Role of Information Systems for Strategic Agility in Supply Chain Setting: Telecommunication Industry Study

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Abstract: The ability of a company to either adapt to the changes in the business environment or to influence the environment, for example by innovations, determines its success in gaining competitive advantage or even survival in the contemporary business environment. Both scholars and practitioners are constantly devising ways to survive the environmental pressures, such as, information overload, technological advances and obsolescence and globalization. This research proposes strategic agility comprised of strategic sensitivity, strategic response and collective capabilities as one such business virtue required. One such competitive and complex industry is Telecommunication industry and this study makes use of a company in that industry to investigate strategic agility and information systems (IS) role in promoting strategic agility. In addition, the supply chain setting is considered because of its significance in the industry as one of the competitive factors. The research revealed different points of view for the role of IS from business and information technology (IT) managers. The value of strategic agility is appreciated by both sets of managers. However, the managers have different views on the value of IS in promoting the strategic agility dimensions, for instance, most business managers highlighted that IS is of no strategic value and one even claimed it is the worst performing function. But IS managers noted that, IS, for instance**,** business intelligence and enterprise resource planning systems could be utilized hand-in-hand to support strategic agility. Moreover, this study make use of dynamic capabilities view in drawing both strategic agility dimensions and IS input. This study contributes to the ever required knowledge on how business could make use of IS and adapt organizational features to the environment requirements in order to survive the competition.

Keywords: strategic agility, strategic sensitivity, strategic response, collective capabilities, Information systems role, supply chain, telecommunication study

1. Introduction

Growth and survival of companies in the contemporary business environment largely depend on how well the companies understand and relate to the dynamic and increasingly complex business environment. For example, changes in the mobile phone industry like increase in smartphones market segment was well understood and catered for, for instance, by Apple's iPhone and Google's Android based devices like Samsung phones dominate the segment because of their innovation in line with the changing environment requirements. The environment has been increasingly dynamic due to advances in technology, globalization and high rate of innovation in some industries. There are many measures business can take to relate to the environment in order to gain competitive advantage. This research aims to investigate one such business virtue, titled strategic agility. Strategic agility involves tactfully sensing and responding with ease, speed, and dexterity to business environment (Tallon and Pinsonneault, 2011).Moreover, the prevailing technological advances bring challenges and opportunities to business. This research contributes to the ever dynamic and required knowledge on IS role in promoting business and past literature offers opposing views on the strategic value of IS (Lech, 2011). For instance one view is that IS, such as though social computing tools like blogs and wikis offers strategic value (Li et al., 2011). Another view is that IS offers no strategic value (Carr, 2003). Additionally, one of the business responses to an increasingly competitive environment is formation of supply chains (SC) (Christopher, 2000). It is also argued that business competition is now at SC level (Sahay, 2003; Makipää, 2008). This is also due to the global nature of the business environment in addition to technological advances which enable quick and cheap communication and collaboration. SC involves systemic, strategic coordination of the traditional business functions and the tactics across the business functions within a particular company and across businesses within the SC, for the purposes of improving the long term performance of the individual companies and the SC as a whole.

After conducting a systematic literature review (SLR) following guidelines by Okoli (2012)we noted that there have been calls in the literature to study agility from different dimensions (Vazquez-Bustelo et al., 2007). The SLR uncovered wide research which highlights the increase in competition in the business environment, for example, Gunasekaran et al. (2004) and thus calling for agility research. Moreover, we also noted that there have been efforts to relate agility to information systems (IS) like Nazir and Pinsonneault (2012) and Lu and Ramamurthy (2011) and these studies concluded that IS play crucial roles to promote agility. In addition,

research covered agility in SC setting, for instance, Christopher (2000). However, we noted a gap in literature of the research which relates strategic agility and the role of IS in SC setting. This is important because of the increasing complexity of the business environment which needs to be analyzed considering all these factors (strategic agility, information systems and supply chains). Moreover, there is a need to include empirical component to the agility study in order to relate research and practice. Table 1 illustrates the evolvement of agility related research. From the research in Table 1 we note how agility research incorporated different factors in drawing and mapping the value of agility for improved business performance. Moreover, Table 1 illustrates the contribution of this research and how it relates to past literature.

Table 1: Strategic agility, IS role and SC evolvement in the literature (modified from Chakraborty and Mandal, 2011)

Author (s)	Contribution
	Linked agile concepts with the core concepts regarding 'customer enrichment', 'cooperation', 'organizing to master change and uncertainty' and 'leveraging the combined impact of people and information'.
Gunasekaran (1998)	Indicated seven enabling technologies required to accomplish agile manufacturing namely: Virtual enterprise formation tools/metrics, physically distributed teams and manufacturing, rapid partnership formation tools/metrics, concurrent engineering, integrated product/production/business information system, rapid prototyping tools and electronic commerce.
Christopher (2000)	Extended the concept of agility to the entire supply chain network domain.
Overby et al. (2006)	Develop enterprise agility concept and explicate the enabling role of information technology. Enterprise agility is viewed as comprised of sensing environmental change and responding readily.
Swafford et al (2008)	Empirically concluded that business performance is enhanced by supply chain agility together with supply chain flexibility and both are enabled by information technology integration.
Li et al. (2011)	Highlighted the strategic value of agility 2.0 achieved by adoption of social technologies.
Nazir and Pinsonneault (2012)	Demonstrated how IT application through integration enhances sensing and responding components of agility.
This study	Demonstrates value of strategic agility which is defined as comprising strategic sensitivity, strategic response and collective capabilities. And highlights related information systems role for each strategic agility dimension and in addition supply chain context is considered.

