



Turun yliopisto
University of Turku

**THE EMERGING ROLE OF KNOWLEDGE
IN SUPPLY NETWORKS:
THE IMPACT ON PURCHASING
AND SUPPLY MANAGEMENT**

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Originality of this thesis has been checked in accordance with the University of Turku quality assurance using the Turnit
OriginalityCheck service

ISBN 978-951-29-6902-9 (Print)

ISBN 978-951-29-6903-6 (Pdf)

ISSN 2343-3159 (Painettu/Print)

ISSN 2343-3167 (Verkköjulkaisu/Online)

Juvenes Print, Turku, Finland 2017

ABSTRACT

The emerging role of knowledge in supply networks: the impact on purchasing and supply management

There are major change factors affecting to operational environment of purchasing and supply management. Global supply market is opening up for all size of firms, servitization as product strategy is changing what is delivered and technological advancement enables digitalization changing the business processes. Volume of available information increases making external knowledge acquisition a core competence. Under this immense change, it is important for purchasing and supply management to understand, how can they efficiently connect requirements of own production to supplier capabilities and develop those together in order to match customer needs.

Knowledge acquisition constitutes a continuous learning process. During learning routines, actions and division of labour are reformulated, recombined and finally institutionalised to construct new operational environment – new social reality. Learned new skills and acquired new knowledge shape the environment requiring continuous learning. Given the expansive cycle nature of learning, knowledge is interesting resource – more it is used, more it increases.

In the thesis, qualitative and quantitative research methods are used to study the impact of the supply network change to purchasing and supply management. The phenomena is looked from small and medium sized enterprises point of view. Purchasing management in small and medium sized firms is in contradictory position in stringent competition, when innovation capability and time-to-market are gaining more and more importance. In spite of being more flexible than large, they are constrained by limited resources to implement new practices in to the use. As organization they have lower capacity to absorb external knowledge and maintain own learning capability at required volume. At the same time and for the same reasons their performance development depends increasingly on external knowledge.

The thesis attempts to answer two questions. First, what is the impact of described changes of supply network on purchasing in terms of information-processing requirements? Second, what impact do the changing supply network trends have on information-processing capabilities in purchasing?

The thesis contributes to discussion of purchasing and supply management. It builds on theories of resource-based view and knowledge-based view of a firm. Applying abductive research approach the thesis provides new understanding on role of purchasing and supply management in knowledge acquisition and use of organizational learning to develop buyer-supplier relationship.

First, the purchasing management has to manage contracts and coded knowledge in order to obtain reliability, quality and performance. However, purchasing must bring in new knowledge and skills to organization beyond what has been stipulated in contracts. For example in project deliveries, products are developed and defined during the delivery requiring flexibility in purchasing.

Second, in the thesis purchasing is observed from service logic point of view. Service logic has been instrumental in marketing emphasizing process how value is delivered instead of product itself. In purchasing, the service logic turns the focus from contact-controlled transactions towards continuous development of skills and knowledge with suppliers.

Third contribution of the thesis is in bringing the organizational learning to purchasing and supply management discussion. In the thesis, different learning orientations are matched against different operational strategies and compared with expectations on buyer-supplier relationships.

Fourth contribution is in building a path from knowledge acquisition through different organizational learning orientations to purchasing performance. It is demonstrated how purchasing uses different supplier development and knowledge acquisition methods and what is effect of those to purchasing performance.

As management implications, the thesis provides constructive methods to assess what new purchasing capabilities are needed and how they should be developed in accordance with overall strategy development. The thesis sheds light on changes on purchasing when firm expands to new supply markets and when market shifts towards service logic. The purchasing has to be able exploit current knowledge and explore new processes and practices with existing suppliers but also have capacity to explore new supply market more proactively.

Keywords:

Small and medium-sized enterprises, Purchasing and supply management, Supply Chain management, Organizational learning, Knowledge acquisition

TIIVISTELMÄ

Tiedon merkityksen korostuminen toimitusverkostossa: vaikutus hankinnan ja toimitusten johtamisessa

Toimitusketjuja muokkaavat laajenevat globaalit toimittajamarkkinat, palvelullistaminen tuotestrategiana sekä tietotekniikan kehittymisen mahdollistama digitalisaatio. Muutoksesta johtuen käytettävissä olevan tiedon määrä kasvaa ja tiedosta itsestään tulee keskeinen resurssi. Hankintatoimelle on tärkeää ymmärtää miten tietoa hankitaan ja hallitaan. Hankintatoimen on ratkaistava miten oman tuotannon ja toimittajan osaamiset saadaan kehittämään yhdessä ratkaisuja asiakkaiden tarpeisiin.

Tiedon hankinta on oppimisprosessi, jossa tiedon innovatiivisen uudelleen määrittelyn ja sen myötä kehittyvän työnjaon kautta rutiinit ja toiminta institutionalisoituvat ja rakentavat uutta toimintaympäristöä. Organisaation oppiessa se muuttaa toimintaansa ja samalla se myös muuttaa toimintaympäristöään luoden pohjaa uudelle tiedolle. Oppimisen jatkuvan kehän vaikutuksesta tieto on mielenkiintoinen resurssi, sillä tieto lisääntyy mitä enemmän sitä käytetään.

Tässä tutkimuksessa tarkastellaan kvalitatiivisin ja kvantitatiivisin menetelmin hankinnan muutosta ennen muuta pienten ja keskisuurten yritysten näkökulmasta. Kehittyneissä talouksissa näillä yrityksillä on merkittävä rooli tuottavuuden ja työllisyyden kehityksessä. Yrityksen hankintatoimella on laajenevilla uusilla globaaleilla markkinoilla tärkeä joskin ristiriitainen työmaa. Kiristyvässä kilpailussa innovaatiosta ja oikea-aikaisesta markkinoinnista on tullut entistä tärkeämpiä. Vaikka pienet ja keskisuuret yritykset ovat ketterämpiä uusien menetelmien käyttöönotossa kuin isojen yritysten vastaavat organisaatiot, niillä on vain rajalliset resurssit omaksua ulkoista tietoa ja ylläpitää jatkuvaa oppimista. Toisaalta juuri omien resurssien rajallisuus tekee ulkoisen tiedon hankinnasta merkittävää varsinkin pienten ja keskisuurten yritysten tehokkaalle toiminnalle.

Tutkimuksen avulla pyritään vastaamaan informaatioprosessin viitekehyksen puitteissa kahteen kysymykseen. Ensiksi; mikä on toimitusketjun muutosten vaikutus hankintatoimeen. Toiseksi; miten hankinnan kyvykkyyksiä tulisi kehittää vastaamaan näitä muuttuneita tarpeita.

Väitöskirjan neljä kontribuutiota liittyvät toimitusketjujen johtamisen ja hankinnan tutkimukseen pohjautuen resurssi- ja tietolähtöiseen teoriaan yrityksen toiminnasta. Abduktiivisen tutkimusotteen avulla tuodaan uutta ymmärrystä hankintatoimen merkityksestä tiedonhankinnassa ja organisaatio-oppimisen roolista hankinnan välineenä.

Ensiksi, koodatun tiedon ja sopimusten hallinta on hankinnan perustoiminto, jolla saadaan toimintaan luotettavuutta, tehokkuutta ja laatua. Hankinnan tulee

myös kyetä tuomaan organisaatioon uutta tietoa ja osaamista, joita ei ole vielä sopimuksissa. Esimerkiksi projektimaisessa toiminnassa tuotteet määritellään ja kehitetään osana toimitusta, jolloin hankintaa tehdään joustavasti.

Toiseksi, väitöskirjassa hankintaa tarkastellaan palvelulogiikan näkökulmasta. Palvelulogiikan arvontuotantomalli on ollut markkinoinnin ja myynnin välineenä jo kauan. Siinä korostetaan tuotteen tuottamaa palvelua ja toiminnan prosessia varsinaisen tuotteen sijaan. Hankinnassa palvelulogiikka siirtää toiminnan painopistettä sopimuksellista vaihdannasta jatkuvaan osaamisen kehittämisen prosessin hallintaan.

Kolmas kontribuutio liittyy organisaatio-oppimisen tuomiseen hankinnan välineeksi. Väitöskirjassa kartoitetaan erilaisten oppimisstrategioiden valintaa sen mukaan, mitä toimittajasuhteilta odotetaan. Toimitaanko reaktiivisesti virheitä korjata vai haetaanko uusia toimintatapoja ennakolta ja nykyisiä menetelmiä haastaen.

