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Information Technology Capabilities and Their Impact on the Transfer of External Information

Implications for both private and public sector organizations

Gunnar Óskarsson
stundakennari og doktorsnemi
við viðskiptadeild Háskóla Íslands

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Abstract

This article reports on the findings of a literature review on information technology resources from a resource based view (RBV) perspective. The objective is to extract and synthesize 'best evidence' on information technology resources and how they contribute to the effectiveness of information transfer and performance of organizations with a particular focus on the sustainable competitive advantages of firms that have operations in international markets. The findings provide a thorough understanding of the subject and indicate that the only information technology resources that contribute to the sustainable competitive advantages of firms are managerial IT skills. It was beyond the focus of this paper to identify other capabilities that are important for information transfer, such as trust, norms, incentives and other factors that have a mediating impact on the effectiveness of using information technology for information transfer and organizational processes. Beyond relevance to an academic audience, this review could be useful for managers of firms and institutions seeking to improve processes and performance of their organizations. In this context, the paper seeks to make a contribution to evidence based policy and practice.

Introduction

Due to increased dynamics and globalization every organization is confronted with growing complexity. Following these changes, access to and the utilization of information from the extenal environment is of growing importance for the sustainable competitive advantages of firms and the effectiveness of organizations. Managing information transfer and use is therefore a key factor in determining how well organizations deal with this complexity.

Although personal communication is widely used for information transfer, it is not necessarily the most effective approach in all circumstances. This applies particularly to international organizations due to simultaneous participation of a number of individuals at different locations and time zones in the communication process. Furthermore it may be useful to store information for later retrieval and to provide means for systematic transfer of information at a later time. It is therefore important to gain an understanding of which information technology resources contribute to the speed of transfer and use of external information in organizations.

Most organizations are mainly using information systems for accounting, financial reporting and to streamline various administrative front and back-end processes. The use of information technology for the transfer of external information is however still limited and many organizations rely mainly on direct personal communication, e-mails and other means for the transfer of external information which do not support organization-wide use.

The objective of this research is to identify resources that contribute to a wider use of information technology with a particular emphasis on the transfer of information from the external environment. The research is a part of a PhD project in the School of Business at the University of Iceland. Of particular importance for this research is the identification of resources that contribute to the sustainable competitive advantages of firms from a resource based view perspective.

The article starts with a description of the methodology used. The next two sections cover the introduction of the literature on the impact of external information and the main sources of external information. Following is a review of the literature on the resource based view with a particular focus on information technology resources and how they contribute to the effectiveness of organizations. The implications of the findings for the PhD research is discussed, and a research framework proposed. Finally the implications for policy making and public organizations is discussed.

1. Methodology

The process of identifying and obtaining the literature was conventional. The key areas of the subject were identified and the literature scanned to identify the main contributions to the field of study. As the literature scanning process progressed, the key references emerged and the key contributors were identified. Having found the main contributions, the impact of the articles was analyzed through and citing articles reviewed. This was done using citation analyzis and mapping from Web of Science accessed from the website www.hvar.is. This process was continued until there was sufficient material gathered to frame the subject in terms of the research and further literature review did not make any additional contributions.

2. Results

The main goal of this section is to describe the findings of the research. The most difficult issue, which was also a challenge, was to understand and combine the contributions coming from different streams of literature that adress the topics related to the utilization of external information and how information technology management supports the transfer of information and the sustainable competitive advantage of firms and effectiveness of organizations. The literature which is relevant for this research comes from studies on the use and scanning of external information (Daft et al. 1988, Eisenhardt 1989), the theory of the resource based view (Barney 1991, Barney 2001) and information technolgy resources (Wade & Hulland 2004). The focus is on the identification of resources that managers can have an impact on and isolation of resources that do not contribute to the sustainable competitive advantage of firms.

2.1 External information

External information is of increasing importance for the management of private and public organizations. Information about customer demands, new technology or development in administrative processes provide the organization an opportunity to improve its performance. Early access to external information is therefore critical for innovation or efficiency. Many scholars and researchers have emphasised the importance of speed for the operational efficiency of organizations (Eisenhardt

1989, Frishammar & Horte 2005). In this respect, the notion of speed refers to recognition, innovation, decision-making and implementation.

Environmental scanning is an essential activity undertaken by top executives in order to be effective in steering the organization in a changing environment. Daft et.al (1988), found that chief executives in high-performning companies scanned the environment more frequenitly and more broadly in response to strategic uncertainty than their counterparts in low-performning companies. Effective organizations are strategically flexible, faster to observe changes in the environment and the competitive landscape, faster to orient themselves in the new landscape, faster to decide what to do, and do it. Although fast decision making is important for all organizations, it is of particular importance for firms that have a leading position and need to sustain their competiveness globally by offering new or enhanced products or services faster than their competitors. An important contribution to their competitiveness is the scannig of information that contributes to innovation (Frishammar & Horte 2005).

Organizations have access to external information from a variety of sources, such as customers, suppliers, technological alliances and consultants. One of the fastest means to access information is through direct personal contacts with the source. Line managers provide important links to the external environment. Sales managers have access to information from existing as well as potentinal customers, service managers have access to informaton on requirements and recomendations during service, installation and maintenance, and through suppliers, and production managers have access to information from suppliers, technological alliances and partner organizations. Table 1 summarises the sources of information and the access to it.

