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Importance of ICT for Technology-Based Small Firms' Networking

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Abstract: Modern ICT is widely understood as important for enabling more effective communication, collaboration and internal operational efficiency for today's businesses. For small firms with limited in-house resources, and especially for technology-based small firms, ICT is expected to play a vital role. The empirical evidence supporting such an understanding are however rare. This paper elaborates on the extent to which ICT capability is employed by technology-based small firms and investigates the influence of ICT capability on network configuration and networking capability. The results provide some new evidence on how ICT may enable more effective networking in this specific category of small firms, and indicates e.g. that technology-based small firms are high users of ICT for gaining flexibility in working hours, accessing vital information, maintaining collaboration with existing business partners, enable a better handling communication within the firm and providing superior customer service. ICT capability was also found to influence small firms networking configuration. Particularly, there is a clear link between higher ICT use for collaboration and more extensive partnership networking, and a higher ICT use for communication and more extensive customer networking. Furthermore, we also found support for a strong relation between ICT capability and networking capability.

Keywords: Information and communication technology (ICT), networking, small firms, competitiveness and capability

1. Introduction

Small firms are a vital part of our modern economy, as they not only offer employment, but also promote growth and instil innovation. In Sweden, particularly technology-based small firms are considered as potentially high growth orientated firms which mean that studying these firms source for competitiveness should have a great impact on the national economy [1]. Many would argue that these firms are frontrunners or elites in-terms of using information and communication technology (ICT). However, to what extent does technology-based small firms use their ICT capability and what impact it has on their competitiveness still needs to be investigated.

The small firm's ability to network with different actors can be an important source of achieving competitive advantage. Networking enables small firms to get access to different resources, enhance learning, and facilitate innovations [2] [3]. Networking as a concept, can be viewed from several perspectives such as, intensity of ties between different actors, social capital, embeddedness, organization networks, etc. This study focuses on such two important aspects, the network configuration (i.e. the pattern of relationships that between actors) and the networking capability (i.e. ability to develop and utilize inter-organizational relationships). In this first section we briefly discuss these concepts and state the objectives and research questions. The next section presents the methodology used, followed by the

results from the empirical study. Finally, business benefits are then discussed, followed by a concluding discussion on the results from this paper.

1.1 Small Firms ICT Capability

ICT for long has been associated with something positive and promising for firms. Particularly, ICT could be a highly valuable tool for small firms, as they have limited access to in-house resources and capabilities. By making low investments small firms can increase their business opportunities such as, have closer relations with customers/partners, lower the cost of production, better information flow, etc. This has driven many governmental initiatives around Europe for promoting the use of ICT [4]. However, the real impact of these initiatives can only be tested and/or understood by observing the current level of ICT use by small firms. In this study we conceptualize ICT capability as closely linked with the strategic use of ICT for business purposes. Thus, the focus lies on utilizing or using ICT, not merely possessing ICT tools.

ICT capability is defined as firms "ability to mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities" [5]. A literature review on small firms ICT capability resulted in identification of thirteen different uses (see Table 1). These different uses will guide us in mapping the extent to which technology-based small firms posses ICT capability and also illustrate the most extensive usages of ICT capability.

Table 1: Thirteen Dimensions of ICT Capability

ICT1 EXISTINGCOL	Maintaining collaboration with existing business partners
ICT2 NEWCOL	Establishing business collaboration with new partners
ICT3 INTCOMM	Handling communication within the firms (e.g. intranet)
ICT4 EXTCOMM	Handling external communication with the firm's stakeholders (e.g. extranet)
ICT5 ACCESSINFO	Accessing information (e.g. market, customers)
ICT6 STRATPLAN	Enable strategic planning
ICT7 COSTSAVE	Enable cost savings
ICT8 GLOBALBUS	Enable global business with partner far away
ICT9 COMPDEV	Enable competence/skills development for employees
ICT10 WORKFLEX	Enable work flexibility (e.g. work outside the office)
ICT11 PRODEVELOP	Enable the product development process
ICT12 SERVQUAL	Enable better customer service quality
ICT13 MARKACTIVTY	Promoting marketing activities

Adapted from [6] [7]