Neljänneksi väitöskirja liittyy erilaiset tiedonhankinnan suuntautumiset ja hankinnan suorituskykyyn. Erilaiset tiedon hankinnan mallit toimivat eri tavoin. Nykyistä tietoa hyväksikäyttävä ”eksploitatiivinen” hankinta toimii varsin itsenäisesti. Kun taas uutta tietoa etsivä ”eksploratiivinen” malli edellyttää selkeää organisaation asemaa.

Käytännön toimitusketjun johtamistyöhön väitöskirja tarjoaa konstruktiivisen menetelmän arvioida miten ja millaisia hankinnan kyvykkyksiä tulisi kehittää yhdessä muun strategiatyön kanssa. Tutkimus tuo esille miten hankinnan tehtävät muuttuvat, kun yrityksen toimintakenttä laajenee tai kun yritys siirtyy kohden palvelulogiikan mukaista liiketoimintamallia. Hankinnan pitää osata paitsi hyödyntää tunnettua toimittajaosaamista, myös etsiä uusia toimintatapoja uusien ja vanhojen toimittajien kanssa.

Avainsanat:

Keskisuuret yritykset, Hankintatoimi, toimitusketjujen johtaminen, organisaatio-oppiminen, Tiedon hankinta

ACKNOWLEDGEMENTS

This has been a long interesting journey to reach this point of studies. Even though reaching the goal is kind of an achievement, the journey makes it worthy of pursuit. Several interesting works in Nokia offered an extended practice period that lasted almost quarter of a century. Nokia offered a place to work in truly global enterprise and unique opportunity to learn to know many great people. Nokia time gave me good reference point to reflect the studies first in Lappeenranta University of Technology and later in Turku School of Economics. Study and research are both hard work hampered by uncertainty and lost directions. Luckily every now and then, there has been some rewarding moments of realization about how some parts of the world around us may work. This opportunity to learn and discover is good motivator.

Work with the doctoral thesis begun in November 2012 when Professor Lauri Ojala and Professor Harri Lorentz suggested in job interview that it could be possible to do the doctoral studies while working in their EAKR project. They did not mention the amount of work it will require. Thanks for that. I made a fast decision and accepted the offer. What followed was almost five years of work. I am grateful that Harri assumed the responsibility of supervising the work. From the beginning, he has guided the work relentlessly towards the goal. Later Dr Tomi Solakivi joined the team as second supervisor. His help in work with statistical methods has been indispensable. Harri and Tomi have coached me to conduct rigour and relevance in research and constantly reminded me on importance of meticulous scientific writing. Without encouraging support of Lauri, Harri and Tomi this work would have been much harder.

I would like to express my gratitude to pre-examiners, Professor Josu Takala from University of Vaasa and Professor Jukka Hallikas from Lappeenranta University of Technology. Their professional pre-examination comments and feedback helped me in improving the thesis. I would also like to express my gratitude to professor Hallikas, who also agreed to act as opponent in my thesis defence.

No matter how interesting the work is, it would have been impossible to accomplish anything without inspiring colleagues and supporting peers: Dr. Jarmo Malmsten, Dr Sini Laari, Dr Tuomas Kiiski and Admiral Bo Österlund. Jarmo has shown good coaching attitude in our discussions about organizational learning, philosophy of science and status of Finnish football. Sini helped me to set the schedule by promising to finalize her theses one day before mine. In the end, she managed to finalize her thesis one year earlier. Tuomas, who is otherwise so inclined towards pragmatism, helped me to find philosophy of science. Surprisingly he persuaded me to register to lecture series on philosophy of science – fundamental in any research. Thank you Bo, you have showed what means dedication and enthusiasm in the research work.

I have been fortunate to get fulltime funding for the thesis work. I wish to thank University of Turku, Turku School of Economics Association and Foundation for Economic Education's for financial support they provided supporting the research process through the years.

Last but not least. The most important help in many turns of the project and life in general I have get from my wonderful family. Thank you Katariina, Hanna and Liisa, I owe my love and gratitude to you for everything.

Ullanniemi, 27.7.2017

Vesa Kilpi

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Article 3: V. Kilpi, H. Lorentz, T. Solakivi & J. Malmsten (2017) The effect of external supply knowledge acquisition, development activities and organizational status on supply performance in SMEs, Forthcoming in the *Journal of Purchasing and Supply Management*

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1 INTRODUCTION

1.1 Background and research motivation

Technological advancement in areas such as the Internet and mobility in Information and Communication Technology (ICT) and digitalization in general has made the global supply market available to all sizes of business. The development has increased the breadth and depth of supply networks, and is undoubtedly transforming contract-controlled supply chain management (SCM) into more collaborative networks all the way from the customer to the supplier and beyond (Handfield et al. 2015; Vargo et al. 2015). Suppliers operating in business-to-business supply networks must have some knowledge of their customers' business processes, and buyers have to have some knowledge of the supplier's business logic (Grönroos & Helle 2010). In this change of operating environment, management of purchasing and supply is a focal actor being in charge and information flow from customers to supply network and back. A broad supply network requires active knowledge management in PSM, in addition to the control of delivery at the agreed time and at the right cost.

In the thesis, the change in supply network is observed from Purchasing and Supply Management (PSM) point of view. According to Carr and Smeltzer (1997) strategic purchasing consists of supplier communication, supplier responses and managing changes in supply market by planning, adjusting and reviewing. Guinipero et al. (2005) highlight the change in environment. They argue that whereas in traditional PSM is rather passive and pursue low risk, in more integrated supply chain PSM needs to adopt proactive mode promoting information sharing and relationship management.

Another major change in supply chains is the increasing role of servitization and services in the offerings. The concept of servitization in manufacturing concerns the process of adding services to products that, taken together, add more value for the user (Baines et al. 2009). On a slightly different level, service logic reflects the fact that service is not an add-on but an elementary part of the delivery. Marketing-oriented service logic is a concept that builds on the idea that products and systems provide the user with a service when they are used (Grönroos & Ravald 2011). It is basically if not exclusively the service that the customer needs, and the tangible product is the delivery platform. The increasing proportion of services in supply chains also modifies the capability requirements of purchasing (Ellram & Tate 2015).

There is a logical connection between knowledge and service logic. According to service logic, awareness of how users create and appropriate value by using the system is essential knowledge (Grönroos & Ravald 2011). Accordingly with regard to service-dominant logic, Vargo (2009) defines service as the fundamental basis of exchange when the application of knowledge and skills is the operant resource being exchanged.

Service logic is closely connected with the advancement of information technology (Grönroos 2007). The industrial internet and the internet of things are practical examples of new technologies that are changing the operating standards of outbound delivery and making service logic and increased knowledge intensity real for purchasing, too. Suppliers can develop and provide new services for the customer-use phase when real-time data can be submitted upstream in a supply network. More tailored products and services are being purchased to better match customer needs.

Technology is not an external organizational entity, but its use is structured via rules and resources in every-day actions. People interacting with technology in an emergent and situational way shape and form technology structures. Orlikowski (2000) describes this learning circle such that the use of technology begins to define the technology that is enacted to constitute structures between people, technology and social action.

In line with Orlikowski's (2000) learning process, service logic and servitization re-shape the entire supply chain, and at the same time supply-chain actors re-shape and develop the services and value they procure and provide. Marketing-oriented service logic takes the downstream perspective on value creation and the customer process. The view adopted in this thesis turns upstream in the supply chain, given the aim to seek explanation of changes in purchasing capabilities related to new information-processing requirements. The PSM strategies are also reflected in strategy axis from prospector to defender in dynamic networks (Miles & Snow 2007).

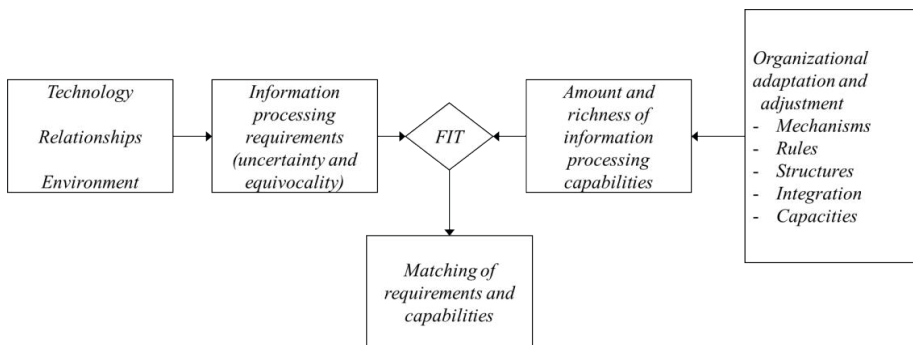
PSM interacts with the supply market in different ways. There is a constant need to interact with current suppliers in addition to conducting exchange-type transactions. Technological advancement and global supply market are enablers facilitating access to new knowledge, but the active involvement of PSM is of the essence. Strategic PSM has an important role in conveying information on the supply market down to the organization, and customer needs up to the supply network.