Table 1. Access to external information

Mangers:	**Customers**	**Suppliers**	**Alliances etc.**
Sales managers	X		
Service managers	X	X	X
Production managers		X	X

The table provides a conceptual rather than proven gateways to information providers, but this is one of the variables that is tested in a survey for the main research. These managers are important for the transfer of information, but they can also act as gatekeepers, resulting in a risk that they might withhold the information for themselves. If they do, the information acquired will not contribute to improved performance since it is not transferred and shared with those who need it for evaluation and to make relevant decisions based on the new information. There are even more sources of external information than referred to in the table, such as from economic, competitor, technological, regulatory, and socio-cultural relationships (Daft et al. 1988). It is therefore extremely important for managers to encourage and provide means for communication, information exchange and collaoration between members of the organization and break down barriers that may hinder the transfer of information.

2.2 **The resource based view**

The resource based view (RBV) is a conceptual framework for understanding firm level performance using resources as the basic building blocks. The RBV has its roots in Penrose's (1959) theory on the growth of the firm and relates to Porter's theory of sustained competitive advantage (1980, 1985). However, as opposed to focusing on the link between strategy and the external environment, the resource based view looks inside the firm to identify the foundations of the firms' competitive situation. There is an increasing support for using the resource-based view as an approach for research in strategy management, including the field of information systems and innovation theory. In their paper on the Research-Based View and Information Systems Research, Wade and Hulland (2004) state that "the RBV in IS contexts has the potential to identify key drivers of superior business performance" (p. 128).

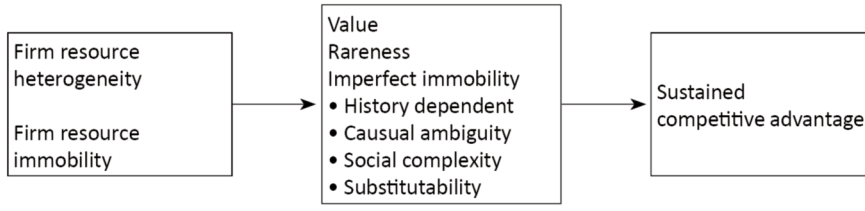
The resource based view (RBV) suggests that firms possess resources and a subset of resources that are unique, rare, valuable, and not easily substitutable or imitable, which enable them to achieve sustainable competitive advantage (Penrose 1959, Wernerfelt 1984, Barney 2001). The RBV focuses on the firms resources as economic rents and as the fundamental drivers of performance and competitive advantage. In the RBV the firm is a seeker of unique or otherwise costly-to-copy inputs that create competitive advantage. The RBV emphasises that the firm generates rent-producing inputs through resources that allow the firm to produce products that have superior value and can be priced higher than that of the competition and at a lower cost. The resources may be financial, human, intangible, physical, organizational, or technological. The RBV furthermore emphasises that it is not only the resources themselves that create a sustainable competitive advantage, but the dependency of the utilization of the resources on the history of the firm. The direction and rate of growth of the firm is influenced by how management conceptualises the firm's resource base. Due to their dependency and interrelationships these resources are not easily imitable by competitors or substitutable and they are therefore not likely to be able to produce similar rent-generating inputs for their production or product development.

Barney (1991) states that "a firm is said to have a sustained competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors [...] and when these other firms are unable to duplicate the benefits of this strategy" (p. 102). It is important to notice that a firm's competition does not only include all of its current competitors, but also potential competitors poised to enter the market at some future date. Furthermore, the sustained competitive advantage does not refer to calendar time that a firm enjoys a competitive advantage, but rather to the possibility of competitive duplication. The article follows Lippman and Rumelts' (1982) suggestion that a competitive advantage is sustained only if it continues to exist after efforts to duplicate that advantage have ceased. It is worth noting that Barney emphasizes that sustained competitive advantage implies that it will not be

competed away through duplication of efforts of other firms, but not that it will 'last forever'.

Barney suggested a framework to analyse a broad range of resources as a potential source of sustained competitive advantage, where the analysis would not only specify the theoretical conditions but also suggest specific empirical questions to be addressed before such a potential could be understood (fig. 1).

Figure 1. The relationship between resources and competetive advantage.



2.2.1 Competencies

A number of scholars have sought to incorporate the theory on competition into the resource-based thinking. One reason for this development is the distinction between stable and dynamic environments and that some resources are more useful when the firm is operating in a relatively stable environment while others are more useful in unstable, dynamic and turbulent environments (Eisenhardt & Brown 1999, Tallon 2008). It may therefore be helpful to focus on the firms' competencies which are developed when combinations of resources are applied together to create specific organizational abilities as opposed to focusing only on the resources themselves (Teece et al. 1997).

Hamel and Prahalad (1990) made a significant contribution to the theory of RBV through their promotion of the Core Competency concept. Their view is that competencies are an organization-wide concept and an outcome of organizational learning (Hamel & Prahalad 1994). The idea of competencies includes their notion of „core competence" and Snow and Hrebiniak's (1980) notion of distinctive competence, which help firms achieve superior performance (Teece et al. 1997, Eisenhardt & Martin 2000). Competencies are distinctive and specific to a firm (Conner 1991), difficult to imitate because they are path dependent (Dierickx et al. 1989, Barney 1991), embedded within the firms' culture and routines (Day 1994a) and not always transparent.

Firms with above average cooperative or appropriate competencies can be expected to be more innovative and have a more sustainable (i.e. long lasting) competitive advantage than competing firms.