This research seeks to address the gap noted above by investigating use of IS in order to map the potential role of IS taking advantage of all the advances in technology and opportunities presented by the evolving business environment, for example, the convergence of enterprise resource planning (ERP) and business intelligence (BI) systems. The research aim is to clarify and propose ways in which IS could promote strategic agility in SC setting. To do that, first the research background is defined and that includes defining strategic agility, SC environment and the role of IS in business. The problem which this research addresses can be generalized as the challenges business face in a competitive environment arising from a dynamic market place in which competitive advantage is a moving target. This research includes empirical analysis of a company undergoing transformation which also illustrates an effort to improve strategic agility. The research question is: How IS could be utilized to improve strategic agility in SC settings? This research contributes to a relatively new area of agility research (Swafford et al., 2006) in which Vazquez-Bustelo et al. (2007) called for different perspectives in developing the research arena. Both practitioners and scholars are constantly engaged in measures to promote business performance especially in a competitive business environment. The practical contribution of this research to this effort to promote competitive advantage and makes use of a company in a telecommunications industry for empirical basis. Next section, Section 2 is the theoretical background then in Section 3 the research methodology is described. Then in Section 4 the findings of the research are highlighted. Section 5 is the discussion and Section 6 is the conclusion.

2. Key Concepts and Theoretical background

This section elaborates the research themes namely strategic agility, SC and the role of IS. In addition, two theories are explained namely Porter's five forces that shape industry competition and dynamic capabilities. These theories address the external and internal factors in competing in a dynamic environment.

2.1 Strategic agility construct

Basing on a dynamic competitive business environment Doz and Kosonen (2008) suggested the need of strategic agility. They proposed strategic sensitivity, resource fluidity and leadership unity as main dimensions of strategic agility. However, after noting other literature, such as, Overby et al. (2006) and Sambamurthy et al. (2003) this research expanded the dimensions of strategic agility to be strategic sensitivity, strategic response and collective capabilities, illustrated in Figure 1.

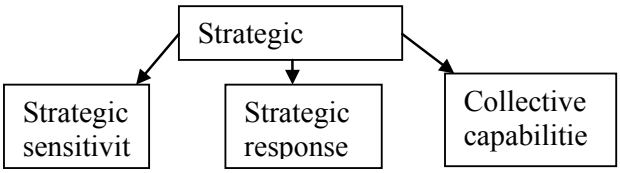

Figure 1: Strategic agility dimensions

Strategic sensitivity is the ability to draw useable data from environment, incorporate data into information, interpret and analyze to acquire knowledge and then detect opportunities and threats in the business environment (Overby et al., 2006). Strategic response is the ability of an organization to impeccably and quickly (re)configure its resources and processes to re-act or pro-act to the business environment demands (Dove, 2001). Collective capabilities include the ability of an organization to take advantage of the synthesis of its resources, for example, information, employees, infrastructure, partners and to succeed on the gains of working together, this is more than each resource's benefits individually summed up.

2.2 Supply chain

A supply chain involves business processes that include goods production or services formulation from suppliers to the end-customers (Mouritsen et al., 2003). Customers places orders which flows from distributor to last tier supplier and this triggers goods or service formulation from the successive SC members until the customer is served as per order as illustrated in Figure 2.