Gaining rents from external information and turning it into useable knowledge requires a fit between the organization's capabilities and its operating environment (technological, for example). Daft and Lengel (1986) explain in their seminal article how information-processing requirements and processing capabilities in the organization need to match. In the information-processing model (Figure 1), for example, communications technology, rules and regulations determine the firm's

operating environment, in which business relationships provide necessary capabilities and technology platforms are used to transfer and communicate information.

Organizations have their own established processes and mechanisms. Daft and Lengel's (1986) information-processing model emphasizes the need to find a match between external requirements and internal information-processing capabilities. Firms in general, and Small and Medium Sized Enterprises (SME) more specifically, do not have the power to influence changes on the left-hand side of the model, but they can develop the necessary capabilities and decide what they need from the market.

Information-processing (IP) framework (Figure 1) constitutes the framework for this thesis. The premise is that there are change factors in supply chains that increase uncertainty, which in the PSM context include the number of suppliers in global supply networks, the volume of available data through digitalization, and the move in marketing strategy towards servitization. The increased level of uncertainty increases the level of information-processing needs in PSM, which is at the interface of the supply market. The higher levels of information enhance the role of knowledge management and require new kinds of capabilities to succeed. The uncertainty caused by the above-mentioned change factors poses a risk, but also provides access to new resources, especially among SMEs that used to lack a global reach. (Daft & Lengel 1986; Galbraith 1974; Trautmann et al. 2009; Tushman & Nadler 1978)



Galbraith 1974, Tushman & Nadler 1978, Daft & Lengel 1986, Trautman et al 2009

Figure 1 An information-processing framework

This thesis examines the changed world of PSM in developed economies in general, and more specifically from the perspective of SME. PSM operates in an increasingly global supply market that provides raw materials and low-cost assembly work, and also critical resources and access to new knowledge. Large-sized multinational organizations have adopted global strategies in the search for new

supply bases, but SMEs cannot afford to do the same in their search for and acquisition of external resources.

The dynamic network offers synergies but also forces firms continuously evolve their strategic position between prospector, developer and analyser (Miles & Snow 1986). SMEs have fewer resources and weaker negotiating power, although the need for complementary capabilities is by no means less relevant (Bierly & Daly 2007). On the other hand, as Neely (2009) demonstrates, SMEs are more successful in servitization than large enterprises in that they are more flexible.

1.2 Research questions

Purchasing management works with current suppliers and often looks for alternative sources of supply in broader markets. PSM continuously acquires knowledge from and about the supply market to be used by the whole firm. According to Van Weele and van Raaij (2014), a superior PSM capability in the future will concern the managing of codified knowledge in supply chains, and thereby gaining superiority over suppliers in terms of resources. According to the resource-based view, external resource management will adapt its competence-development concepts as more critical resources are acquired from the market.

Global supply and digitalization are the current major trends of change in supply market and supply network not leaving PSM intact. These changes are manifested by increased importance of information and communication systems, servitization of offering and networked modes of operation. Strategic alignment between different functions within the firm is essential to enhance its overall performance (Baier et al. 2008). As PSM takes a more active role in knowledge acquisition, aspects such as cross-functional integration, functional coordination, the management of team competences and the implementation of purchasing-performance measures assume importance in terms of performance improvement (Foerstl et al. 2013; Pohl & Förstl 2011).

Two research questions are addressed in this thesis with a view to shedding light on the phenomenon of knowledge acquisition, and assessing in more detail the impact of changed information-processing requirements on purchasing. The development of networked and servitized supply chains implies changed information-processing requirements, hence the first research question concerns the impact of the above-mentioned changes in the supply chain. The second question is asking for required capabilities of PSM relevant to the change.

RQ 1: What is the impact of changes in supply network trends on PSM in terms of information-processing requirements?

RQ2: What impact do the changing supply network trends have on information-processing capabilities in PSM?

The first question is motivated by service logic of marketing. Firms are focusing on delivering customer solutions, and competitive advantage is shifting from ‘how to do’ goods to ‘how to put together’ capability in systems delivery. When firms transform their offering from goods to servitized systems they also have to adjust what they do in their purchasing operations, and how they do it (Sheth 2009). Value appropriation happens in the network and is not limited to dyadic relationships. As Gummesson (2007) notes, service is synonymous with value creation, which involves multiple stakeholders. The unstructured business environment challenges hierarchical decision-making. It is argued that the networked environment emphasizes the entrepreneurial way of working throughout the organization (Handfield et al. 2009).

The firm’s borderlines are also blurred, as various teams interact with different external parties in relationships that vary in depth (Clegg et al. 2013). The purchasing function has a pivotal role in this complex network in terms of translating market needs from the customer to the supplier and beyond (Ellram et al. 2013). The required perception in PSM is of goods and services as standalone products, but there is also a need for solid knowledge about the customer’s business processes, and of the supplier’s business logic and capabilities (Grönroos & Helle 2010).

The second question concerns the need for new PSM capabilities to match information-processing requirements that reflect the fast pace of interaction within supply networks and the increasingly intangible content of servitized supply. PSM relies on coded knowledge components such as contracts and product specifications, and also on operational practices and implicit inter-organizational knowledge (Díaz-Díaz & de Saá Pérez 2014).

The management and development of knowledge are among the core capabilities of a firm (Kogut & Zander 1992). These authors describe firms as organizations that acquire and learn new skills by reconfiguring their current capabilities, and consider make-or-buy decisions accordingly. In this PSM usually needs to address the following three questions. What is its capability level? How effective is it in learning and acquiring the capability? What is the value of the capability as a platform?

Augier’s (2009) dynamic-capability paradigm stresses the importance of organizational learning as a framework within which to coordinate networked externalities and asset specifics in make-or-buy decisions. During the learning process organizations build on their existing knowledge base, reconfiguring it and bringing in new knowledge. Intendedly rational managers in enterprises must combine contradictory activities: they need to explore new opportunities and at the same time to exploit and renew current knowledge.

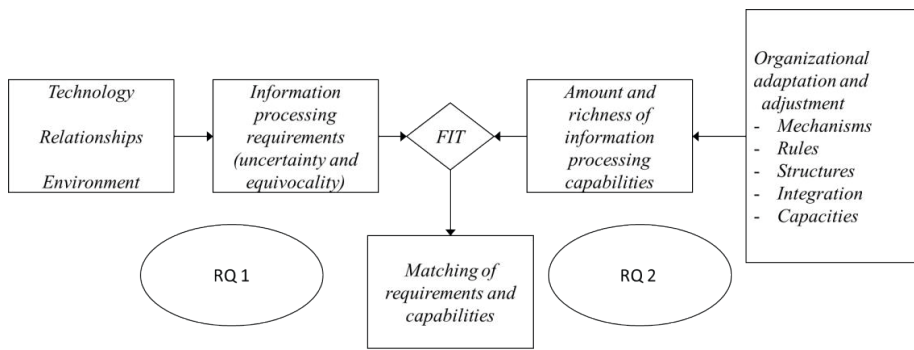
March (1991) defines these two distinct organizational learning styles in terms of where the new knowledge comes from and how it is used. Organizations may learn predominantly by exploiting current practices and certainties, or by exploring potential new alternatives.

Nonaka (1994), in his SECI model (Figure 6), describes the organizational-learning process as a continuous cycle. The tacit knowledge of individuals is made explicit by means of coding. The coded knowledge is shared with the organization, which builds up a common knowledge base in socialization interactions. Different pieces of knowledge are combined to create new knowledge that will be internalized to become tacit knowledge. The common tacit knowledge is then coded and externalized. In other words, organizations learn from their established (institutionalized) practices and past behaviour (Azadegan & Dooley 2010).