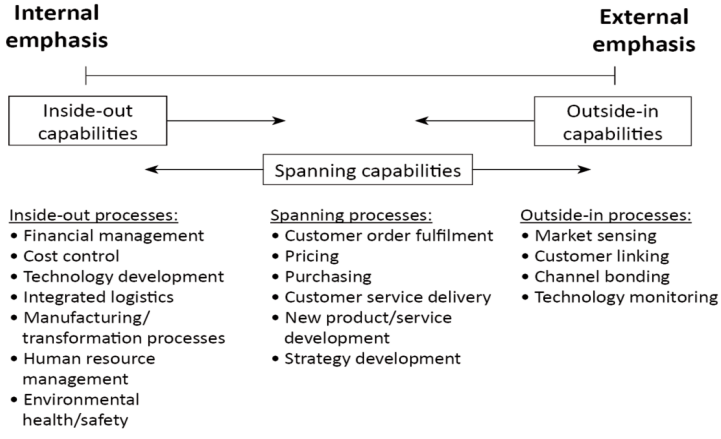
2.2.2. Resources and capabilities

Resources are defined in the RBV as tangible or intangible assets that a firm controls and can use to conceive of and implement its strategies. These include tangible assets, such as a firm's factories or products and intangible assets, including teamworking among its managers, or reputation among customers (Barney & Hesterley 2008).

Capabilities enable the organization to take full advantage of the resources it controls and carry out business processes. Capabilities alone do therefore not enable the organization to conceive of its strategies.

Day (1994b) proposed a classification of capabilities into three categories depending on the orientation and focus of the processes they support. At one end of the spectrum are capabilities that are deployed from the inside-out and at the other from outside-in. Outside-in capabilities connect and orient processes to the requirments of the external environment and enable the business to compete by anticipating market needs ahead of the competition and create durable relationships with channel members, suppliers and customers. Inside-out capabilities support the activation of business processes. Spanning capabilities are needed to integrate outside-in and inside-out capabilities. Figure 2 depicts this spectrum of capabilities from a marketing perspective with examples of processes they support.

Figure 2 Classification of capabilities
Adapted from: Day (1994)



2.2.3 Performance of business processes

Initially the resource based view focussed on a highly aggregated dependent variable, namely, firm performance (Ray et al. 2004). Barney et al (2004) suggested that adopting the performance of a business process as a dependent variable, and to

examine the kind of capabilities and resources that generate competitive advantages at this level of analysis was a more appropriate way for research with an RBV perspective. In a study on the effectiveness of the customer service business process in a sample of North American insurance companies, Barney et.al (2004) tested the impact of four resources and capabilities; service climate, managerial information technology knowledge, technology resources used in the process, and investments in the customer service process on the performance of the customer service process. The results suggest that understanding the relationship between a firm's resources and the effectiveness of its activities, routines, or business processes is a particularly fruitful ground for analysing the empirical implications of the resource-based theory.

Because firms can have a competitive advantage in some business processes and a competitive disadvantage in others, a research on the relationship between specific resources and the overall performance of the firm can lead to misleading conclusions. From the managers perspective, "research on understanding why some activities, routines or business practices are able to generate competitive advantages while others cannot is likely to be more helpful than research that examines just the relationship between resources and firm performance at a more aggregated level" (Ray et al. 2004: p. 36). Kling and Scacci (1982) introduced a model that they refer to as 'web of computing' that provides a framework for understanding the impact of information technology on business processes. They argue that managers who use a web model are "more likely to see a technical change (or new policy) as embedded in a larger system of activity, as having consequences which depend on peoples' actual behaviour, and as taking place in a social world in which the history of related changes may influence the new change" (Kling & Scacchi 1982, p.4).

Several studies have used a disaggregated dependent variable in studying the implications of RBV on business performance. Henderson and Cockburn (1994) examined how a firm's architectural competence affected its ability to develop new products by examining the new drug development process in pharmaceutical firms. Schroeder, Bates and Junttila (2002) examined how a firm's manufacturing capabilities affected manufacturing effectiveness by studying a sample of manufacturing firms, and Tarafdar (2007) investigated the relationship between specific IS competencies and performance in process innovations in a large healthcare organization in the USA. These studies suggest that the RBV might be a useful approach for research in the field of information systems (Mata et al. 1995, Wade & Hulland 2004, Tarafdar & Gordon 2007). **2.3 Information technology**
This section provides a review of the literature on information technology resources and how they contribute to the sustainable competitive advantages of firms.

2.3.1 Information system resources

The literature on the resource-based view of information systems classifies organisation's IS resources into three broad categories, technical, human and intangible. Technical resources include physical IT assets, such as databases, software, hardware, network and applications as well as firm-specific proprietary technology and applications which provide a platform on which information systems are built and tools for transferring, storing and retrieving information (Mata et al. 1995, Armstrong & Sambamurthy 1999, Broadbent et al. 1999, Bharadwaj 2000). IS-related human resources include the skills of IS professionals, including technical skills, experimentation and innovation skills and skills in IT management, communication, and understanding of the business (Feeny & Willcocks 1998, Jarvenpaa & Leidner 1998, Bharadwaj 2000, Wade & Hulland 2004). Intangible IS assets include vendor relationships, customer orientation, flexible IS culture and knowledge assets, partnership between IT and business units and end user and top management relationships (Ross et al. 1996, Bharadwaj 2000, Bassellier & Benbasat 2004). IS competency is created when processes and structures are applied in non-transparent and inimitable ways to develop specific abilities for accomplishing IS-related organizational tasks. IS competencies are therefore embedded in organizational processes and business routines (Teece 2000).

