy. *Journal of International Management, 7*, 235–251.

Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: a review. *International Journal of Management Reviews, 8*(1), 21–47.

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107–136.

Aldrich, H. E. (1979). *Organizations and environments*. Englewood Cliffs: Prentice Hall.

Aragón-Sánchez, A., & Sánchez-Marín, G. (2005). Strategic orientation, management characteristics and performance: a study of Spanish SMEs. *Journal of Small Business Management, 43*(3), 287–308.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*, 99–120.

Becker, S., & Egger, P. (2013). Endogeneous product versus process innovation and a firm's propensity to export. *Empirical Economics, 44*(1), 329–354.

Benitez-Amado, J., Llorens-Montes, F. J., & Perez-Arostegui, M. N. (2010). Information technology-enabled intrapreneurship culture and firm performance. *Industrial Management & Data Systems, 110*(4), 550–566.

Bernard, A. B., & Jensen, J. B. (1999). Exceptional exporter performance: cause, effect, or both? *Journal of International Economics, 47*(1), 1–25.

Bowman, E., & Hurry, D. (1993). Strategy through the option lens: an integrated view of resource investments and the incremental-choice process. *Academy of Management Review, 18*, 760–782.

Brock, J. K-U. (2001). Market space and the new mechanism of internationalisation: some preliminary insights. in Taggart, J.H., Berry, M. & McDermott, M. (eds), *Multinationals in a New Era: International Strategy and Management*, New York: Palgrave, 88-104.

Buckley, P. J., & Casson, M. C. (1998). Analyzing foreign market entry strategies: extending the internation-alization approach. *Journal of International Business Studies, 29*(3), 539–561.

Cadogan, J., Sunkqvist, S., Salminen, R. T., & Pumalainen, K. (2005). Export marketing, interventional interactions, and performance consequences. *Journal of the Academy of Marketing Science, 33*(4), 520–535.

Carlsson, B., Jacobsson, S., Holmén, M., & Rickne, A. (2002). Innovation systems: analytical and method-ological issues. *Research Policy, 31*(2), 233–245.

Cassiman, B., & Golovko, E. (2011). Innovation and internationalization through exports. *Journal of International Business Studies, 42*, 56–75.

Cepeda Carrion, G., Cegarra Navarro, J. G., & Jimenez-Jimenez, D. (2012). The effect of absorptive capacity on innovativeness: context and information systems capability as catalysts. *British Journal of Management, 23*(1), 110–129.

Chandler, A. D. (1986). The evolution of modern global competition. *Competition in Global Industries; Harvard Business School*, 405–448.

Chari, M. D. R., Sarv, D., & Parthiban, D. (2008). The impact of information technology investments and diversification strategies on firm performance. *Management Science, 54*(1), 224–234.

Chen, I. J. (2001). Planning for ERP systems: analysis and future trend. *Business Process Management Journal, 7*(5), 374–386.

Christensen, C. M. (1998). Strategies for survival in fast-changing industries. *Management Science, 44*, 207–221.

Civi, E. (2000). Knowledge management as a competitive asset: a review. *Marketing Intelligence & Planning, 18*(4), 166–174.

Coase, P. H. (1937). The nature of the firm. *Economica, 4*(16), 386–405.

Cooper, J. (1998). A multidimensional approach to the adoption of innovation. *Management Decision, 36*(8), 493–502.

Dale Stoel, M., & Muhanna, W. A. (2009). IT capabilities and firm performance: a contingency analysis of the role of industry and IT capability type. *Information & Management, 46*(3), 181–189.

Das, S. R., Zahra, S. A., & Warkentin, M. E. (1991). Integrating the content and process of strategic MIS planning with competing strategy. *Decision Sciences, 22*, 953–984.

Dedrick, J., Gurbaxani, V., & Kraemer, K. L. (2003). Information technology and economic performance. A critical review of the empirical evidence. *ACM Computing Surveys, 35*(1), 1–28.

Dellner, E., & Lundgren. (1999). *Globalisation via Internet - an Internet-based business model*. Stockholm: Stockholm University.