PSM may need to exploit current supplier capabilities and at the same time search the market for new skills (Voss & Voss 2013). Acquiring new knowledge within the existing supply base and from a broader supply market needs simultaneous adaptation to market changes and alignment of the process with current needs (Gibson & Birkinshaw 2004). It would be beneficial to implement both exploitation and exploration activities at same time, although the capacity and capability of teams and individuals may be limited and a choice has to be made. In practice, PSM needs to balance resources between exploiting current supplier-base capabilities and acquiring new capabilities from the market (Lubatkin et al. 2006 Voss & Voss 2013).

Knowledge acquisition is not merely an add-on feature in the PSM category. According to service logic, the value function of a firm is not limited to one-off transactional exchanges but is integrated into value appropriation in the use phase of the system (Grönroos 2008). The acquisition of knowledge in the PSM context requires a holistic understanding of how purchased goods and services are used and valued at different stages in the supply chain. It is an integral part of dynamic service delivery, and the actions taken are related to the operational context. This thesis explores the new PSM capabilities that are required in the changing information-processing landscape.

Networking, servitization and technological advancement are strongly connected. The automation of business processes facilitates the first two phenomena, but it must be remembered that it is not the tool that initiates the change, but how it is used (Orlikowski 2000). All three aspects are intertwined and emphasize the increasing role of PSM in the management, acquisition and development of external knowledge in the supply chain. Figure 2 positions the two research questions in an information-processing theory (IPT) that has been described earlier in chapter 1.1.



Galbraith 1974, Tushman & Nadler 1978, Daft & Lengel 1986, Trautman et al 2009

Figure 2 The research questions and the information-processing framework

PSM is not only concerned with suppliers but also has pivotal role in translating knowledge about the customer's value-in-use so as to develop suppliers' potential capabilities as value providers (Grönroos & Voima 2013). The role of purchasing is becoming increasingly strategic, and the function has to acquire new capabilities related to supplier relationships and both internal and external integration into the supply chain (Zsidisin et al. 2015). PSM's performance output depends on the kind of measures that are necessary to comply with external environmental requirements and internal capabilities (Pohl & Förstl 2011).

It would be useful to examine the mechanism through which PSM capabilities converge to improve performance. The aim in this thesis is to explain and enhance understanding of the new purchasing capabilities required in a supply network that will enable firms to access, accumulate and utilize external knowledge and thereby to succeed. PSM needs to assume a new and more strategic role in the networked and knowledge-intensive supply chain, and should bring in new measures to ensure that external capabilities and capacities are aligned and coherent throughout the organization (Kerkfeld & Hartmann 2012).

1.3 The contribution of the thesis

The aim in this thesis is to contribute to PSM on the practical level as well as to the theory development. As a practical management implication, the research draws a framework for external resource management to expand the firm's own knowledge base. Innovation and time to market have become key issues in strategic management, and PSM has a role to play in developing these capabilities. Attention is given in the thesis to how purchasing adds value in supply terms, not only by lowering costs but also by integrating new knowledge into the chain. The

thesis shows how PSM should acquire a new set of capabilities related to the utilization of external knowledge.

According to Van Weele and van Raaij (2014), research on supply chains should be more clearly grounded on established economic and social theories such as Dynamic Capabilities, the Resource Based View and Network Theory. To gain strategic value PSM should develop and sustain codified knowledge of supply markets and the supply chain, and should use it to exercise management power over external resources and thereby enhance procurement competence. The authors conclude that there is still limited research on how to leverage purchasing and supply knowledge and expertise within an organization.

This thesis contributes to the discussion on and the development of PSM theory. For example it gives a concise explanation of the role of knowledge in purchasing and supply management in networked and servitized business environments. It also furthers the discussion on knowledge-based PSM, describing purchasing as an organizational-learning and knowledge-management function.

In the contexts of supply-chain management and theory development, it is necessary to bring in complementary theories from other disciplines so as to expand the knowledge base (Halldorsson et al. 2007). PSM is discussed in this thesis in line with the knowledge-based view of a firm (Grant 1996) and the resource-based view (Penrose 1995 Wernerfelt 1984) of the firm, which together explain its operating environment.

The development of knowledge is viewed through a socio-constructivist lens (Berger & Luckmann 1966; Searle 1995); interaction in buyer-supplier relationship is aligned with theories of organizational learning theories (Engeström 2008; March 1991; Nonaka 1994); and the business model in the supply chain is derived from service logic (Grönroos & Helle 2010).

The practical constructivism argues that reality is not just brute facts and their causal correlations (Mitchell et al. 2012). They do not mean that reality is fiction or mere imagination. Reality means that the actor – world relation is reliable and trustworthy for the actor. This relation is based on facts (opposite to fiction), which are possible, have some value for the actor and are communicable. Constructive approach is based on relevance of practical problem and aims to produce solutions to explicit problems (Kasanen et al. 1993). The problem is understood by connecting it to the theories, through which the solution is being constructed.

The research process of the thesis follows the abductive reasoning. In the process the real life observations and previous theoretical knowledge is in dialog to obtain match and finally for suggestion for theory and its application (Dubois & Gadde 2002; Kovács & Spens 2005).

In combination, grand theories from other disciplines offer an interesting perspective on purchase and supply management. Learning is a temporal process, changing the status of the learner as a subject and changing the outcome as an

object. In other words, learning is not just a matter of copying what has been done and is known, it also fosters the creation of new skills, products and knowledge.

1.4 The structure of the thesis

Terms — supply chain, supply network supply market and supply base — are used through the thesis. In every day management as well as in research literature they do not have fixed definition. In this thesis, the terms are used in following fashion.

The term supply chain describes rather structured system of activities in delivery process, which is transferring materials and services from source to end customer. Definition of supply chain states that it involves three or more organizations in flow of goods and services from source to customer (Ellram & Cooper 2014; van Weele & van Raaij 2014). Business networks consist multiple actors who interact and integrate resources (Lusch et al. 2010). Compared to definition of supply chain a supply network is broader and less controlled environment, where multiple parties operate in parallel or sequentially (Halinen et al. 2012).

In this network firms compete for a better position in and seek to work with supply-chain partners that show the best performance. Firms acquire knowledge within the existing suppliers forming the supply base but they have to scan also broader supply market to comply customer needs. Supply market is overall market place accessible to PSM. PSM is scanning it for new sources of raw materials and services in general but also critical resources and new knowledge (Handfield et al. 2009).

The theoretical framework, methods, research process and contributions are discussed in the corresponding chapters of this document. This first chapter introduces the research questions and information-processing theory. The focus in the empirical part is on small and medium-sized enterprises, the importance of which is also discussed in this introduction.

Chapter two describes the theoretical framework and the key constructs of the thesis. First, PSM is positioned in the research discipline of supply-chain management. Information-processing theory provides the framework for the rest of the thesis and is explained in more detail. Key concepts used in the thesis, such as theories of the firm and of knowledge, service logic and organizational learning, are defined.

The changed information-processing requirements are explained in Chapter 2.4. Chapter 2.5 defines the new purchasing and supply capabilities related to organizational status and integration, and discusses the performance of the PSM function given that the suggested changes in capabilities may reflect performance measures.

Chapter three concentrates on the methodological choices and concept-building process. Given the use of mixed methods, cross-case, structural modelling and the

systematic literature review are discussed in detail to assess validity and reliability issues. The theory development is based on Christensen's (2006) dual model depicting descriptive and normative theories. The theory evolves, gradually, adding knowledge by describing phenomena, indicating correlations and detecting possible causal relations of phenomenological entities.

The three research articles that constitute the core of this thesis are introduced in Chapter 4, and linked to the theory development. Each of them explores the phenomenon of knowledge and information processing in PSM from a different perspective, applying different methodology. Article 1 is a conceptual literature review of changes in the PSM operating environment attributable to servitization and networking. Article 2 reports on a qualitative cross-case analysis focusing on the organizational-learning choices made in a buyer-supplier relationship. Finally, Article 3 applies survey-based quantitative methodology and structural equation modelling in analysing the role of PSM in knowledge acquisition, and the impact of internal processes on purchasing performance.

The results of the thesis are summarized in the concluding Chapter five. The answers to the research questions are discussed, and the contribution of the thesis to the development of PSM theory is assessed. Finally, limitations are considered, and some suggestions for further research are offered.