The IT capability literature rooted in the resource based view argues that various IT related resources combine to form an IT capability that is valuable, rare, nonimitable and nonsubstitutable (Mata et al. 1995). Bharadwaj (2000) defines IT capability as "the ability to mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities" (p. 171). Table 2 provides an overview of studies on IT-related resources that combine to form IT capability.

Table 2. IT-Related Resources that combine to form IT Capability

Studies (in chronological order)	IT-related resources that combine to form IT capability
Mata et.al (1995)	Access to capital, proprietary technology, technical IT skills, managerial IT skills
Ross et.al (1996)	Reusable technology base (technology asset) IT-business partnering relationship (relationship asset) IT human resources (human asset)
Powell and Dent-Micallef (1997)	Technology (IT) resources Complementary IT human resources Complementary business resources
Feeny and Willcocks (1998)	Design of IT infrastructure, business process integration, internal IT partnerships, external IT partnerships
Bharadwaj (2000)	IT infrastructure, human IT resources, IT-enabled intangibles
Sambamurthy et.al (2003)	IT investment scale, IT capabilities (as Bharadwaj 2000)
Tippins and Sohi (2003)	IT objects (hardware, software, and support personnel) IT knowledge (technical knowledge about IT systems) IT operations (IT utilization to manage information)

Adapted from: Pavlou et.al (2006)

The literature suggests that IT capability has three key dimensions; the acquisition of IT resources, deployment of IT resources through tight IT-business relationships, and leveraging of IT resources (table 3).

Table 3. IT capability dimensions

The acquisition of IT resources	Technology assets (Ross et al. 1996), IT objects (Tippins & Sohi 2003) and the overall IT infrastructure (Feeny & Willcocks 1998, Bharadwaj 2000)
Deployment of IT resources through tight IT-business relationships	IT-business partnering (Ross et al. 1996), IT partnerships (Tanriverdi 2006) and business-IT vision (Feeny & Willcocks 1998)
Leveraging of IT resources	Technical IT skills (Mata et al. 1995, Tippins & Sohi 2003, Ray et al. 2005), and human IT resources (Ross et al. 1996, Powell & DentMicallef 1997, Bharadwaj 2000)

The three dimensional IT capability views the construct at the firm level which is predominantly drawn from within the IT unit. Pavlou et.al (2006) developed an IT capability construct specifically for New Product Development (NPD) processes and focused on leveraging capabilities of the NPD work units as business users (or clients). They defined this capability as IT leveraging competence in NPD which relates to the ability of NPD work units to effectively use IT functionalities to support IT enabled NPD activities.

"IT leveraging competence in NPD thus describes the ability of NPD work units to be aware of what IT functionalities have to offer, to understand when to use them if they may be useful, and (when they decide to use them) to do so effectively by taking advantage of their specific IT functionalities" (Pavlou & El Sawy 2006: 204).

This definition is in congruence with Tippins and Sohi (2003) who described their notion of IT competency as the extent to which a firm is knowledgeable about and effectively utilizes IT tools to manage information within the firm.

Wade and Hulland (2004) advanced our understanding on the application of the RBV in IS research by critically evaluating the use of the RBV by IS researchers and by suggesting extensions to make the RBV more useful for empirical IS research. They argue that the proliferation of definitions and classifications has been problematic and suggest a simplification of the definitions. Following Sanchez et.al (1996) and Christensen and Overdorf (2000) they define resources as assets and capabilities that are available and useful in detecting and responding to market opportunities or threats and together they define the resources available to the firm. Assets are defined as anything tangible or intangible the firm can use in its processes for creating, producing, and/or offering its products (goods or services) to a market, whereas capabilities are repeatable patterns of actions in the use of assets

to create, produce, and/or offer products to a market. Wade and Hulland (2004) argue that the RBV theory provides a valuable way for IS researchers to think about how information systems relate to firm strategy and performance. Information System resources rarely contribute directly to sustained competitive advantage, instead they form a complex chain of assets and capabilities that lead to sustained competitive advantage. The RBV facilitates the specification of information system resources and how they contribute to the performance of firms.

Wade and Hulland (2004) classified IS-resources according to the attributes of resources which contribute to sustained competitive advantage according to their advantage creation and advantage sustainability following the RBV approach (table 4). The table describes hypothesized rather than proven relationships and Wade and Hulland note that the entries in the table should be interpreted in relative rather than absolute terms. The table suggests that outside-in and spanning resources tend to have similar resource attributes and relationships to the RBV. The table provides an interesting support for this research by suggesting that the outside-in and spanning resources, which are externally oriented have higher value, more rarity, lower appropriability, imitability, substitutability and mobility and should therefore have stronger impact on sustained competitive advantage of firms than the inside-out resources.