Desouza, K. C., & Awazu, Y. (2006). Knowledge management at SMEs: five peculiarities. *Journal of Knowledge Management, 10*(1), 32–43.

Dess, G. G., & Picken, J. C. (2000). Changing roles: Leadership in the 21st century. *Organizational Dynamics, 28*(3), 18–34.

Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: is actual usage the missing link? *Management Science, 49*(3), 273–289.

Dewett, T., & Jones, G. R. (2001). The Role of Information Technology in the Organization: A Review, Model, and Assessment. *Journal of Management, 27*, 313–346.

Dibrell, C., Davis, P. S., & Craig, J. (2008). Fueling innovation through information technology in SMEs. *Journal of Small Business Management, 46*(2), 203–218.

Dosi, G., & Malerba, F. (Eds.). (1996). *Organization and strategy in the evolution of the enterprise*. London: MacMillan.

Doz, Y., Santos, J., & Williamson, P. (2001). From global to metanational. In *From global to metanational*. Boston, Massachusetts: Harvard Business School Press, 258p.

Duffy, J. (2000). The knowledge management technology infrastructure. *The Information Management Journal, 34*(10-11), 62–64.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal, 21*(10-11), 1105–1121.

Etemad, H., & Wright, R. (1999). Internationalization of SMEs: management response to a changing environment. *Journal of International Marketing, 20*(1), 13–28.

European Commission. (2002). High technology SMEs in Europe. In *The observatory of European SME's N°.6*. Luxembourg: European Communities.

Fillis, I. (2002). Barriers to internationalization: an investigation of the craft microenterprise. *European Journal of Marketing, 36*(7/8), 25–44.

Fjermestad, J., & Romano, N. C. (2003). Electronic customer relationship management: revisiting the general principles of usability and resistance — an integrative implementation framework. *Business Process Management Journal, 9*(5), 572–591.

Gefen, D., & Ragowsky, A. (2005). A multi-level approach to measuring the benefits of an ERP system in manufacturing firms. *Information Systems Management, 22*(1), 18–25.

Golovko, E., & Valentini, G. (2011). Exploring the complementarity between innovation and export for SMEs' growth. *Journal of International Business Studies, 42*, 362–380.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*, 109–122.

Gringley, P. C., & Teece, D. J. (1997). Managing intellectual capital: licensing and cross-licensing in semiconductors and electronics. *California Management Review, 39*(2), 8–41.

Guan, J., & Ma, N. (2003). Innovative capability and export performance of Chinese firms. *Research Policy, 36*(6), 880–886.

Hanson, M. T. (1999). The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits. *Administrative Science Quarterly, 44*, 82–111.

Hill, C. W. L., & Snell, S. A. (1989). Effects of ownership structure and control on corporate productivity. *Academy of Management Journal, 32*(1), 25–46.

Hitt, L. M., Wu, D. J., & Zhou, X. (2002). Investment in enterprise resources planning: business impact and productivity measures. *Journal of Management Information Systems, 19*(1), 71–98.

Holsapple, C. W., & Sena, M. P. (2005). ERP plans and decision-support benefits. *Decision Support Systems, 38*(4), 575–590.

Jacobs, R., & Weston, F. C. T. (2007). ERP – a brief history. *Journal of Operations Management, 25*(2), 357–363.

Jaffe, A. B. (1986). Technological opportunity and spillovers of R & D: evidence from firms' patents, profits, and market value. *The American Economic Review, 76*(5), 984–1001.

Jaffe, A. B. (1989). Real effects of academic research. *The American Economic Review, 79*(5), 957–970.

Jashapara, A. (2011). *Knowledge management: an integrated approach*. New York: Pearson/Financial Times/ Prentice Hall, Harlow, Essex.

Jones, M. V. (1999). The internationalisation of small high technology firms. *Journal of International Marketing, 7*(4), 15–41.

Jones, M. V. (2001). First steps in internationalization concepts and evidence from a sample of small high technology firms. *Journal of International Marketing, 7*(3), 191–210.