1.5 Small and medium-sized enterprises as the research context

The empirical part of the thesis explores information-processing capabilities in the purchasing and supply-management function specifically in the context of small and medium-sized enterprises (SMEs). By definition small and medium-sized firms have an annual turnover ranging from 10M€ to 50M€ and employ, on average, between 50 and 250 people (EU Commission 2003). SMEs continue to grow in importance in developed economies as both employers and innovators. For example, they accounted for 71 per cent of the employment increase in the non-financial sector in 2014 (European Commission 2015). In Europe, these firms provide 37.7 per cent of all employment in non-finance business and contribute 36.8 per cent to the total value added. By way of comparison, large enterprises account for 33.3 per cent of work places and contribute 41.4 per cent to the total value added (Eurostat 2011).

There is need to harness the growth potential of SMEs in the economy. They are more flexible and innovative than larger firms, which are slowed down by built-in organizational inertia. On the other hand, they have fewer available resources to explore their supply networks and to develop and realize innovations. SMEs may also find it harder to protect their intellectual property, which limits their ability to utilize external knowledge (Bierly & Daly 2007).

Those responsible for SME purchasing in particular are inclined to avoid dependency on one supplier, more so than suppliers would like and even though it is known that long-term commitment in buyer-supplier relationships improves the organization's performance (Adams et al. 2012). As Gebauer et al. (2012) propose, SME-type organizations need to take a leap to avoid the traps of familiarity, proximity and maturity, which may inhibit innovativeness. PSM plays an important role in balancing actions between the efficiency of long-term relationships and the risk of limiting dependency.

Many new SMEs are born-global by being firms that engage in international business from the outset via the application of their knowledge-based resources to realize sales in foreign countries (Knight & Cavusgil 2004). However, they do not always have sufficient development resources. Those who are limited in this regard rely on networking and gaining access to a new, broader knowledge base. When a firm, be it old or new, is going global its PSM needs to have a thorough understanding of the global demand for and use of purchased goods and services in broader context. In factor markets, for example, firms are competing not only with firms in the same industry but also with a diverse set of industries (Ellram et al. 2013). In PSM the need for knowledge of the supply base extends beyond the product specification of purchased goods.

Notwithstanding the fact that reaction speed to change is faster in SMEs (Arend 2014), their capacity to turn innovations into products is limited due to the liability of smallness and related resource constraints (Penrose 1995). However they are more entrepreneurial in their decision-making, and show dynamic capabilities in their actions differently than larger and older firms. Hence, they can act in shorter time frames and accept smaller expected gains (Arend 2014). In a dynamic global market the purchasing function, especially in SMEs, can adopt new skills in addition to cost bargaining and on-time-delivery control. PSM has to interpret customer needs to match with supplier capabilities, and integrate supplier knowledge into the firm's own operations to ensure supply among diversified rivalry (Ellram et al. 2013).

Proponents of the knowledge-based view define the firm as a knowledge integrator rather than a mere production facility of goods (Grant 1996). From the SME's perspective this means not only purchasing raw material at the right price, but also gaining a better understanding of goods and services – how they are accessed, used and developed. The changing role of knowledge in the supply chain could be beneficial to SMEs. The supply network is a versatile source of critical resources they cannot afford to develop in-house. Moreover, digitalization and ICT development in general facilitate access to supply markets without investing in establishing a local presence, and SMEs have the flexibility needed for process matching in servitization.

2 THEORETICAL FRAMEWORK

The changing role of PSM in supply networks is studied within an information-processing framework. Purchasing gains more strategic role and assumes broader responsibility for external resource management (ERM) (van Weele & van Raaij 2014). There is a need to enhance understanding of how PSM acquire and further develop new knowledge from the supply market and how firm matches requirements and capabilities.

This chapter discusses in some detail how firms acquire and construct knowledge. Also the changes in requirement side of information processing are elaborated. Digitalization, servitization and networking are drivers of change that increase the importance the knowledge acquisition as they increase uncertainty by impacting depth, breadth and speed in information processing.

To match to the new requirements PSM needs to develop new information-processing capabilities based on knowledge-acquisition practices on the individual and the organizational level. Through the practical application of organizational-learning theories it can convey customer needs to suppliers and connect the supplier knowledge base to the supply chain.

The role of PSM thus becomes more strategic, and internal alignment is essential (Knoppen & Sáenz 2015). The changing information-processing requirements also highlight the need for structural alignment and measurement mechanisms. The chapter ends with a discussion about purchasing performance and the status of PSM.

2.1 From purchasing towards external resource management

PSM, Supply Chain Management and logistics are closely connected concepts that sometimes overlap. Logistics, as a supporting function of manufacturing, has evolved into SCM, which Fawcett and Waller (2013, p. 183) describe as a “*value-creation engine of the modern organization*”. SCM extends the concept of logistics beyond the transportation of goods to include human actors in its otherwise rather mechanistic world.

Supply Chain Management has its roots in logistics, the focus of which has been on the distribution of tangible goods. The key elements of logistics include processes of transportation, warehousing and materials management. Engineering and materials management functionality approach which is typical for logistics relates

to military history - the movement of troops and supplies has to be planned to fit to needs and capabilities (Cousins et al. 2008).

Despite the fact that Supply Chain Management and Logistics are sometimes used as synonyms in the research literature, there are differences between them. According to the systemic view, Supply Chain Management is more than a new name for logistics (Cooper et al. 1997; Lambert & Cooper 2000). Fawcett et al. (2011) define SCM as a combination of supply management, manufacturing and customer relationships.

The multi-layer structure of the supply chain is continuously changing in line with technological advances and the opening of the global economy. Some years ago Bowersox and Daugherty (1995) noted an information-technology-driven paradigm shift in logistics, with more emphasis being placed on its management role in connecting suppliers and customers more transparently and forming strategic alliances.

Purchasing and supply management is a core component of SCM, which encompasses value streams from supply networks to customers and back. The role of PSM in that chain is to manage external resources – both tangible goods and intangible services. According to Van Weele and Van Raaij (2014), it is responsible for all kinds of external resources “necessary for running, maintaining and managing the primary and support processes of the firm at most favourable conditions”.

PSM is increasingly taking a strategic rather than a transactional role, and the internal support and integration enables utilization and development of skills from past technical and administrative support to be more targeting to strategic business management (Knoppen & Sáenz 2015). Its task in buyer-supplier relationships is by no means simple, including economic, behavioural, resource-related and bridging-based perceptions (Tanskanen & Aminoff 2015). Tassabehji and Moorhouse (2008) present a taxonomy of five core purchasing skills that enhance performance: 1) Technical skills, 2) Interpersonal (team-building) skills 3), Internal Enterprise skills, 4) External Enterprise skills and 5) Strategic Business skills.

In general, supply chain management is not only a necessity in terms of managing materials and service delivery, it could also be considered a source of long-term competitive advantage, which PSM strives to sustain (Barney 2012). PSM is in a central position within the supply-chain framework, which in itself is a complex, multilevel phenomenon. The actors and operators at multiple levels of the chain are organized by function, and further as organizations in interaction such as virtual enterprises that cross company boundaries (Clegg et al. 2013). Those working in PSM need to recognize their operational environment and level to avoid unnecessary complexity (Carter et al. 2015).

The increasing focus in PSM on the strategic management of external resources reflects to purchasing and supply management levers which currently emphasises

cost reduction, value improvement and risk management (Weele 2010). As the role of purchasing becomes increasingly strategic, there is a need to adopt new capabilities related to supplier relationships and internal integration (Eltantawy & Giunipero 2013).

2.2 The information-processing framework

The basic premise of information-processing theory is that organizations have different requirements for information processing and implement different connection and integration tools (Trautmann et al. 2009). Information processing is at the core of organizational decision-making, mitigating the uncertainty (Daft & Lengel 1986). The process comprises the gathering, interpreting and synthesizing of information that is relevant to the context. According to Tushman and Nadler (1978), information should have the potential to change the knowledge base: data becomes information by being relevant, timely and accurate.

Four theoretical approaches to information processing are summarized in Table 1. They all share three main building blocks: at first there is operating environment as source of uncertainty. In the second block there are organizational capabilities to adapt and adjust. Third bloc in the middle is describing the matching of requirements and capabilities.

Uncertainty, according to Daft and Lengel (1986), arises from the environment, changes in technology and relationships in the business network. Tushman and Nadler (1978) point out the complexity and interdependence that characterize inter-unit relationships. Not all uncertainties are external, as Galbraith (1974) and Trautman et al. (2009) note, and task execution is one source of uncertainty.

Capabilities that affect requirement-matching include organizational rules and mechanisms (Daft & Lengel 1986), structures and control (Tushman & Nadler 1978), operating rules and integration (Trautmann et al. 2009) and adjustments for planning and performance (Galbraith 1974).