Table 4. IS resources by attribute

	Advantage Creation			Advantage Sustainability		
	Value	Rarity	Appropri-atability	Imit ability	Substitut ability	Mobility
Outside-In						
External relationship management	H	M - H	L - M	L	L - M	L
Market responsiveness	H	M - H	L - M	L	L - M	L
Spanning						
IS-business partnerships	H	M - H	L - M	L	L - M	L
IS management/ planning	H	M - H	L - M	L - M	L - M	M
Inside-Out						
IS infrastructure	M - H	L - M	H	H	L - M	H
IS technical skills	M - H	L - M	M	M	M - H	M - H
IS development	M - H	M	M	M	M - H	M
Cost efficient IS operations	M - H	L - M	M	L - M	M - H	M

Note: L = low, M = medium, H = high
Adapted from: Wade and Hulland (2004)

2.3.2 IT capabilities {XE "IT capabilities"} {XE "IT skills"}

A basic premise in the literature is that the firm's performance can be explained by how effectively the firm utilizes information (IT) to enhance its core competencies. Because innovation processes are information and knowledge intensive (Madhavan & Grover 1998), they can be enhanced by the effective leveraging of IT functionalities (McGrath and Insiti 1998, Nambisan 2003). The main impact that IT will have on the performance of innovation processes are:

- Support information processing through enhanced communication and increased efficiency of information sharing (Burton & Obel 2003)
- Enhance the efficiency, scope, and flexibility of New Product Development (NPD) capabilities (Pavlou & El Sawy 2006)
- Facilitate the efficiency of NPD capabilities by facilitating rapid and reliable knowledge sharing (Alavi & Leidner 2001)
- Increase the scope of NPD capabilities by increasing knowledge reach and richness (Sambamurthy et al. 2003),
- Enhance the flexibility of NPD capabilities by enhancing the accessibility and availability of knowledge (Zahra & George 2002)

The capability of firms to utilize IT for enhancing the firm's sustainable competitive advantage, including innovativeness, has been referred to as managerial IT skills (Mata et al. 1995). Managerial IT skills have also been referred to as IT leveraging competence (Pavlou & El Sawy 2006) and are proposed to enhance market orientation and the advantage of network relationships by accelerating the efficiency by which information is acquired by the environment.

Bharadwaj (2000) found that not all firms are successful in creating an effective IT capability, and that IT investments and firm performance are uncorrelated or even negatively correlated. "An organization's ability to use IT to support its core competencies is dependent on IS functional capabilities, which, in turn, are dependent on the nature of human, technology, and relationship resources of the IS department" (Ravichandran & Lertwongsatien 2005, 238). „Given the complexity associated with creating a firm wide IT capability, in any sample of IT spenders, only a small subset of the sample is likely to have the right IT resources in place for achieving competitive advantage" (Bharadwaj & Menon 2000, 186). This is also supported by Hitt and Brynjolfsson (1996) who reported that returns on IT spending is either non-significant or even slightly negative. Due to the lack of relationship between IT investment and performance and the potential positive impact of IT on performance, there is a need for further research on how IT may be appropriately viewed as an organizational capability or enterprise wide capability to leverage technology to differ from the competition and how it contributes to a sustained competitive advantage of firms (Henderson & Venkatraman 1993).

2.3.3 IT attributes {XE "IT skills":XE "IT attributes"}

A review of the literature suggests that five specific attributes of IT contribute to the competitive advantage of firms; access to capital, customer switching cost, proprietary technology, technical IT skills and managerial IT skills.

Access to capital {XE "IT skills":"access to capital"}

Investments in IT have increased rapidly over the last years and account for up to 50% of all capital investments of firms (Venkatesh et al. 2003, Love & Irani 2004). Access to capital has therefore been suggested as a source of sustainable competitive advantage for at least some firms (McFarlan 1984), but a number of studies have indicated that it is not the level of spending, but rather how the IT investments and capabilities are employed and their impact on specific processes within the firm that is of importance to the firm's competitiveness (Dehning & Stratopoulos 2003). Even large IT investments do not contribute to improved performance or sustained competitive advantage if they are not heterogeneous or unimitable, and it is even possible that they have negative impact due to the amount which was wasted. Ray, Muhanna and Barney (2005) argue that it is the access to certain IT skills that allow the firm to provide necessary services that is important for the competitiveness of the firm. Even small firms that have little retained earnings and small debt capacity can overcome these capital market disadvantages if they have access to the required IT investment capabilities and resources, which provides them with access to the necessary skills and capital through cooperation or alliances (Mata et al. 1995). Although access to capital is important and contributes to competitive advantage, it does therefore not create a sustained competitive advantage according the RBV approach.

Customer switching cost

Some authors have suggested that firms can enhance their competitiveness by applying IT to create high switching cost which makes it difficult for competitors to compete and to make the customer dependent on the supplier's products for a long period of time (Carpenter & Nakamoto 1989). Switching costs, which are created when customers make investments that are specific to a particular supplier, have also been the object of significant criticism (Klein et al. 1978, Malone et al. 1989). Typically customers will anticipate the risks of being captured by a specific supplier and will therefore be reluctant to invest in the product. If the customer will not have a guarantee that the supplying firm will not take unfair advantage of their investments, they will attempt to pursue alternative technologies or even create their own. Such actions will reduce the ability of the supplier to extract extra value from their relationships with „captured" customers and therefore the existence of switching costs will not be a source of sustainable competitive advantage. The exploitation of switching costs can even have an impact on the reputation of the

supplier as being untrustworthy causing itto lose itscustomers instead of gaining extra rents from them (Malone et al. 1989).

Proprietary technology

It has been suggested that technology which can be kept proprietary can be a source of sustained competitive advantage (Porter 1980). Proprietary technology is part of technical resources which form a platform on which information systems are built and provide tools for processing, transferring, storing and retrieving information. Firms that possess valuable proprietary technology that it can keep secret can obtain sustained competitive advantage. The fact that it is proprietary suggests that it is heterogeneously distributed across firms and the fact that it is secret suggests that it is imperfectly mobile. Most research, does however indicate that it is relatively difficult to keep a firm‘s proprietary technology secret and it is therefore unlikely that it will be a source of sustained competitive advantage. In today’s hyper-competitive environment, knowledge resources, processes and products become obsolete quickly (Di Benedetto 1999), and since communication technology provides competitors with access to information on new products and technology it is difficult to keep a technology proprietary for a long period of time. Due to a number of factors that act to reduce the extent to which proprietary technology can be kept secret, including reverse engineering, workforce mobility, and formal and informal communication (Lieberman & Montgomery 1988), firms will most likely only gain a first mover advantage but not a sustained competitive advantage.