1.2 Network Configuration, Networking Capability and ICT Capability

As suggested before, networking can be a viable source of achieving competitiveness for small firms [2]. Firms can have different network practices or configurations that may involve several actors such as, small firms, large firms, universities or even government bodies [8]. These actors can be customers or partners to the small firm. A possible reason for selecting any particular kind of networking configuration can be due to the expected benefits related with each relation [9]. We define network configuration as "the pattern of relationships that are engendered from the direct and indirect ties between actors" [10]. In Sweden, around 60% of small firms have some kind of organized collaboration with at least one other firm and another 15% have some sort of collaboration with another type of partner [11]. Thus, it seems that small firms, contrary to the understanding of them as individualistic and non-cooperative entities, extensively use and rely on their networking.

However, according to [12], it is not enough to practice networking, it's also essential for firms to be able to successfully and in-practice utilize their networks. This presumes a networking capability, which according to [13] is a firm's ability to develop and utilize inter-organizational relationships to gain access to various resources held by other actors and which includes five components: a) the firm's coordination activities between

collaborating firms, b) the firm's relational skills due to their ability of inter-personal exchange, c) its partner knowledge, i.e. possessing organized and structured information about their collaborating firms and competitors, d) the firm's internal communication to attain organizational learning within partnerships, and e) skills in locating and building up new relations with potential partners. A small firm with such capability would be able to strengthen their relations with different actors and gain more benefits from their network, which would lead to increased entrepreneurial behavior and better performance [14].

ICT capability can have strong influence on firms' networking configuration and capability. According to [15], ICT is seen as an important tool for working together and for having constant availability of information and communication with partner firms, which can lead to development of trust, satisfaction and commitment. Further, small firms with ICT capability can find it easier to meet the needs of their clients and offer customized products and services to conform those needs. It can also reduce physical barriers, and firms can focus on establishing most suitable partnerships [16]. Thus, we would like to propose that firms with high ICT capability would not only have ease in creating appropriate network configuration, but also gain more in term of networking capability.

2. Objectives

The overall objectives of this paper is two-fold: first to examine the extent to which ICT capability is possessed by technology-based small firms and second to investigate the influence of ICT capability on network configuration and networking capability.

These objectives can be further divided into four research questions.

1. What level of ICT capability is currently possessed by technology-based small firms?
2. Which dimensions of ICT capability are widely used by technology-based small firms?
3. How does ICT capability influence network configuration for technology-based SMEs?
4. How does ICT capability influence networking capability for technology-based SMEs?

3. Methodology

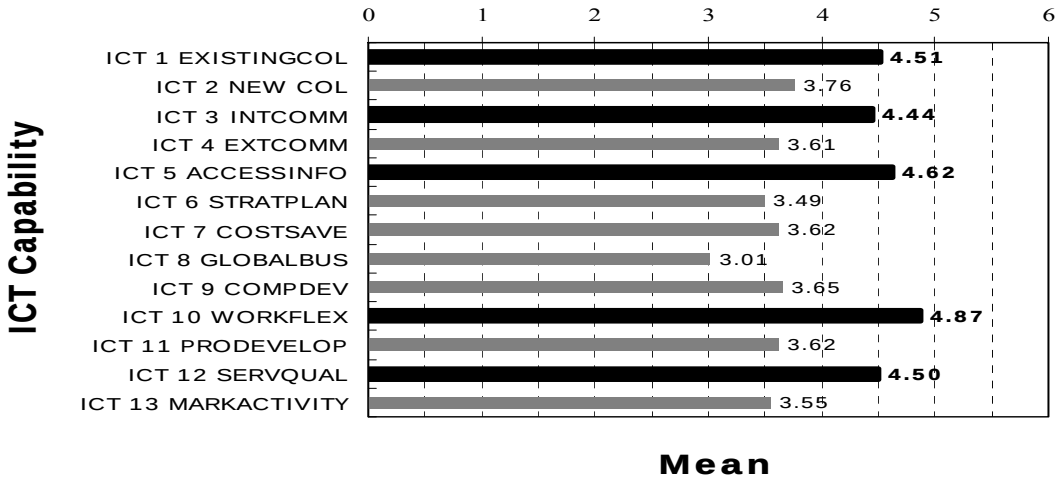
To achieve the above stated objectives, a survey was conducted involving Swedish technology-based small firms. This study is built on a pre-study that was done in autumn 2006 (see [7]). The pre-study included three in-depth case studies which were used as the baseline for defining criteria for selecting survey firms and for developing the questionnaire. The survey firms targeted were "consultancy-related computer systems or computer software firms" (Swedish industry index code of 72220). From the entire sample of 9,000 active firms, 1,471 firms were selected based on the following criteria: The firm should have less than 50 employees (i.e. small firms according to EU definition) and more than 1 MSEK/0,11 MEUR in sales (to ensure an active firm).