As an example of matching needs in the multinational corporations, Trautman et al. (2009) refer to the building of a global sourcing structure through the matching of global capabilities with local needs to achieve sourcing efficiency.

Table 1 Information-processing theories

	Driver/ source of uncertainty	Effectiveness matching	Capability
Daft & Lengel 1986	Technology Relationship Environment	Processing capabilities and requirements Reducing uncertainty and resolving equivocality	Organizational mechanisms and rules
Tushman & Nadler 1978	Complexity Interdependence and Environment Inter-unit interdependence	Matching structural capacities and requirements	Information-processing capacities of organizational structural and control mechanisms
Trautmann et al. 2009	Efficiency in MNC global sourcing	Requirement matching to integrate strategy (vertical vs lateral)	Organizational integration
Galbraith 1974	Uncertainty Task execution	Vertical information systems and lateral relationships	Pre-plan or Adapt to less planning or Adjust performance requirement

Finally, as Galbraith (1974) points out, the greater the uncertainty of the task, the greater is the need for information processing during the execution in and between the organizations performing the task. Uncertainty limits the possibility to pre-plan, and the information processing has to be done during the task execution.

The following sub-chapters explain the information-processing framework in the PSM context. Digitalization, global supply and servitization in the supply chain establish the change factors: the amount of data to be processed is increasing following digitalization and the expansion of the supply network.

The uncertainty increases at the interface of the new supply market and the information-processing needs intensify. The increased volume of information in purchasing and supply enhances the role of knowledge management in PSM where it requires the development of new capabilities.

2.3 Knowledge in PSM

2.3.1 *Knowledge and theories of the firm*

The operating environment of purchasing is viewed in this thesis from perspectives three major concepts of the firm- Transaction Cost Economics (TCE), the Resource Based (RBV) View and the Knowledge Based View (KBV) – each with its own approach to knowledge development in business relationships. Information processing (IP) provides a framework within which to study how knowledge, a complex, multifaceted and philosophical phenomenon, can be managed, developed and exchanged in business organizations.

Transaction Cost Economics (Williamson 1979) is based on the premise that the purpose of a firm is to find the most economical way to organize production. Firms choose between building their own organization, referred to as a hierarchy, and purchasing the particular services or goods from the market. TCE postulates that work should be done in-house as long as the cost remains below the cost of purchasing equal products from the market, including the transaction and contract costs. If the market provides the products at a lower cost it is rational to make a contract and purchase them.

The management of external resources complements the own production processes and value appropriation (Cox 1997). Purchasing interacts with the market as well as managing contracts with the suppliers of goods and services needed by own production. The supply chain is comprised of interactions among the actors in the network that spans the boundaries of the particular firm.

Contracting has specific costs related to selecting a supplier and governing the contract made for supply. The firm tries to acquire supplier knowledge through its contacts, which tend to be imperfect, however. The imbalance in knowledge transfer between supplier and buyer is referred to as information impactedness. The imbalance in the transaction as well as in contracts in general is affected by bounded rationality and uncertainties, which may lead to opportunistic behaviour.

In line with TCE principles, the purchasing function seeks the lowest cost in terms of managing contracts and limiting the negative impact of uncertainty and opportunistic behaviour. The optimal solution is to find a balance between the risk of supplier opportunism and cost, the risk being highest when the buyer cannot accurately specify its needs and is thus not able to measure the deliverables. (Ellram et al. 2008). In the case of knowledge acquisition, this is often the case, when PSM has to manage the uncertain cost of an undefined product. Essential capabilities required for the successful purchasing and management of external resources include the ability to define deliverables and duties in advance.

According to the Resource Based View the firm is a bundle of resources and capabilities that define how things are made. Resources are mobile, markets are not homogenous, and final value is defined by exogenous actors and not the firm (Barney 1991; Priem & Butler 2001). The firm should develop its own capabilities or contract external capabilities that provide competitive advantages and a means to grow. The RBV defines the firm in terms of its capabilities and competences with which it operates rather than what it produces (Wernerfelt 1984). A firm's objective is to create a situation in which its own (or controlled) resource position is different, and difficult for others to match. According to Barney (1991), "*a firm is said to have a competitive advantage when it is implementing a value creating strategy not simultaneously implemented by any current or potential competitors.*"

From the RBV perspective, firms in general - and resource-limited SMEs in particular – tend to optimize operations so that resources are in best use (Penrose 1995). Efficiency is achieved through specialization and the division of labour. The firm's boundaries are extended, and external resources need to be bought in, managed and developed as part of its own pool. Managers in unpredictable markets must possess dynamic capabilities, defined by Teece et al. (1997) and Augier and Teece (2009) as "*the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments*".

The firm is thus a "pool of resources" - its own and acquired – facilitating the production of goods and services (Das & Teng 2000) with a view to achieving profitable growth. Firms are heterogeneous and their capabilities vary depending on how their resources are used to increase and develop knowledge. As Searle (1995) notes, reality is the same for all in terms of new technologies and customer needs. Difference is in how reality is understood and how the new knowledge is used. That part depends on the capabilities the firm has to accumulate its 'Stock of Knowledge' (Penrose 1995).

The RBV serves to explain what firms do but not how they do it, nor how they develop new capabilities. According to Priem and Butler (2001), all sorts of resources can be sources of competitive advantage, making differentiation an ambiguous concept. The limitations of the RBV are further clarified in the statement that "the ability to learn to develop effective resources is a resource itself". Tacit knowledge as a source of competitive advantage is descriptively understandable but difficult to measure in terms of performance impact and differentiation between firms. Priem and Butler (2001) note the need to ask questions such as: "How can the resources be obtained? How do they interact? How and in what context do they contribute?" More efficient production and competitive advantage depend less on having better resources than on knowing more about their productive capacity. Organizations may specialize and pursue efficiency and competitive advantage through the division of labour. However, SMEs are seriously constrained in terms of achieving growth and economies of scale.

Conner and Prahalad (1996) compared opportunism-based TCE and the knowledge-based view (KBV) to define why firms exist. In their view knowledge-based considerations may outplay opportunism and thus challenge the opportunistic basis of organizational theories. They argue that knowledge differences between individuals rather than the opportunistic withholding and manipulation of information constitute the basis for competitive advantage. The rationale behind co-operation lies in value creation (Das & Teng 2000), in line with the knowledge-based definition of the firm as a knowledge-integrating institution. As such, it engages in the delivery of products and services.

Decision makers are intendedly rational (Augier & Teece 2009). Their aim is to make the best use of the knowledge at hand. In terms of rational choice this is shown in consistent preferences and interactions (Herne & Setälä 2004). However the rationality of actions depends on the content of the preferences. According to the KBV (Grant 1996; Spender 1996), the task of management is to coordinate the specialized knowledge of individuals as a primary resource through the production of goods and services. This coordination task is complex in that the goals are often conflicting and the levels of knowledge vary. Grant's KBV emphasizes the institutional role of the firm in terms of applying knowledge rather than creating it. Spender (1996) takes a slightly different approach, describing knowledge as a dynamic process.

The intentionally rational decision maker behaves in an opportunistic manner in an opportunistic market. Bounded rationality reflects how knowledge is construed in a spatial, temporal context and established in institutions (Berger & Luckmann 1966). According to Searle (1995, p. 151), knowledge is epistemically objective, being neither opinion-based nor arbitrary. However human efforts to arrive at a true representation of reality are affected by culture, economics and psychology – human institutions in general. The interpretation of knowledge as an active and dynamic system relies on boundary setting and an understanding of institutional influences (Halinen & Törnroos 2005).

In an operating environment in which knowledge acquisition from and about the market plays an increasingly important role, PSM has to consider its information-processing capabilities and how it integrates knowledge of external resources into the firm's processes. As Spender (1996) points out, knowledge is not a static transferable asset, but a process within the firm.

2.3.2 *The development of knowledge*

According to the constructivist worldview, knowledge resides within individuals and organizations, shaping both at the same time as learning individuals and organizations are shaping the body of knowledge (Berger & Luckmann 1966; Searle 1995).

Learning is an integral part of knowledge, and could be depicted as an activity system (see Figure 3). As such it is used to explain organizational learning as a change-making process (Engeström 2001). Activity system works alongside the knowledge process and comprise explicit and implicit rules that organizations and communities eventually institutionalize in the form of routines aimed at enhancing efficiency through the agreed division of labour. More specifically organization (firm) members learn to use resources (e.g. instruments and tools) to work with product (object) in order to get a desired outcome.