Junnarkar, B., & Brown, C. V. (1997). Re-assessing the Enabling Role of Information Technology in KM. *Journal of Knowledge Management, 1*(2), 142–148.

Kalika, M., (1995). Structures ed'entreprise- Réalités, déterminants, performances. Economica (2° tirage).

Knight, G. A., & Liesch, P. W. (2002). Information internationalization in internationalizing the firm. *Journal of Business Research, 55*(12), 981–995.

Koellinger, P. (2008). The relationship between technology, innovation, and firm performance-Empirical evidence from e-business in Europe. *Research Policy, 37*(8), 1317–1328.

Kortum, S., & Lerner, J. (1998). Stronger protection or technological revolution: what is behind the recent surge in patenting? *Carnegie-Rochester Conference Series on Public Policy, 48*, 247–304.

Laanti, R., McDougall, F., & Baume, G. (2009). How well do traditional theories explain the Internationalization of service MNEs from small and open economies? – Case: national telecommunication companies. *Management International Review, 49*, 121–144.

Lam, L. W., & White, L. P. (1999). An adaptive choice model of the Internationalization process. *International Journal of Organizational Analysis, 7*(2), 105–134.

Larsen, E., & Lomi, A. (2002). Representing change: a system model of organizational inertia and capabilities as dynamic accumulation processes. *Simulation Modeling Practice and Theory, 10*, 271–296.

Laudon, K. C., & Laudon, J. P. (2003). *Management information systems: managing the digital firm* (8th ed.). Upper Saddle River: Pearson Prentice-Hall.
Laudon, K. C., & Laudon, P. L. (2006). *Managing information systems. Managing the Digital Firm* (10th ed.). USA: Pearson Prentice Hall.
Lee, H., Kelley, D., Lee, J., & Lee, S. (2012). SME survival: the impact of internationalization, technology resources, and alliances. *Journal of Small Business Management, 50*(1), 1–19.
Lefebvre, E., Lefebvre, L. A., & Bourgault, M. (1998). R&D-related capabilities as determinants of export performance. *Small Business Economics, 10*(4), 365–377.
Leonidou, L. C., Katsikeas, C. S., & Samieec, S. (2002). Marketing strategy determinants of export performance: a meta-analysis. *Journal of Business Research, 55*(1), 51–67.
Lu, J. W., & Beamish, P. W. (2001). The internationalization and performance of SMEs. *Strategic Management Journal, 22*(6-7), 565–586.
Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal, 22*(5), 387–401.
McDougall, P. P., Shane, S., & Oviatt, B. M. (1994). Explaining the formation of international new ventures: the limits of theories from international business research. *Journal of Business Venturing, 9*(6), 469–487.
Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: information technology and organizational performance: an integrative model of it business value. *MIS Quarterly, 28*(2), 283–322.
Moller, C. (2005). ERPII: a conceptual framework for next-generation enterprise systems? *Journal of Enterprise Information Management, 18*(4), 483–497.
Mudambi, R., & Zahra, S. A. (2007). The survival of international new ventures. *Journal of International Business Studies, 28*(2), 332–352.
Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge: Harvard University Press.
Nguyen, P. H. S. (2007). *Un modèle intégrateur des effets de l'internationalisation sur la performance de l'entreprise*. Montréal, AIMS: XVIème Conférence Internationale de Management Stratégique.
O'Regan, N., Ghobadian, A., & Sims, M. (2006). Fast tracking innovation in manufacturing SMEs. *Technovation, 26*(2), 251–261.
Oh, W., & Pinsonneault, A. (2007). On the assessment of the strategic value of information technologies: conceptual and analytical approaches. *MIS Quarterly, 31*(2), 239–265.
Pan, S. L., & Scarbrough, H. (1999). Knowledge management practices: an exploratory case study. *Technology Analysis & Strategic Management, 11*(3), 359–374.
Pavlou, P. A., & El Sawy, O. A. (2006). From IT leveraging competence to competitive advantage in turbulent environments: the case of new product development. *Information Systems Research, 17*(3), 198–227.
Penrose, E. (1959). *The theory of the growth of the firm*. Oxford: *Oxford University Press*.
Petersen, B., Welch, L., & Liesch, P. (2002). The Internet and foreign market expansion by firms. *Management International Review, 42*(2), 207–221.
Poon, S., & Jevons, C. (1997). Internet-enabled international marketing: a small business network perspective. *Journal of Marketing Management, 13*, 29–41.
Porter, M. (2001). Strategy and the Internet. *Harvard Business Review, March, 79*(3), 62–78.
Porter, M. E., & Stern, S. (2001). Innovation: location matters. *MIT Sloan Management Review, 42*(4), 28–36.
Prashantham, S., & Berry, M. (2004). The Internet and the internationalization of small knowledge-intensive firms: a conceptual approach. In M. V. Jones & P. Dimitratos (Eds.), *Emerging paradigms in international entrepreneurship* (pp. 192–216). Cheltenham: Edward Elgar.
Preiss, K. (1999). Modeling of knowledge flows and their impact. *Journal of Knowledge Management, 3*(1), 36–46.
Quelch, J., & Klein, L. (1996). The Internet & international marketing. *Sloan Management Review, 37*(3), 60–83.
Rai, A., Patnayakuni, N., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quarterly, 30*(2), 225–246.
Ramaswamy, K., Kroeck, K. G., & Renforth, W. (1996). Measuring the degree of internationalization of a firm: a comment. *Journal of International Business Studies, 27*, 167–177.
Ravichandran, T., & Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: a resource-based perspective. *Journal of Management Information Systems, 21*, 237–276.
Ray, L. L. (2008). Requirement for knowledge management: business driving information technology. *Journal of Knowledge Management, 12*(3), 156–168.
Ray, G., Muhanna, W. A., & Barney, J. B. (2005). Information technology and the performance of the customer service process: a resource-based analysis. *MIS Quarterly, 29*, 625–651.
Rialp, A., & Rialp, J. (2001). Conceptual frameworks on SMEs' internationalization: past, present and future trends of research. *Advances in International Marketing, 11*, 49.