The questionnaires were sent in three waves during May- July 2007. Each questionnaire included three items: (1) a cover letter addressed to the CEO of the firm, explaining the motivation for this study. This letter was also signed by the researchers and personalized for each firm; (2) a business reply envelope; and (3) an eight-page questionnaire. A total of 291 usable replies (21% response rate) were received. Our key measurements were based on well-established scales from literature and the questionnaire was tested before-hand using inputs from small firm managers in similar industries as the targeted. During exploratory and confirmatory factor analysis, we did not observe any unexpected cross loading or irregularity and the alpha value were satisfactory (between 0.67 - 0.88). In order to contrast our two final research questions, regression analysis was conducted using SPSS 15.0. We moreover controlled for environment factors (dynamism, and hostility), firm age and firms size (number of employees).

4. Results

The analysis shows that technology-based small firms have a high level of ICT capability. However, from the thirteen different uses of ICT capabilities, five were extensively used by small firms, namely, ICT 10 WORKFLEX, ICT 5 ACCESSINFO, ICT 1 EXISTINGCOL, ICT 12 SERVQUAL, and ICT 3 INTCOMM. On the scale of 0 to 6 these usages were all rated above 4.

Table 2: Mean Value of ICT Capabilities Dimensions (A Key to Used Abbreviations is Provided in Table 1).



Factor analysis was used to group the different dimensions of ICT capability into more specific groups. Three groups were identified: ICT use for internal purpose, ICT use for communication, and ICT use for collaboration (see Table 3). At the bottom of the table the main characteristics associated to each group is stated. Three dimensions associated with ICT capabilities were removed from these groups as they did not explicitly relate to any particular group shown in italics in table 3 (ICT 8, ICT11, and ICT 12).

Table 3: The Main Groups for ICT Capability

	Internal use of ICT	ICT use for Communcation	ICT use for Collboration
ICT1 EXISTINGCOL			◆
ICT2 NEWCOL			◆
ICT3 INTCOMM		◆	
ICT4 EXTCOMM		◆	
ICT5 ACCESSINFO	◆		
ICT6 STRATPLAN	◆		
ICT7 COSTSAVE	◆		
ICT8 GLOBALBUS			
ICT9 COMPDEV	◆		
ICT10 WORKFLEX		◆	
ICT11 PRODEVELOP			
ICT12 SERVQUAL			
ICT13 MARKACTIVTY			◆
Main Characteristics	Internal use of ICT refers to those firm activities which are closely related with achieving internal efficiency	ICT use for communication refers to better flow of information inside and outside the firm	ICT use for collaboration addresses maintaining and establishing new relationships with different actors

Finally, for investigating the influence of ICT capability on network configuration and networking capability, regression analyses was performed (see Table 4). Two aspects of ICT capability significantly influenced network configuration. Particularly, it is the ICT use for communication that effects networking with customers ($\beta=0.177$, $p<0.05$) and ICT use for collaboration that effects networking with partners ($\beta=0.068$, $p<0.10$).