In fact, little learning takes place unless there is a contradiction or a conflict in the system. One obstacle in learning is defined by Argyris (1986) as skilled incompetence. Organizations as well as individuals become masters on routines, habits and tools slowing down any change process, which in turn will constrain the outcome achieved. Organizations are eventually forced to take action on those constraints and to change either what is being made or how it is made, and in the best cases they do both. The entire activity system is reshaped in this expansive learning process as both the object and the subject are changed.

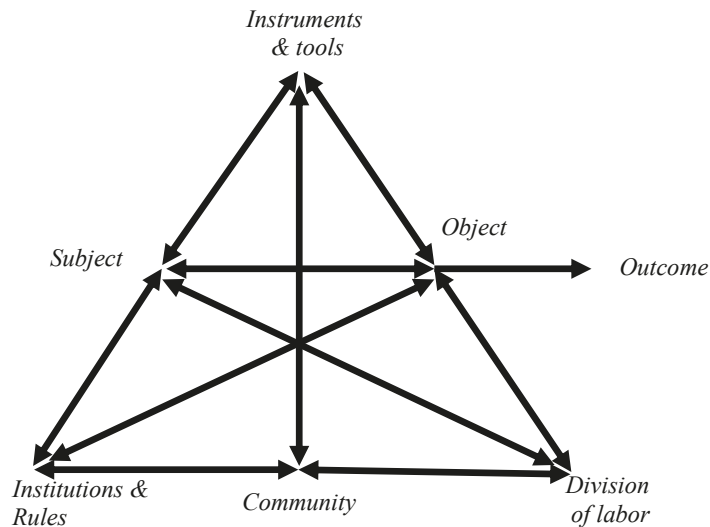


Figure 3 The activity system (Engeström & Sannino 2010)

Human action has a purpose, some object of intent. Knowledge accumulates and decision-making criteria evolve, also changing the benefit-appropriation possibilities in the supply chain. Causality is not always clear. Is it the intention that drives the action or does the action explain the intention? Do we read a book in order to learn or are we learning when we read the book? Intentions drive people to do things, which according to Wright (1971, p. 69) is not sign of causality as such. All this calls into question the use of causal explanations given that the human mind may well find the logic and the reasoning after the decision has been made. It would be more fruitful to base explanations of actions on understanding the intentions of the actors (or agents) (Wright 1971).

According to Hayek (1945), the use of economics knowledge depends on time and place. It is not possible to gather it all, but there is a sufficient amount available to make decisions. The value of the knowledge derives from its use - temporally and spatially but imperfectly. Hayek challenges the notion that people's knowledge corresponds with the objective facts of the situation. How does a complex structure like a supply chain use knowledge if every actor has his or her own understanding and ways of appropriating value? The contextual variables need to be understood in collective action in which knowledge sharing replaces the zero sum game (Ostrom 2000). In both cases economics-oriented thinkers emphasize the importance of knowledge in the economy and also point out the risk of its generalization.

Vanderschraaf and Sillari (2014) distinguish between mutual knowledge and common knowledge. Mutual knowledge is what everyone might know, but it has not been shared: it becomes common knowledge when every actor has access to it – in other words, it is available and shared (“I know that he knows that I know, and so on...”). This leads to an infinite hierarchy and an endless loop. A different temporal order or spatial possibilities for rent appropriation challenge the beneficial use of knowledge. The concept of limited information and bounded rationality is also at the core of TCE. However, a common context makes it easier for actors to share similar preferences in the utilization of common knowledge. Such knowledge is attainable when it is public and all parties can draw the necessary inferences from it.

The following example of knowledge development in business involves the internationalization process of a firm. Internationalization is not specific to any one country but accumulates as a way of working in the organization. Firms have specific experiences of and accumulated knowledge about how to operate in new markets. On the one hand they have experiential knowledge of country-specific markets, clients and institutions, and on the other hand they have knowledge about the process of internationalization required in managing the complexity of the international business endeavour (K. Eriksson et al. 1997).

Kogut & Zander (1992) use the concept of knowledge sharing to explain the function of a firm. A firm holds two kinds of knowledge: information about what should be made and how things are done, based on both informal and formal data (who, how much, when), on the one hand, and skills related to methods, problem-solving and how to co-operate on the other. This knowledge comprises what individuals know tacitly and their combinative capability, meaning that the organization knows more than its members do individually.

In the context of the knowledge-based view, Grant (1996) points out interdependence, mutual adjustment and coordination as factors of individual specialized knowledge that need to be integrated. There is also a need for common knowledge – a common language, a communication channel, a common understanding of the need for specialization and shared meaning. As Nonaka and Takeuchi (1995) show in their model of organizational knowledge, SECI (Figure 6), the tacit knowledge of individuals is externalized by coding such that it can be communicated and again internalized by members of the organization. Thus knowledge is used, shared and developed in one continuous process.

According to Spender (1996), both Hempel's conventional positivist approach and Popper's fallibilist views are theoretically inadequate to describe the knowledge-based firm. Knowledge is not testable depending on its possible presence or absence. The epistemology should be constructed in discourse between reality and knowledge. Spender takes a pluralist standpoint: a firm is not just a collection of rational individuals. Moreover, organizational knowledge includes individual and social levels, and migrates from the implicit (tacit) to the explicit (coded). He further argues that knowledge is a dynamic activity system rather than an intangible asset that can be handled like a material good: "*only then with this insider's knowledge of its meaning, do we begin to comprehend the dynamics of the system's interactions*". Knowledge is not an object out there that is observable in positivist manner, it is rather the interaction between the creative individual and collective knowledge that gives the meaning and identity. To Spender, it is a probe with which to explore and unpack the complexity of our world.

Berger and Luckman (1966) present a model in which the foundation of knowledge is in social interaction. They define the sociology of knowledge as the relationship between human thought and the social context. A body of knowledge develops in a system, as depicted below in Figure 4. It is a simplified illustration from a complex model of Berger and Luckman (1966, p 75). It depicts origins of institutionalized knowledge, which defines new constructs and roles. The shared body of knowledge is built on institutionalized habits and roles, division of labour and innovation, and in turn will generate new habitualizations. Some of them gain more attention and form base for new institutions.

The knowledge constitutes the reality by means of internalization (subjective) and institutionalization (objective). Knowledge and reality are intertwined in the

social context and in the interaction taking place between individuals and the world (organization). Knowledge building in everyday life - as in supply chain - happens through continuous communication and correspondence between meanings. Signs in communication derive meaning (objectification) from reality and at the same time define reality. The social stock of knowledge develops in the interaction process.

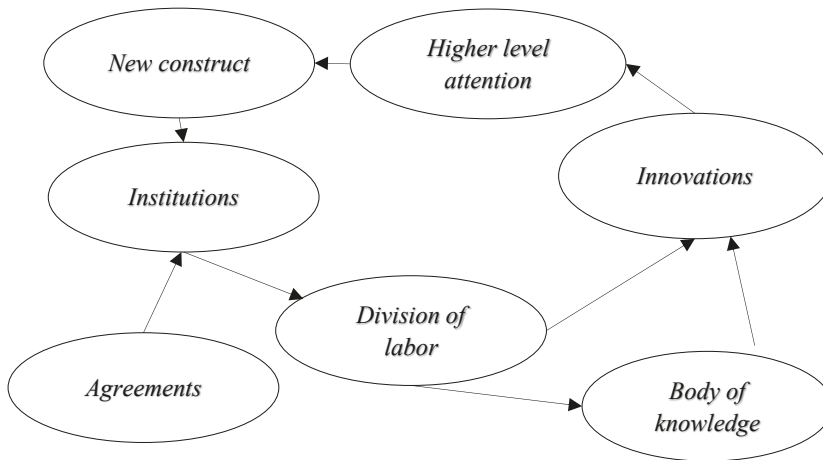


Figure 4 A body of knowledge

Firms seek innovation to avoid imitation. They learn new skills by re-combining current capabilities. Acquiring new knowledge (and skills) is demanding, thus firms tend to utilize current social relationships. There is a certain level of determinism – what has been done in the past limits future choices (Kogut & Zander 1992).