Rigby, D. K., Reichheld, F. F., & Schefter, P. (2002). Avoid the four perils of CRM. *Harvard Business Review, 80*(2), 101–109.

Salojärvi, S., Furu, P., & Sveiby, K. E. (2005). Knowledge management and growth in Finnish SMEs. *Journal of Knowledge Management, 9*(2), 103–122.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly, 27*(2), 237–263.

Schumpeter, J. (1934). *The theory of economic development*. Cambridge: Harvard University Press.

Shin, I. (2006). Adoption of enterprise application software and firm performance. *Small Business Economics, 26*, 241–256.

Shrader, R. C., McDougall, P. P., & Oviatt, B. M. (2000). How new ventures exploit trade-offs among international risk factors: lessons for the accelerated internationalization of the 21st century. *Academy of Management Journal, 43*(6), 1227–1247.

Skorupinska, A., & Toreent-Sellens, J. (2017). ICT, innovation and productivity: evidence based on Eastern European manufacturing companies. *Journal of the Knowledge Economy, 8*(2), 768–788.

Soliman, K. & Janz, B. (2004). A exploratory study to identify the critical factors affecting the decision to establish Internet based interorganizational information systems. *Information and Management,* 1–10.

Spigarelli, F. (2003). Internationalization processes of SMEs: an empirical analysis of the productive context of the Marche Region. *Economic and Management, 3*, 57–78.

Stuart, T., Hoang, H., & Hybels, R. C. (1999). Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative Science Quarterly, 44*(2), 315–349.

Tallon P.P., & Pinsonneault, A. (2011). Competing perspectives on the link between strategic information technology alignment and Oorganizational agility: insights from a mediation model. *MIS Quarterly, 35*(2), 463–486.

Tanabe, K., & Watanbe, C. (2005). Sources of small and medium enterprises excellent business performance in a service orientated economy. *Journal of Services Research, 5*(1), 5–20.