Technical IT skills

Technical skills which refer to the know-how needed to build IT applications using the available technology to operate them to make products and services (Capon & Glazer 1987) have been mentioned as a possible source of sustained competitive advantage. Technical skills which include experience with operating systems, programming languages, and understanding of communication protocols and products are not heterogeneously distributed across firms. Technical IT skills are furthermore mobile, since they are usually explicit and codifiable by means of equations, procedures, blueprints, etc. Teece (1988) argued that since technical skills are easy to transmit and receive they can easily be diffused among firms. A firm that is at competitive disadvantage with regards to technical skills have a variety of solutions, such as to train its own employees, hire new employees, ask employees to take various classes to learn relevant technical skills and by those means the firm can regain competitive parity in technical skills. Although technical skills are important in the use and application of IT and valuable to the firm, they are not a source of sustained competitive advantage according to the RBV theory. Tallon (2008) found that managerial IT capabilities have a positive impact on agility in dynamic environments, but technical IT capabilities in stable

environments. It is therefore particularly important for firms that operate in volatile markets to have good managerial IT capabilities. They argue that managerial IT capabilities associated with flexible IT infrastructure drives agility or firm's ability to react to change in its products and markets. Weill, Subramani and Broadbent (2002) found that managerial IT capabilities have a positive impact on technical IT capabilities and they argue that it is important that managers are able to anticipate future strategic moves and make complex assessments about how IT infrastructure must adapt to support the long-term enterprise wide strategies while at the same time being responsive to the demands of business unit strategies. The literature furthermore suggests that effective IT government practices embedded in managerial IT capabilities have positive impact on how effectively firms respond to change by building an IT infrastructure that is flexible, scalable and supported by a broad range of technical IT skills (Mata et al. 1995, Feeny & Willcocks 1998, Bharadwaj 2000).

Managerial IT skills

Managerial IT skills refer to the ability to provide leadership for the IS function, manage IT projects, evaluate technology options, manage change, and envision creative and feasible technical solutions to business problems (Mata et al. 1995, Feeny & Willcocks 1998). Managerial IT skills, which have been identified with „learning by doing", are often developed over long periods of time through the accumulation of experience by trial and error (Katz 1974) and are thought to significantly reduce the costs and lead times associated with IT development (Bharadwaj 2000, Tallon 2008). For example, trust and friendship are developed over many years through interpersonal communication, making business functions able to work together in an efficient way to create and deploy novel IT applications that competitors may not be able to replicate. History is therefore important for developing these skills which are in many cases tacit (Castanias & Helfat 1991) and may involve a large number of small decisions that cannot be precisely imitated. The application and development of many of those skills depend to a considerable extent on close interpersonal relationships between IT managers and functional managers, or between IT managers and customers, sometimes through interactions with functional or divisional managers, which in the case of international companies may have access to customers in culturally different markets which is important for the competitiveness of firms which offer products for international markets.

Even if managerial IT skills are developed over longer periods of time, are causally ambiguous and socially complex, they do not necessarily have the attributes for being a source of sustainable competitive advantage.

> „In general, when managerial IT skills that can be written down, codified and transferred at low cost and with little loss in richness or understanding those skills are not likely to be sources of sustained competitive advantage. On the

> other hand, when managerial IT skills cannot be written down, codified or transferred at low cost or without significant loss of richness and understanding, those managerial IT skills may be a source of sustained competitive advantage“ (Mata et al. 1995, 499).

An important aspect of managerial IT skills are the impact they have on the exploitation of information through linkages with the environment, such as customers, suppliers or technical alliances (Lall 1992). Henderson (1990) notes that organizational linkage has positive impact on the effectiveness of interactions between organizations, including physical process integration, information integration and social networks. Information integration enables organizations to better plan and execute their own internal business processes. Electronic integration, in which information exchange goes beyond transaction automation through better and more effective information sharing contributes to successful strategic partnerships.

Corso, Cantis and Paolucci (2002) argue that firms can gain sustainable competitive advantage through careful management of a continuous and cross-functional process of knowledge creation, transfer and integration inside and outside the boundaries of a firm, particularly in knowledge intensive organizations, such as high technology and professional services, and in organizations that have to deal with a network of dispersed knowledge workers. Pavesi (2003) investigated the role of ICT as a trigger for change in knowledge processes, which indicated that ICT supports managerial activities and decisions in innovative environments. The managerial activities entail developing and exploiting tools to manage knowledge in increasingly complex networks of relationships both inside firms and beyond their boundaries. Organizational, technological and managerial solutions influence the enablers that foster knowledge processes in special functional units, which is even more critical in multinational companies where organizational practices, values and cultures are different in the subsidiaries (Hofstede 1980).