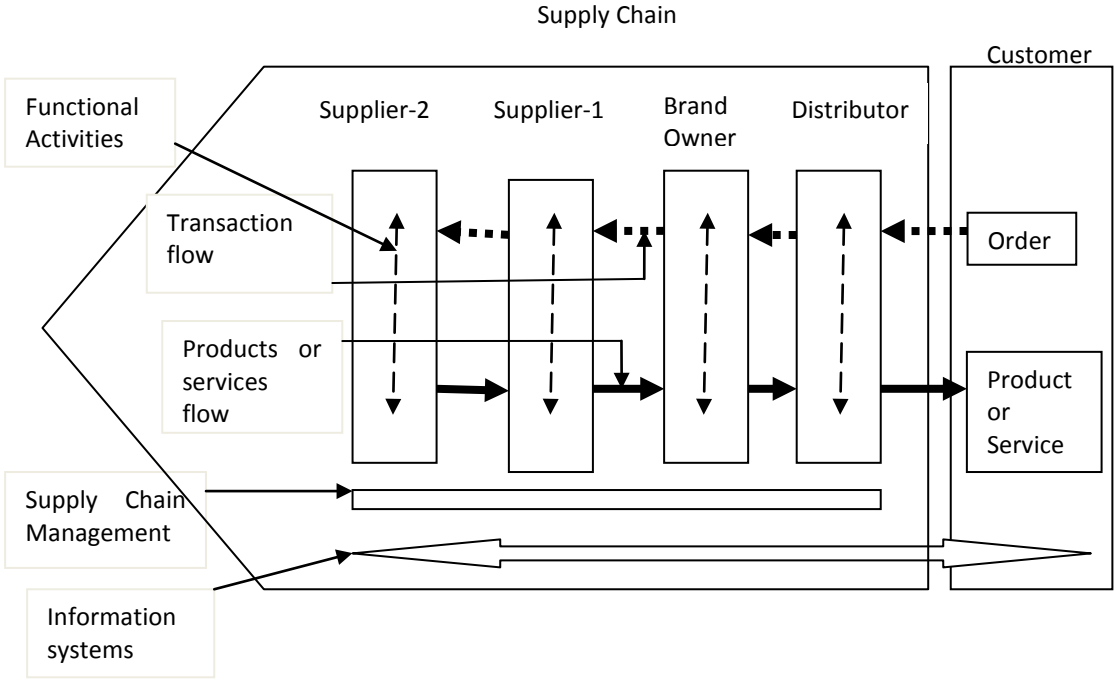

Figure 2: A general supply chain management model (modified from Mouritsen et al. 2003)

In addition, SC can also be innovative and produce new goods or services which could disrupt the market. A SC is comprised of, for instance, enterprises, vendors, distributors, manufacturer, and supplier-1 until the last-tier supplier. Products whose formulation is from the last-tier supplier and delivered to the customer are administered by SC management who acts in two levels SClevel and organizational level. At SC level management tackles the issues that make the chain effective and efficient and on organizational level they

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make sure that the organization is functioning as required by the chain. Their choices include determining structure, process and as well as SC partners (Mouritsen et al., 2003). Information sharing is a vital component of the SC and information should be available to all SC partners in transparent manner.

2.3 The role of IS in business

There are mixed views from both practitioners and scholars on role of IS in business performance and hence efforts, for example by Remenyi et al. (2007) and Lech (2007) on drawing measures to evaluate IS costs and benefits. For instance, there has been wide audience of both critics and promoters on Carr (2003) argument that IT does not matter. He argued that IS, like electricity, is being a commodity which is of no competitive advantage. Some business personnel of the company in this study shared the same views. However Schryen (2013) noted that there is vast IS research which empirically concluded that ISs are of operational and strategic value. For example, Sambamurthy et al. (2003) concluded that the role of IS in business is crucial But scholars also differ in arriving to this conclusion, for example, Ordanini and Rubera (2010) noted that there are two approaches first, that IS impacts directly business performance, for example, media company with its suppliers. The second approach is that IS indirectly impacts business through organizational features, such as, strategic agility and this study concur to this view. Doz and Kosonen (2008) suggest that strategic agility is required in a competitive business environment, which is prevalent in the current environment. Specifically this research seeks to highlight IS task in enhancing strategic agility, which is a business imperative especially in a competitive environment.

2.4 The five competitive forces that shape industry competition

Porter (2008) suggested that competition is drawn from new entrants, existing competitors, substitute products and services, suppliers and buyers as illustrated in Figure ****. He emphasized that in industries, such as, airline and hotel these forces are intense which makes it hard for companies to gain competitive advantage or even to survive. This study is based on one such competitive industry, that is, telecommunication industry. This model is used in this research in analysis the competitive factors which needs to be sensed for strategic agility.

Figure 3 The five competitive forces that shape industry competition

Figure 3 shows new entrants as one of the competitive forces. These are prominent in the contemporary business environment because of, for instance, globalization and technological advances. The power of customers is increasing as well because of the unlimited buying options enhanced by e-commerce. Innovations are also creating new products and services which could be substitute, for example, Voice over Internet Protocol (VOIP) technologies, these are, technologies for the delivery of voice communications and multimedia sessions over Internet as substitute to the telecommunication industry.

2.5 Dynamic Capabilties

Teece et al. (1997) in developing dynamic capabilities approach took into consideration the five competitive forces that shape industry competition approach elaborated above. The competitive forces approach highlights the competitive strategy formulation relating to the environment, for instance, the approach could be used to aid the company position itself in the industry. Thus the competitive forces approach has external focus whilst the dynamic capabilities approach has internal. Both approaches serves companies operating in a competitive environment although from different perspectives, but both basing on continual changes, for example, new innovative products, new regulations, new competitors and new dimensions of the competition

which brings constant threats and opportunities. Teece et al. (1997, p. 516) defined dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments".

The dynamic capabilities are utilized in this research in drawing concrete ingredients required to develop strategic agility. That is, dynamic capabilities are utilized in highlighting how strategic agility dimensions namely strategic sensitivity, strategic response and collective capabilities could be enhanced in dynamic environment. However, there is debate in the literature on what exactly are dynamic capabilities and thus research such as by Wang & Ahmed (2007) on the review and research agenda on dynamic capabilities, Eisenhardt & Martin (2000) titled "dynamic capabilities: what are they?" and Winter (2003) on understating dynamic capabilities. Wang & Ahmed (2007, p. 10) suggested dynamic capabilities to relate to ways firms conducts itself in defining dynamic capabilities as "a firm's behavioral orientation to constantly integrate, reconfigure, renew and recreate its resources and capabilities, and most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage". From this definition we note that dynamic capabilities relate to the changing environment and developing firm strengths in line with the changes in the environment. The firms' strengths are reflected by the ability to gain competitive advantage and this relates to the strategic agility dimensions.