Tarafdar, M., & Gordon, S. R. (2007). Understanding the influence of information systems competencies on process innovation: a resource-based view. *The Journal of Strategic Information Systems, 16*(4), 353–392.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533.

Tiessen, J. H., Wright, R. W., & Turner, I. (2001). A model of ecommerce use by internationalizing SMEs. *Journal of International Management, 7*(3), 211–233.

Umble, E. J., Haft, R. R., & Umble, M. M. (2003). Enterprise resource planning: implementation procedures and critical success factors. *European Journal of Operational Research, 146*, 241–257.

Van Beveren, J. (2002). A model of knowledge acquisition that refocuses knowledge. *Journal of Knowledge Management, 6*(1), 18–23.

Van Beveren, I., & Vandenbussche, H. (2010). Product and process innovation and firms' decision to export. *Journal of Economic Policy Reform, 13*(1), 3–24.

Verona, G., & Ravasi, D. (2003). Unbundling dynamic capabilities: an exploratory study of continuous product innovation. *Industrial and Corporate Change, 12*(3), 577–606.

Von Krogh, G., Nonaka, I., & Aben, M. (2001). Making the most of your company's knowledge: a strategic framework. *Long Range Planning, 34*(4), 421–439.

Wade, M., & Hulland, J. (2004). Review: the resource-based view and information systems research: review, extension, and suggestions for future research. *MIS Quarterly, 28*(1), 107–142.

Westhead, P., Wright, M., & Ucbasaran, D. (2004). Internationalization of private firms: environmental turbulence and organizational strategies and resources. *Entrepreneurship and Regional Development, 16*(6), 501–522.

Wiig, K. M. (1997). Integrating intellectual capital and knowledge management. *Long Range Planning, 30*(3), 399–405.

Williamson, O. (1975). *Markets and hierarchies*. New-York: Free.

Williamson, N. C. (1999). Gathering export market information using the Internet. *Multinational Business Review*, 73–80.

Wilson, T.D. (2002). The nonsense of 'knowledge management'. Information Research, 8(1), Paper No. 144.

Wolff, J. A., & Pett, T. L. (2000). Internationalisation of small firms: an examination of export competitive patterns, firm size, and export performance. *Journal of Small Business Management, 38*(2), 37–47.

Wong, K. Y., & Aspinwall, E. (2005). An empirical study of the important factors for knowledge-management adoption in the SME sector. *Journal of Knowledge Management, 9*(3), 64–82.

Yam, R. C. M., Lo, W., Tang, E. P. Y. L., & W, A. K. (2011). Analysis of sources of innovation, technological innovation capabilities, and performance: an empirical study of Hong Kong manufacturing industries. *Research Policy, 40*(3), 391–402.

Yen, D. C., Chou, D. C., & Chang, J. (2002). A synergic analysis for Web-based enterprise resources planning systems. *Computer Standards & Interfaces, 24*, 337–346.

Yu, D., & Zhou, R. (2017). Intellectual management: an integrative theory. *Journal of the Knowledge Economy, 8*, 929–956.

Zahra, S. A., Neubaum, D. O., & Larrañeta, B. (2007). Knowledge sharing and technological capabilities: the moderating role of family involvement. *Journal of Business Research, 60*(10), 1070–1079.

Zhang, M., Sarker, S., & Sarker, S. (2008a). Unpacking the effect of IT capability on the performance of exportfocused SMEs: a report from China. *Information Systems Journal, 18*(4), 357–380.

Zhang, C., Hu, Z., & Gu, F. F. (2008b). Intra- and interfirm coordination of export manufacturers: a cluster analysis of indigenous Chinese exporters. *Journal of International Marketing, 16*(3), 108–135.

Zucchella, A., & Siano, A. (2014). Internationalization and Innovation as resources for SME growth in foreign markets. *International Studies of Management and Organization, 44*(1), 21–41.

Zucchella, A., Palamara, G., & Denicolai, S. (2007). The drivers of the early internationalization of the firm. *Journal of World Business, 42*(3), 268–280.

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