An important attribute of IT skills for innovation processes was identified when Tallon (2007) found that product leadership firms emphasize IT use for product and service enhancements as the most important support for business process activities and IT use as an important support for supplier relations. Tallon (2008) argued that managerial IT capabilities consisting of IT-business partnerships, strategic planning and ex-post IT project analysis have an impact on technical IT capabilities and the ability to respond to changes in the environment. The use of IT to coordinate supplier linkages is furthermore supported by Bakos (1991) who found that IT supports linkages with suppliers, resulting in reduced cost of communication and search. Parsons (1983) argues that the application of IT supports the different value chain activities of firms (Porter 1985), including experimentation support in research laboratories, computer-aided design, development work in engineering departments and marketing research within different divisions and across the boundaries of the firm. IT is furthermore credited with improving innovation,

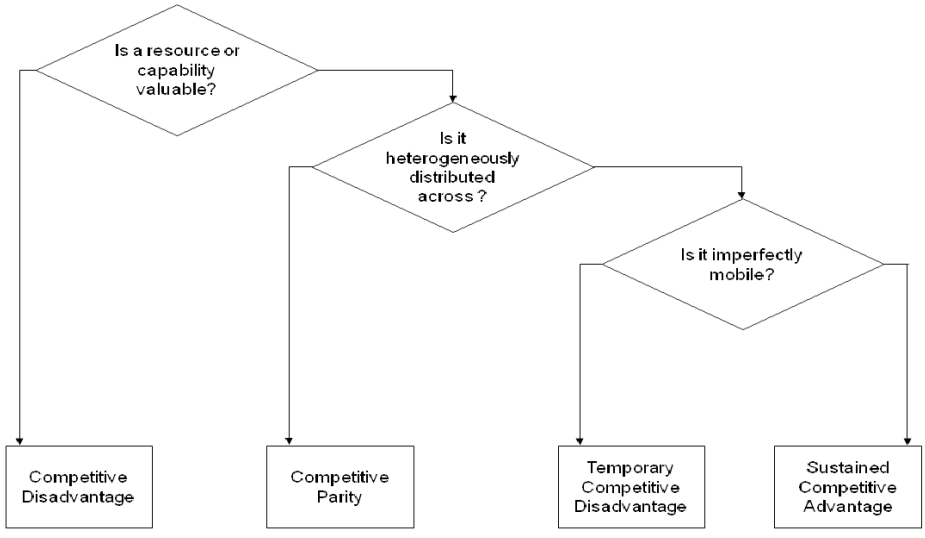
helping to bring new products and services faster to market and at lower cost (Porter & Millar 1985). This suggests that the implementation of necessary levers (Gieskes 2001) and conditions that stimulate effective use of IT for communication with suppliers and subsidiaries in product innovation processes will have a positive impact on information sharing and contribute to sustainable competitive advantage.

2.4 It attributes and the sustainable competitive advantage

Mata et.al (1995) developed a model based on the resource based view that can be applied to identify the conditions under which IT attributes can, and cannot be a source of sustained competitive advantage of firms (figure 3). Of the five resource attributes studied, only managerial IT skills are likely to be a source of sustainable competitive advantage. Although some of the IT resources do not contribute directly to sustainable competitive advantage, they may be indispensable for the effective use of IT and therefore have indirect impact and contribute to the effective application of managerial IT skills.

Mata et.al (1995) argued that managerial IT skills have an impact on the sustainability of the competitive advantage provided by IT applications. The nature of managerial IT skills relate to personnel capabilities of IT managers, including their abilities to understand business needs, their ability to work with functional managers, their ability to coordinate IT activities and their ability to anticipate the future needs of IT managers. Managerial IT skills may have an impact on functions such as marketing, product development and functional divisions of multinational firms (Gupta & Govindarajan 1991, Nobel & Birkinshaw 1998, Almeida & Phene 2004):

Figure 3: A Resource-Based Model of Competitive Advantage
Adapted from: Mata et.al (1995)



- The ability of managers to understand and appreciate the business needs of other functional managers, suppliers and customers
- The ability to work with these functional managers, suppliers and customers to develop appropriate IT applications
- The ability to coordinate IT activities in ways that support other functional managers, suppliers and customers
- The ability to appreciate the future IT needs of functional managers, suppliers and customers.

Without these managerial skills the full potential of IT will almost certainly not be realized, and it is therefore almost self evident that these managerial skills are valuable. Dehning and Stratopoulos (2003) confirmed Mata's results based on a dataset consisting of firms that were recognized for their effective use of IT. They found that managerial IT skills are positively related to sustainability, but there was no support for the impact of technical IT skills or IT infrastructure on sustainable competitive advantage. A number of research initiatives indicate that managerial IT skills are however still limited due to a lack of close working relationships among those in IT and between IT and other functions on which the acceptance and usefulness of IT applications actually depend (Adams et al. 1992, Hernandez et al. 2008). One of the key issues is that if the individuals who will be using the application are not consulted in the software development process, it is likely that difficulties arise in the adoption of the application and the technological advances will not be realized (Hernandez et al. 2008). In order to leverage the potential benefit of IT, issues of competitive outcome, market satisfaction and organizational goals must intertwine through interaction between IT and functional managers (Chen & Edgington 2005).

3. Discussion

The research revealed that the resource based view provides an interesting framework for a research on the impact of information technlogy on the sustainable competitive advantage of firms and performance of organizations. This framework allows the investigation of the reationship between factors that have an impact on the use of information technology and performance of specific business or organizational processes. The literature suggests that the resource based view is an appropriate approach for a research in information systems (Wade & Hulland 2004) and that the RBV provides an opportunity, not only to identify the relationship between IT resources and the overall performance of the firm, but more importantly its impact on specific processes within the firm. A number of IT related resources were identified and analyzed for their impact on the sustainable competitive advantages of firms. Some of the the resources that contribute to performance do however not contribute to the sustainable competitive advantage of firms according to the resource based view.