3. Research methodology

This study is a qualitative survey based research which includes interviews from the same company as elaborated below. Conboy (2012) highlighted the value and contribution of qualitative approach in IS research, for example as is the case in this research, in a highly complex and turbulent context, rich data can be generated that enable answering research questions comprehensively. Data collection and analysis. The selection criterion of the company include operations in highly competitive environment in a supply chain setting and is undergoing transformation thus visibly making efforts to survive or lead the market. Table 1 illustrates the list of people who participated in the research from Net Power.

Table 2: Interview participants

Interview ID.	Functional Area	Title and duties	Experience	Interview focus
1		Senior Architect - Business architecture development.	About 6 years in the industry	business and IS aspects
2	Research and Development	Head - Research to ensure the future technology competitiveness of the organization.	More than 5 years in current position	business and IS aspects
3	Software Platforms Architecture	Manager - How IT tools are used and how they can be changed in the organization as seen from a software business point of view.	About 15 years in the industry	IS aspects
4	Business Enhancement	Head - Responsible of developing innovation research projects in collaboration with partners and public R&D (universities, VTT).	About 15 years in the industry	business aspects
5	New Business Development	Head - Looking for new business opportunities with customers in Nordic and Russia region.	About 7 years in the industry	business aspects
6	Information management	Principal Engineer – Evaluation of Enterprise Architecture approach (methods and frameworks) and its application for future communication services business.	About 20 years in the industry	business and IS aspects
7	New Corporate Projects	Head - Driving new business domains and business models for the Organization.	About 20 years in the industry	business aspects
8	Information Systems Strategy	Head - IS strategy development, execution and communication and creation and implementation of IT competence and change management frameworks across IT.	About 10 years in the industry	IS aspects

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The participants were selected so that they offered diverse knowledge which is of interest to the study, for example, IS application for business and daily use, strategic agility as well as supply chain aspects. Net Power was going through restructuring at the time of the research and, for instance, interviewee 1, Senior Architect was not certain about his function. The interviewees are senior company employees with vast experience in the industry and have great influence on the company operations. The interviews focused on business aspects or IT aspects and in some cases both aspects depending with the profile of the interviewee.

The interviews were semi-structured in that a set of guiding questions were drafted before the interview to provide focus. But the interviews were not restricted to the questions as issues perceived as important raised in the interviews were further elaborated. The duration of the interviews was approximately one hour each. The main questions of the interviews included: (Strategic sensitivity related question) what are the measures the company takes in understating and recognizing trends in the business environment? (Strategic response related question) How does the company respond to the strategic matters uncovered? (Collective capabilities related question) What are the essential capabilities in sensing and responding to the environment? What is the role of IS in all these efforts? These questions were further expanded considering SC setting.

All interviews were audiotape-recorded, transcribed and directed content analysis (Hseieh and Shanon, 2005) steps noted below were utilized in the data analysis:

- Theoretical framework guiding the analysis was drawn from past literature as highlighted in the theoretical background section
- The manuscripts were scrutinized to identify and categorize instances, that is, strategic agility dimensions, IS role and SC setting
- The highlighted passages from the manuscript were coded within the defined framework
- New insights that could not be categorized with the initial coding scheme given new codes like differing views on role of IS noted

3.1 Company description

Net power (pseudonym as real name cannot be revealed because of confidentiality issues) is one of the leading companies in telecommunication equipment and networking. It has operations in over 100 countries. The company was formed around 2005 and has been rapidly growing but recently undertook restructuring removing over 15000 positions to enable strategic focus due to increasing competition and stable demand. All the company employees who participated in this research noted the intense competition and the need of drastic action to survive. The telecommunication equipment and networking industry is very competitive and the competition is increasingly complex and the value chain very sophisticated. The head of research and technology and head of business enhancement suggested that only the best 3 companies will survive the competition. The competitive market place is one of reasons and motivation of choosing this company as it suits the research requirements. This industry is very dynamic and the changes are being driven by technology advances and obsolescence, evolving customer services, strict regulations and top players ever lifting the competition dimensions and levels. Because of the prevalent changes companies operating in this industry are facing many challenges, such as, powerful customers, emerging low-cost players, global markets which requires customized products. The reasons for intense competition in the industry are also elaborated below;

> *[Head of research and development:] In our field the competition is so tough. There are couples of reasons for this; one is that this is a very standardized industry, so together we develop different standards for the interfaces between different equipment and different functions of the equipment. And then operators can buy different equipment from multiple vendors and still have them interoperate because of the standards. And the other thing is that there are not so many suppliers and in that sense it is not hugely competitive like in some consumer goods there maybe 100s of suppliers but here there are just a few 6 or 7 suppliers but the problem is there are kind of 600 customers in the whole world and these are enterprises they are not consumers and the most important one are very big companies much bigger than us in revenue and there are extremely professional in purchasing so we have very skilled customers who are very good at negotiating and putting the vendors against each other which is possible because of the standards so this is what makes it very competitive, we have very good buyers.*

Figure 4 illustrates in simple terms the complex Net Power supply chain and also illustrates the competitive environment of the telecommunications industry. There are 7 suppliers who provide suppliers to Net Power and its competitors. There are strong existent Net Power competitors who have better market share. Net Power collaborates with competitors, for instance, in standardization and European Union projects. There are emerging low cost competitors for Net Power who have government support which makes the competition space uneven.