Table 4: Results from Regression Analysis

	Network Configuration			Networking Capability			
Dependent Variable →	**Networking with partners**	**Networking with customer**	**Internal communication**	**Coordination**	**Relationship skills**	**Building relations**	**Partner knowledge**
Firm age (log)	-0.050	-0.207	-0.071	-0.258***	-0.027	-0.109	-0.185**
Firm size (log)	0.246***	0.273**	0.264***	0.173***	-0.017	0.239***	0.025
Environmental dynamism	0.049	0.409***	0.143***	0.098	0.108*	0.010	0.029
Environmental hostility	-0.101**	-0.086	-0.026	-0.061	-0.146**	-0.048	-0.097
ICT collaboration	0.068*	-0.014	0.122**	0.187***	0.141***	0.116**	0.191***
ICT internal	-0.013	0.086	0.028	-0.028	0.034	0.104*	0.040
ICT communication	-0.028	0.177**	0.117***	0.088*	0.087*	0.011	0.026
Model Summary							
R square	0.122	0.192	0.217	0.175	0.153	0.143	0.114
R square adjusted	0.098	0.170	0.197	0.153	0.130	0.120	0.090
Std. Error of the estimate	0.714	1.354	0.903	0.937	0.809	0.973	1.000
F-ratio	5.126	8.800	10.795	7.868	6.670	6.220	4.788
Significance	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

p<.10, **p<.05, ***p<.01 Regression coefficients shown are beta coefficients

For the networking capability, all its components are significantly affected by ICT capability. Specifically, the component of relationship skills was strongly influenced from ICT use for collaboration (β=0.141, $p<0.01$) and marginally from ICT use for communication (β=0.087, $p<0.10$). Similar result was also received for coordination where ICT used for collaboration (β=0.187, $p<0.01$) and communication (β=0.088, $p<0.10$) had a significant influence. However, the internal communication component revealed an opposite relation to ICT capability where ICT use for communication (β=0.117, $p<0.01$) played a stronger role and ICT use for collaboration (β=0.122, $p<0.05$) a weaker. Additionally, partner knowledge was influenced by ICT use for collaboration (β=0.191, $p<0.01$) solely and the component of building relation was influenced from ICT use for collaboration (β=0.116, $p<0.05$) and internal use of ICT (β=0.104, $p<0.10$). All the models in the regression analyses have above satisfactory explanation power as the R square are between 0.144 and 0.217. Thus, the results indicate that ICT use for maintaining and establishing closer relations with business partners pays off in terms of developing the firm's network and its networking capability.

5. Business Benefits

We will now discuss the business benefits emerging from our results using two themes: (1) the level of ICT capability possessed by Swedish technology-based small firms and (2) the influence on ICT capability on network configuration and networking capability.

The level of ICT capability is mapped using the thirteen dimensions given in Table 1. Each dimension was carefully selected based on a literature review and inputs from our preceding case studies. Many studies in past have highlighted the problems faced by small firms in successfully using ICT. However, in the context of technology-based small firms, this does not seem to hold true. Our results clearly show that the small firms currently have a rather high ICT capability. On the scale of 0 to 6, the minimum mean value was 3.01 and the highest 4.87. A possible reason for this high level of ICT capability may be related with the maturity in using technology tools and technological standardizations [6]. Furthermore, technology-based small firms might have a higher level of ICT capability compared to other industries where e.g. their employees can find it easier to effectively use ICT tools for business purposes [7].

Five dimensions of ICT capability have high mean values. Thus, they can be considered as those ICT related activities, which are widely used by technology-based small firms. ICT 10 WORKFLEX refers to ease in work from different locations and also having flexibility with working hours. This dimension has the highest mean value. Thus, it shows that for small firms it is vital that employees can work according to their needs and convenience. And as several employees might work part-time in these small firms ICT enabled work

flexibility would hold a special value. The next dimension refers to the use of ICT for accessing information (ICT5 ACCESSINFO). Easy access to information is precious for firms operating in a dynamic environment, and as firms need to be updated on new technologies or innovations that might influence firms' future competitiveness. Wold wide web become an essential enabler for information search/exchange and this role seems to be considerably high for small firms. ICT12 SERVQUAL deals with use of ICT for better customer service. ICT has long been associated as a tool for providing customers with better services in terms of quicker response and closer interactions. Certainly ICT capability would be useful for achieving better service quality as customers' needs can be effectively met e.g. customer relationship management (CRM) systems. The next two dimensions deals with ICT use for maintaining relations with partners (ICT1 EXISTINCOL) and achieving better internal communication (ICT3 INTCOMM). Both these usages hold high significance for small firms and in some ways they compliment each other. With the help of intranet and extranet, small firms can attain effective internal communication, which might make them, operate closely and facilitate closer relation with existing partners [15]. Thus, clearly these dimensions hold the highest ICT valuable for technology-based small firms.