Wade and Hullands' (2004) suggestion that the application of the RBV in information system (IS) contexts has the potential to identify key drivers of superior business performance supports further research on the impact of information technology on the transfer of information from the external environment. They also mention that the propositions they hypothesized have not been tested, suggesting that this research will make an important contribution to the theory. It follows that it may be useful to test the relationship between the utilization of information and communication technology (resources) for the exploitation of external sources of information (processes) and performance in product innovation processes (dependent variable), which serves as a disaggregated measure of performance, specifically in dynamic environments (Pavlou & El Sawy 2006).

The investigation which is summarized in this paper furthermore contributed to the identification of resources that might be useful to apply in this research. An important contribution of the literature is that the only IT skills that contribute to sustainable competitive advantage (Mata et al. 1995) are managerial IT skills, suggesting that this research should emphasize on the identification of relationships between managerial IT skills and the utilization of external knowledge in product innovation processes.

Research framework

This research is challenged by providingfurhter understanding of the relationship between the utilization of information technology and supporting capbilities (Oskarsson 2005, Oskarsson 2009) for the exploitation of external information and performance in innovation processes. The research takes theperspective of the resource based view (RBV) and focuses on firms that have operations in international markets, providing them access to valuable information directly from customers or potential customers through sales and service activities, suppliers and alliances on a worldwide basis (Oskarsson 2008).

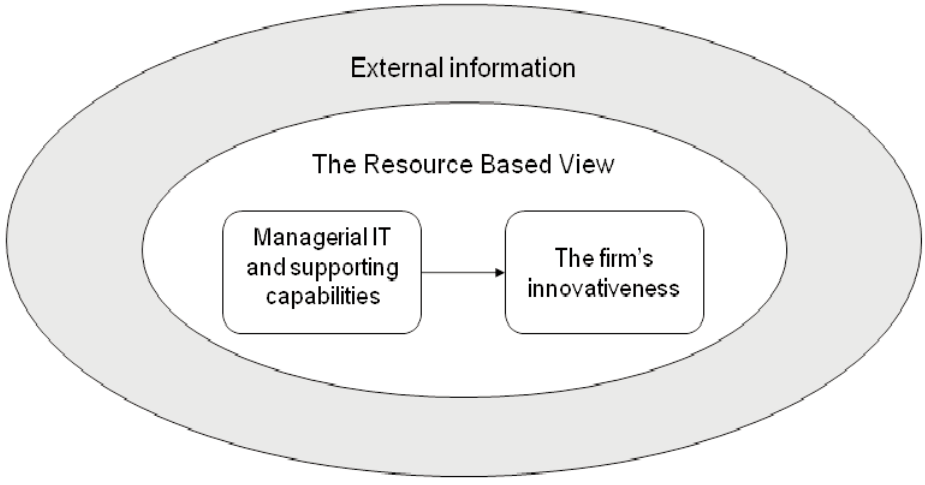
In addition to managerial IT skills, the literature revealed that a number of mediating capabilities are important for providing condition for the exploitation of information technology. Without these supporting capabilities the potential impact of IT applications will not be fully utilized. These conclusions prompted the following research question:

> Is there a positive relationship between managerial IT capabilities and the exploitation of external information in new product development processes and the sustainable competitive advantage through innovativeness of international firms and to what extent are they mediated by supporting capabilities?

The question takes the resource based view and focuses on the relationship between the leveraging of information technology (IT) for the exploitation of

external information on the one hand and the innovativeness of firms which has an impact on the sustainable competitive advantage of firms on the other hand. In order for external information to be exploited, a number of actions need to be taken by the members of the NPD team, such as the utilization of information directly in new product development processes or by gaining further understanding or insight through interaction with other members of the organization. Previous research has indicated that the interaction processes have an impact on the exploitation of external information and innovation capability (e.g, Håkansson & Waluszewski 2002, Han et al. 2008) and that the interaction processes can be supported with the application of information technology (Chen 2007). Following the discussion in the literature review, the research question assumes that the only IT skills that contribute to the sustainable competitive advantage of firms are managerial IT capabilities. The impact of the application of IT on interaction processes will however only be limited if the firm does not have other capabilities that support the interaction processes and the utilization of IT. This leads to the research framework depicted in fig. 4.

Figure 4: The initial research framework



Implications for policy making and public organizations

Although the focus of this research is on firms that have operations in international markets, the transfer and utilization of external information is of importance for public organizations as well. In a research on knowledge sharing networks related to hospital quality measurement and reporting, Rangchari (2008) found that senior administrators must undertake proactive and unceasing efforts to coordinate knowledge exchanges across physician and coding subgroups and connect these subgroups with the changing external environment. Orzano et.al (2008) furthermore argue that medicine is a knowledge-based profession and that finding,

sharing, and developing clinicians' knowledge is necessary for effective primary health care practice.

Results of previous research indicate that there is a positive relationship between Leadership Excellence and Performance with both the public sector and private sector samples. The conclusions of previous research indicates that there is no difference between the effect of Business Excellence on public, as opposed to private sector organizations. Public and private sector organizations also share similar management models (Oakland et al. 2002, Tanner 2005).

These examples indicate that the findings of this research will support the management of public organizations and the understanding of the impact of information technlogy capabilities on performance are important for the effectiveness of administrative processes in both governmental institutions and public organizations.

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