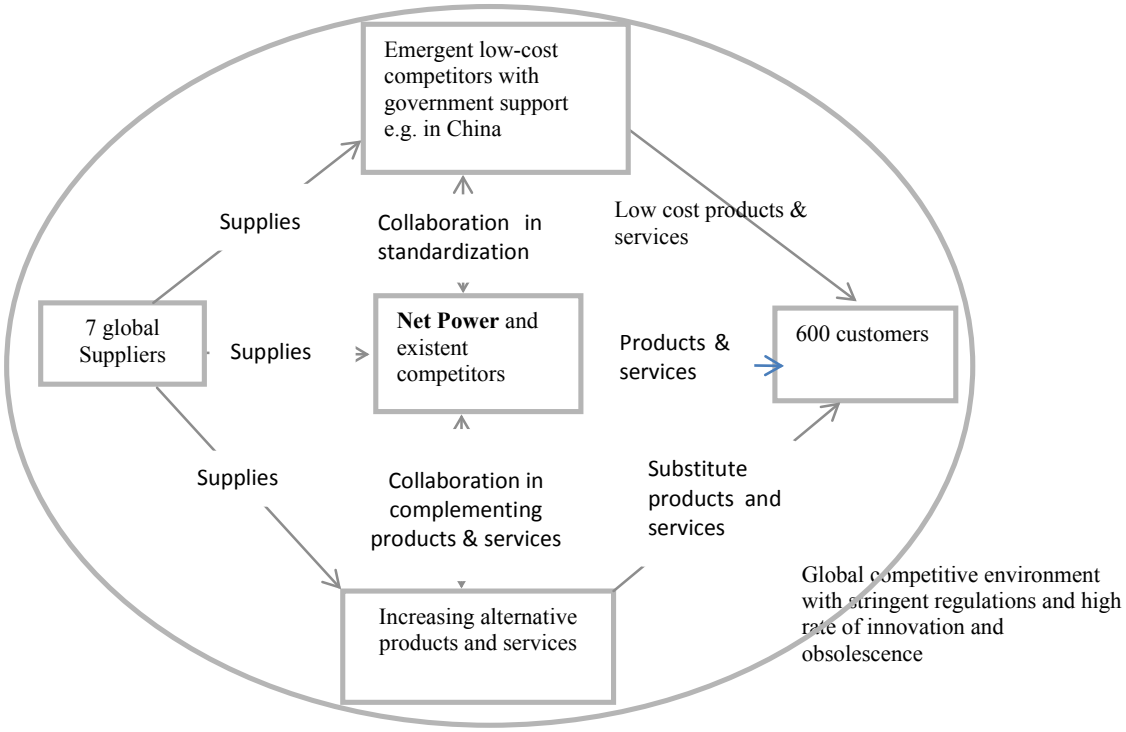

Figure 4: Net power supply chain and competitive environment (modified from Porter, 2008)

> *[Head of business enhancement] Interesting to see what will happen with the Chinese vendors. They have been very strongly supported with the Chinese government for instance during 1 year they got 30 billion euros of loan from Chinese government and that loan unbalanced the business environment. So now I suppose that kind of continues but that may change. Then the market leader, I am wondering whether they need to restructure within 2 to 3 years' time because they have same problems we do. Currently since there are number 1 their problems are not that severe because the profit margin is still high.*

4. Results

In this section the findings from Net Power study are elaborated. The results are explained within the strategic agility dimensions collective capabilities, strategic sensitivity and strategic response and the role of IS also highlighted. The SC and related strategic agility and IS issues are also elaborated.

4.1 Strategic sensitivity and role of IS

Most of the interviewees acknowledged the importance of understanding the environment as well as the business trends. The head of new corporate projects entitled with developing new businesses stressed that new businesses are mostly created because of some changes in the market and thus the importance of strategic sensitivity. Moreover, Net Power has well established policies on customer intelligence, requirements gathering and customer feedback collection, thus well established strategic sensitivity capabilities. Both strategic foresight and strategic insight were highlighted;

> *[Senior Architect:] Planning cycles are done for the short term (forecast) and long term (strategies). These are done continuously to be up to date.*

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> *[Head of research and development:] We discuss with customers very much both in standards organization and in private like discussing what they want and need in the future and tell them what we think they will need and its kind like iterative.*

There were contrasting views on the value of IS for strategic sensitivity by the interviewees as illustrated in Table 3. For instance the Senior Architect suggested that business intelligence systems for competitor analysis are key systems to keep up to date in the dynamic business environment. But the head of research and development urged that IS are not yet intelligent enough to produce knowledge; they are more for collecting data and disseminate it. Dynamic capabilities emphasize the need of distinctive processes that offer competitive advantage. And from strategic sensitivity point of view such firm has sensing skills made up of difficult-to-imitate combined technological, organizational and functional skills and management capabilities. Thus the effectiveness of technology for strategic sensitivity depends on how well is the fusion with other factors, such as, organizational competences.