The second theme discusses the influence of ICT capability on network configuration and networking capability. These relationships have several significant links. The network configuration includes two aspects (partnerships and customers integration). Although, these two aspects are closely related, firms usually get involved in each of them due to different motives [9]. Networking in form of partnerships is mainly driven by the need of small firms to find prospective partners and projects. In this scenario, ICT use for collaboration has a positive impact as firms can put emphasis on using ICT tools for establishing and maintaining new inter-firm relationships. Having this closeness can also allow them to be informed about future market trend, new technological developments and more importantly regarding prospective business partners. Similarly, for networking with customers, one purpose can be to develop better products and services, where ICT use for communication has significant influence. And as in this form of networking the relationship already exists ICT use for collaboration does not seem to have any significant impact. However, with the use of CRM solutions, small firms can achieve a higher level of communication and interaction that makes it simpler for firms to understand customers' need and wants. Also, it would be more feasible to integrate the customers' feedback early in the product development phase, which will save costs.

The results from this study indicate that most components of networking capability are either influenced from ICT use for collaboration or/and from ICT use for communication. Specifically, coordination, relationship skills and partner knowledge have stronger relations to ICT use for collaboration. Technological tools such as EDI (electronic data interchange) can provide firms with the possibility to have a constant connection with trading partners, which fosters knowledge sharing and better customer/supplier information exchange [17]. These advantages have positive impact on firms' ability to better coordinate its actions and gather valuable information about customers. Furthermore, ICT can enable firms to offer extra services to their partners such as updated records of transactions, just-in-time deliveries, quick responses on inquiries, etc. Thus, creating an environment of mutual benefit and manifesting better relationship skills. ICT can also facilitate small firm to build goodwill among peers and help them in becoming an attractive partner for business. This will be helpful in building new relations and maintaining existing ones where ICT use for collaboration, and specifically on the component of building new relations, seems viable. ICT use for communication has on the other hand a significant impact on firms' internal communication. This could be the result of reduced structural barriers within firms which makes the communication channels more efficient. The firms' websites can also serve as an important tool for information and communication exchange for different stakeholders.

6. Discussion and Conclusions

To conclude, our results suggest that technology-based small firms are high users of ICT. Most of our sample firms view ICT as a vital part of their business practice. In this study, thirteen different uses of ICT were identified based on theory and practice. However, some of them are more widely used than others. The important ones are aimed at gaining flexibility in working hours, accessing vital information, maintaining collaboration with existing business partners, better handling communication within the firm and providing superior customer service. ICT capability does seem to influence small firms networking configuration. Particularly, there is a clear link between higher ICT use for collaboration and more extensive partnership networking, and a higher ICT use for communication and more extensive customer networking. The regression analysis also shows that ICT capability plays a significant role in enhancing networking capabilities. All components of networking capability are either influenced by ICT use for collaboration or communication. Thus, using technology for maintaining and establishing closer relations with business partners pays off in terms of developing the firm's network and its networking capability.

The theoretical contribution of this study provides further evidence regarding the importance of ICT capability for small firms' competitiveness. Previous studies have empirically linked ICT to performance and innovation [5] [9] [18]. However, the strong influence of ICT capability on networking related aspects has rarely been studied. This study makes a modest attempt to build the gap by empirically relating both these concepts. The main practical contribution of this study is towards providing a compressive picture to the small firms' mangers and policy makers. They can reflect on these results and might find similar or dissimilar scenario with-in their firm or region. The current level of ICT seems to be high at least for technology-based small firms and has large impact on there networking practices. Thus, ICT should be given special value within small firms and not just viewed as an ad-hoc process.

Future research can aim at replicating this study in another setting thus investigating a broader empirical perspective. It may be expected that the results from another industrial setting would be different and these differences can be appealing to investigate further. Another avenue for further research could be to elaborate on the causalities involved. This study has focused upon the influence of ICT on networking. However, this relation can also be the opposite, as many small firms might have adopted ICT due to their reliance networks. All these prospective tracks can be help in further building the research field and provide answers that have been lacking in the current study.

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