Table 3: Strategic sensitivity and perceived IS role by business and IS Managers

	Business Managers	**IS Managers**	**Dynamic Capabilities View**
Strategic sensitivity	Sense all the important players in the environment	Smart and ubiquitous systems that notes the strategic changes in the environment.	Distinctive processes for gathering and analyzing competitive actors and factors.
Perceived role of IS for Strategic sensitivity	Of no strategic value, only operational	Unavoidable e.g. business intelligence systems for forecast and thus strategically important	Technological skills combined with other technical, organization and management capabilities to foster sensitivity.

4.2 Strategic response and role of IS

Most of the interviewees suggested that strategic response is the most difficult step in practice. After successful drawing data from the environment to respond to strategic events when they are realized is a key challenge. Nevertheless, Net Power Principle Engineer argued that firms that are able to react fast on changing condition on changing ecosystems are the ones who will be successful in the future. Software Platforms Architecture Manager suggested that the current execution state of Net Power is not optimal because of the state of the company (restructuring process). Moreover the response has to be related to actors and factors in the industry, such as, competitor's actions and regulations as elaborated below.

> *[Head of research and development:] There are couple of ways of how to compete, one is to be a fast follower, follow what the leaders are doing and develop same thing faster or listen to customers carefully and ask what they want and develop what they want and the other way is that you must be a leader and develop the new things yourself and then you know what is coming and we try to be leader and we lead in standards and markets and we control to some degree the markets. The problem is that we are not the biggest supplier and we do not have the control as we wish.*

Table 4 notes the different views from business and IS managers on strategic response. From an internal orientation response initiatives essential from the environment pressures include company rearranging and more focus on the customer. The restructuring effort which Net Power is engaging is an example of a response action. In addition ERP systems play a crucial role in enhancing strategic response from internal orientation. However, Software Platforms Architecture Manager noted that Net Power competitors invest more in research and development and can easily and quickly replicate concepts. External response orientation could be either an action to influence the environment or an action in reply to the environment pressures. Innovation efforts are an example of a pro-action to influence the business environment. All the interviewees acknowledged the value of innovation in the company as well as in the industry. Dynamic capabilities highlight the strategic value in "timely responsiveness and rapid and flexible product innovation, coupled with the management capability to effectively coordinate and redeploy internal and external competences." In addition, dynamic capabilities view calls for the renewal of competences in line with the dynamic environment which relates to strategic response. Technology is both a push and pull factor from a strategic response perspective in that technological innovations drives the environment, that is, environmental pressure and on the other hand firm can make use of technology as a response effort.

Table 4: Strategic response and perceived IS role by business and IS Managers

	Business Managers	IS Managers	Dynamic Capabilities View
Strategic response	Either fast follower or leader but leader strategically plausible.	IS based coordinated response efforts.	Efficiency based approach which includes evolution path adopted by firm based on its assets positions.
Role of IS for strategic response	Of no strategic value, only operational	Essential especially for internal integration of the response measures e.g. ERP	Push and pull technological factors in the business environment.

Net Power innovates both to influence the environment as well as to improve its internal processes, such as, lean/agile processes and six sigma techniques. IS, such as customer relationship management (CRM), are useful to segment customers and thus playing a role in efforts to better serve the customer. However, the telecommunication equipment and networking industry is such that open innovation is a tradition in the sense that the standards are developed at industry level in collaboration with customers. Net Power collaborates with competitors in standardization at industry level as well as in European Union funded projects (Interviewee 2).

> *[Head of research and development:] The innovation is extreme. This is an industry that have been developing very fast in the last 20yrs they have been multiple evolutions one was mobility with GSM and in many markets fix phones are disappearing the 2nd innovation was internet coming together with new generation of phones and other devices.*

4.3 Collective capabilities and role of IS

Collective capabilities, such as, human resources competences, information and knowledge management capabilities were noted as crucial as shown in Table 5. Moreover, Net Power is going through a restructuring exercise to cut costs as well as revamp its human resources and brings fresh ideas into the new company structures, as elaborated below.

> *[Senior Architect:] Leadership competence is the most essential capability in the competitive business environment. Employee competences are essential for innovation. The company rewards skillful employees who come up with patents. There is competition inside the company on who is performing well.*

> *[Head of business enhancement] Now we are reducing our order of more than 20000 people which is a must to be successful in this business. I think the only way is to focus and we decided to focus on the cellular mobile broadband wireless area and related services and software which are big enough area still. And also extend the cooperation with partners as well as we can. One of the challenges is that the parent companies have been successful for a long period and persons working for the company are becoming old. Several of those people do not have the enthusiastic approach anymore so it means that some of the persons have to go.*

Table 5: Collective capabilities and perceived IS role by business and IS managers

	Business Managers	IS Managers	Dynamic Capabilities View
Collective capabilities	Capabilities essential for coordinated and aligned sense and response efforts like human resources competences.	Information and knowledge management capabilities.	Integrates management of R&D, product and process development, technology transfer, intellectual property, manufacturing, human resources and organizational learning
Role of IS for collective capabilities	Of strategic and operational value	Of strategic and operational value	IS that enhance knowledge assets and complementary assets e.g. Knowledge management systems

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There is a challenge in the use of group collaboration technologies (collaboration systems use immature) in Net Power as noted by the interviewee 1, Senior Architect. But there are some collaboration tools (groupware) in the company, such as, discussion forums which are very important in research and development (R&D) as well as to support teams which work from different places. The purpose of the collaboration technologies is not clear but nevertheless social technologies are existent, for example, Net Power connect and Net Power Tube. But the social technologies are only used internally, that is, there is no use in relating to the external environment but there exists an extranet link with customers in which they use an identity and password to access vital information and downloads (Interviewee 2). The interviewees gave mixed views on the use and value of social technologies, such as, wikis, blogs, Net Power connect (internal social network system) on promoting collective capabilities, such as, information management (Bytheway, 2011) and organizational learning. The head of IT strategy and organization development acknowledged the initial steps the company is taking in trying to gain value from use of social technologies.

> *[Head of IT strategy and organization development] The main benefit from strategy point of view (of social technologies) is that it would enable people to share information easily, it is not hidden anyway it is more openly publicly published within the company its should help to find competences within the company instead of finding it in human resources tools we can find it in the social media type of tools within the company where people post their activities, knowledge etc. So in a nutshell I would say that from strategic point of view it should enable information sharing and help find better people for projects easier. But then it is a different question of is it actually happening or are we too early in a curve that if it happens it is realized.*

Dynamic capabilities view calls for inclusiveness in developing ways for attainment and sustainability of competitive advantage. That is, it draws upon areas, such as, "management of R&D, product and process development, technology transfer, intellectual property, manufacturing, human resources and organizational learning" (Teece et al., 1997). This inclines to collective capabilities essential for strategic agility.

4.4 Supply chain and related strategic agility and IS role

Table 6 relates the SC upstream and SC downstream to the strategic agility dimensions and the IS role. Strategic sensitivity is vital in both upstream and downstream as few suppliers in telecommunication industry mean it is best to understand and relate well with suppliers. The powerful customers have to be served best and strategic sensitivity is important in tracking customers. The 600 customers are fairly easy to track and Net Power is constantly tracking the customer loyalty index, done 4 times per year (interviewee 5).

The Telecommunication industry is one of the most dynamic and innovative industry. Products and services are continuously merging and the rate of obsolescence is high. Therefore strategic response is of immense value in the industry. The collective capabilities are also important in the whole SC. In the SC downstream, in relating with customers it is important to create personal relationships as interviewee described it as "knowing customer by name". In the SC downstream, organizational learning is very essential due to the high rate of change in the industry. The learning has to be together with the suppliers and any other players that could bring value in an open innovation paradigm. ISs, such as, ERP and business intelligence systems are crucial both in the SC upstream and downstream, for example, for smooth operations and better understanding of a global market.

> *[Head of research and development:] IS is very necessary to have SC integrated, we have one SAP system that controls everything globally and also end to end that you can always have exact view on what is happening in different parts of the company and different parts of the processes so it's very important otherwise the other way would have to have very local operations but then you lose the scale advantage.*

Table 6: Strategic agility dimensions and the role of IS in SC

	SC upstream	SC downstream
Strategic Sensitivity	understand and relate with the limited suppliers	better know and relate with the customers
Strategic Response	collaborate with suppliers in formulating products and reducing production costs	collaborate with the customers in serving them
Collective Capabilities	organizational learning	personal relationships – know the customer by name
IS	e-procurement systems, ERP systems	social networking technologies, Business Intelligence systems
IS role	gain better deals with suppliers	uncover potential customers, aids relating with the customers
Dynamic Capabilities View	Processes, positions and paths in fostering strategic response for the whole chain	Processes, positions and paths in fostering strategic sensitivity for the whole chain

Teece et al. (1997, 518) argued that dynamic capabilities are embedded in "managerial and organizational processes, shaped by its (specific) asset position, and the paths available for the firm". These bring competitive advantage and we argue that in a SC setting they should be tailored in line with the tasks of the SC members. For example, the members who are in contact interaction with the customers should develop organizational and managerial processes that foster strategic sensitivity. And the strategic posture of the firm which includes specific assets like specialized equipment and plant should be developed from the SC upstream in enahcing the strategic response of the chain.

5. Discussion

Figure 2 which illustrates Net Power SC and competitive environment is closely related to the five competitive forces that shape industry competition model proposed by Porter (2008). The five competitive forces that shape industry competition are rivalry among existing competitors, bargaining power of suppliers, bargaining power of buyers, threat of new entrants and threat of substitute products or services. Figure 2 also take into consideration additional constructs, such as, other business environment factors that shape the competitive environment, for example, uneven market place due to government backing, restrictive regulations, and high rate of innovation and obsolescence. The practical implication of this is that a firm has to consider all the actors and factors in analyzing the competition. And the influence or competitive value of the factors and actors varies in different industries. In telecommunication industry competition has mainly focused on the price which Porter (2008) argued that it is destructive to profitability as price competition transfers profits from industry to customers.

Dynamic capabilities views aim to draw measures that brings competitive advantage in dynamic marketplace. This is the same aim as this study thus specific dynamic capabilities input are utilized to categorically input into strategic agility dimensions strategic sensitivity, strategic response and collective capabilities as well as in SC settings. This is important in drawing a conclusive input to the different views of business and IT managers. Dynamic capabilities made up of a combination of resources that could be readjusted in line with the changing environment (Wang and Ahmed, 2007) addresses how processes generated could be utilized in enhancing strategic agility dimensions. For example, Eisenhardt & Martin (2000) argue that dynamic capabilities are identifiable processes which are visible, for example, product development, strategic decision making and alliances. Teece et al. (1997) suggested that processes, positions and paths available to an organization determine its competitive advantage. That is, paths available for an organization depending on the managerial and organizational process mapped by its assets position define the competitive basis of the firm. Organizational and managerial processes enable collaboration and learning is fostered in the experience. In addition, the processes should be reconfigurable due to the required transformational capabilities because of the changing nature of the environment. The implication of the dynamic capabilities to the strategic agility reasoning includes, for instance, strategic agility dimensions specific dynamic capabilities need to be developed inclusive of all important factors, such as, organizational, functional and technological to create unique processes that are difficult to imitate. In SC context dynamic capabilities should be tailored made in line with strategic agility settings of the chain.

Table 7 shows that collective capabilities are viewed as driving the strategic agility process. However, in Net Power collective capabilities were viewed as in development phase because of the restructuring exercise going

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on. Strategic sensitivity is a necessity and is well established in Net Power. On the contrary, strategic response was viewed as not optimal in Net Power and it was also viewed as the most difficult dimension of strategic agility. The role of IS for strategic agility is of diverse value as illustrated in Table 4. For instance, IS such as SAP enterprise resource planning is perceived to be very important for almost all processes in medium and large size companies, such as, human resources process and business processes, to the extent that processes malfunction without IS (Interviewee 5). Although business intelligence systems have been noted to be of value for strategic sensitivity and ERP valued for strategic sensitivity, these ISs need to be utilized collaboratively to aid business efforts to reduce impact of environment pressures. But then, IS are deemed to be of little value, for instance, in strategic sensitivity. This is explained by Net Power Software Platforms Architecture Manager who noted that you cannot replace mind and experience by decision making tools. But Papageorgiou and Bruyn (2010) noted that many companies have chosen executive IS to provide relevant and accurate information to management which is useful for collective capabilities.

Table 7: Summary of Net Power strategic agility and related IS perceptions

	Strategic Sensitivity	Strategic Response	Collective Capabilities
Viewed as	A necessity	Most difficult	Driving factor
Perceived Net Power position	Well established	Not Optimal	In development phase
Perceived Net Power IS support	Required minimally	Necessary but not determining factor	Very important
IS in use	Business intelligence systems	Enterprise resource planning system	Collaboration systems
IS role	Gather data and reporting	Support response initiative	Offer alternative means e.g. in communication and thus lowering costs
Potential and proposed future IS role	Analyzing real-time actions in the business environment	Real-time reactions to market changes	Real-time decision making support

This research addresses the challenges brought about by pressures from a competitive environment considering the telecommunications industry. However, the research limitations include that there are some significant differences between different competitive industries that were not captured in this research. Therefore, future research should include studies from other competitive industries, such as, airline industry. Moreover, another research limitation is that this research also took into consideration the SC dimension but analyzed from a single SC member perspective. Further research is encouraged to comprise other SC players in addressing the strategic agility concerns and role of IS.

6. Conclusion

In today's highly competitive business environment companies have to draw measures to gain competitive advantage and even to survive. This research proposed use of strategic agility to gain competitive advantage and this was reinforced by dynamic capabilities approach. Moreover, the agents and factors from which competition is drawn are also developed from Porter (2008)'s five competitive forces that shape industry competition. The role of IS in enhancing strategic agility in SC setting is highlighted in this research although different views are noted business and IT managers. IS makes a difference in a competitive environment especially in SC setting. For instance, IS which enables cost efficiency and allows you to be agile, to get information fast and supports you in making changes fast e.g. changes in R&D programs, changes in your business models e.g. changes in pricing models. Net Power has tools that support pricing, that is, how products are prized. Moreover, Net Power mostly make a deal with customers that have different kinds of products and needs tools that support this globally. It is very important that technology supports because in a global business with many complex products which are combined in different ways there is a need to have very good IS support to be able to be strategically agile.

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