A comparison of Berger and Luckman's model with Searle's concept of socially constructed reality adds elements to the picture. The agreements in a body of knowledge derive meaning from collective intentionality into institutional facts (Searle 1995). Likewise, the body of knowledge is constructed from communicable facts (Searle 1995, p 77) and codified knowledge (Searle 1995, p87), and in this process, innovation and attention derive their meaning from agentive functions (Searle 1995).

According to Alasuutari (2004), our reality consists of routines, which are a form of institutionalized intelligence. The dilemma with knowledge is that it is a combination of objectivity and subjectivity. Knowledge development is a continuous process in which learned constructs are turned into habits and established as institutions. The more specific the knowledge we acquire, the deeper is the division of labour. More efficient use of the knowledge may follow, but at the same time

communication between individuals (and organizations) becomes harder, and language diversifies and becomes more specific.

From the PSM perspective, the firm's internal organizational knowledge constitutes subjective and established knowledge, which has to be bridged in the process of acquiring external knowledge and further developing it with suppliers. There is a continuous need to match the institutionalized routines and diversified languages of two or more organizations. Contracts have proved to be one albeit inadequate way of managing coded knowledge when PSM operates in a digitalized supply network delivering intangible servitized products.

2.4 Requirement trends in supply chain

As described in earlier chapter, different management theories have their distinctive viewpoints of knowledge. TCE (Williamson 1979) emphasizes bounded rationality that is present in economical transactions. In TCE also information impactedness in business relations is fundamental describing imbalance of knowledge of stakeholders and in ways they use it. Different valuations and capabilities of business partners may appear as opportunistic actions, which are controlled by contracts more or less successfully.

On the other hand, RBV (e.g. Wernerfelt 1984) stresses that key feature of a firm is to manage knowledge about critical resources. These may reside within own organization, but also increasingly they are sought from supply chain. This makes external knowledge management as integral part of external resource management of the firm. In that vein Conner and Prahalad (1996) stress the need to consider non-opportunism-based knowledge sharing as a method to gain competitive advantage.

Third set of management theories, KBV (Grant 1996; Conner & Prahalad 1996) suggests that a core function of a firm is to act as integrator of a knowledge by recombining external and internal knowledge in novel way. As knowledge is seen a fundamental resource of a firm, capability to manage it and overcome underlying opportunism becomes core feature in purchasing.

Digitalization features in everyday life as the "new reality" which can be experienced in four dimensions – time, space, actors and artefacts. Computing is not something "out there", it is something with which we live. The basic meaning of digitalization is the representation of discrete symbols of the real world in a digital form so that information can be processed by information and communication systems (Yoo 2010).

Yoo (2010) makes a distinction between digitalization and virtualization. In the latter case the technology may be used to develop its own world – virtual reality. The virtual world differs from representational computing, in which the world is

represented in terms of digital symbols. In the virtual world the construction of images need not be constrained by real-world limits.

The digital revolution has been gathering momentum since the 1960s, and changes in access to global knowledge are usually attributed to ICT systems and digitalization (Bowersox 1969). According to Hevner (2004), the purpose of an information system is to improve organizational performance. ICT advancement is often mentioned as a major driver of change in SCM (Hyötyläinen & Möller 2007).

It should be borne in mind that the tool does not make the change, and phenomena like digitalization may give the impression of external aid. It is the community that constitutes the operational environment and processes the necessary information (discourse) to make the decision whether or not to go for the new system, and further how it will operate (Wang & Ramiller 2009). Systems are intertwined in the environment in which they are used, and an IT system becomes a tool for change only when it is used to bring about change in the operational environment (Krogh 2009; Obstfeld 2005).

The digitalized supply chain has become a new reality for PSM. Management of the process is expanding spatially and temporarily, and new kinds of actors and artefacts are emerging. Digitalization extends supply networking geographically and speeds up communication. Servitization and service logic require deeper process matching between supplier and customer. These aspects are discussed in more detail in the following chapters.

2.4.1 Service logic

Service is gaining an increasingly strong foothold in the manufacturing industry, with 30-40 per cent of its turnover generated by service units in developed economies (Ulaga & Reinartz 2011). Servitization in firms has been predominantly a marketing project. Tuli et al. (2007) point out the differences in perceptions of service between suppliers and customers. Suppliers see the solution as an integrated combination of goods and services to fulfil a particular customer need, whereas customers perceive it as a relational process. Within the firm, marketing and PSM also approach services from different angles.

More specifically, service logic (SL) is a business model in which the focus is on customer value and its appropriation (Grönroos & Ravald 2011; Vargo & Lusch 2004). It should be noted that it is a business model that suits goods, services and systems delivery equally well.

According to service logic (Grönroos 2007) economic value lies in how goods are used and not so much in their production. There is also a connection between value and knowledge. It is posited in service-dominant logic (SDL) (Vargo &

Lusch 2008), on the other hand, that actors in the economy exchange services instead of goods: the first of its premises states that service is the application of knowledge and skills (i.e. operant resources).

Some knowledge is concrete and tested by the senses, but much of it is abstract. However, goods are there to deliver services, which brings value - benefiting the actors participating in the service exchange. According to Grönroos (2008), service logic adopts the customer perspective on value creation in the supply chain in that value is defined and created by the customer in the use phase, and is provided by the system or goods in use. Service-dominant logic (Vargo & Lusch 2004, 2008) represents a slightly different point of view: it is the service that is delivered to the user, and the supplier and the customer both participate actively in value co-creation. A common element in these two models is the ultimate targeting of the value rather than the goods or services. PSM, in following service logic in the supply chain, is in a position to convey customer needs to the supplier network and match them with supplier capabilities.

The process matching (Figure 5) clearly indicates the breadth of the buyer-supplier interaction according to service logic: firms in the supply chain interact continuously and on multiple levels throughout the delivery process.

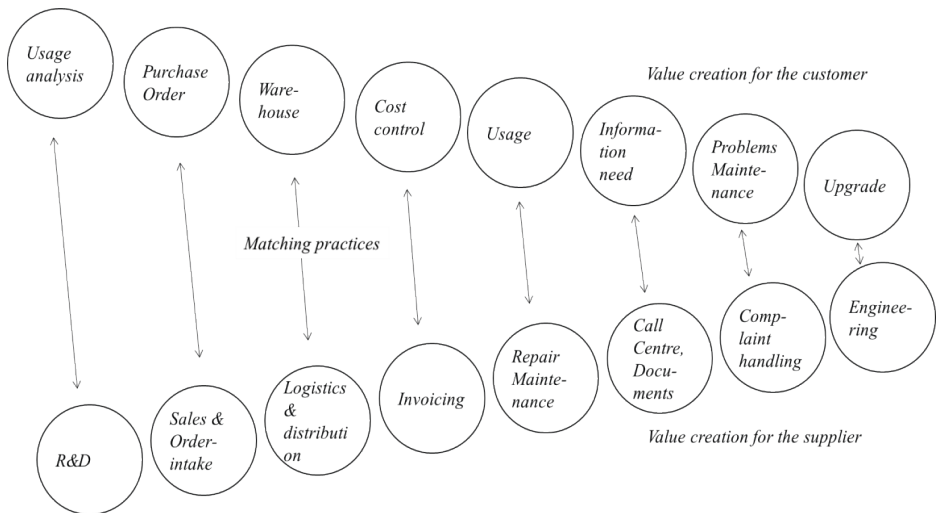


Figure 5 Process matching (Grönroos 2011)

It is beneficial to both buyer and supplier to see how they each connect to the other's value process. As illustrated in Figure 5 the process matching covers activities from end-customer support to initial system specification (Grönroos 2011). It has its roots in marketing, indicating how the supplier can interact with customers throughout the business process. With regard to PSM the matching shows which

supplier capabilities may affect which processes. In the case of buyer-supplier process matching the interaction extends beyond order–sales transactions, whereas in the purchasing process there is a need to convey relevant information on end-customer usage to the supplier’s product-development function. Distribution and logistics systems should be matched, and invoicing data should flow correctly between supplier and buyer. Given that suppliers retain key data and competences related to the product-use period, technical support as well as future upgrades and product-development activities should be synchronized.

Manufacturing firms are increasingly adopting the service business model, expanding their offerings by adding and bundling services to their equipment delivery (Kowalkowski et al. 2015). However they have to have a proper strategy to fit the environment and their capabilities (Gebauer 2008; Neely 2009). A healthy financial status helps them to make the transition to a service mode, but they need to have established customer and supplier links. Large firms succeed better in this, being more likely to have slack managerial, financial and personnel resources they can allocate. They also have the capacity to collaborate with customers, which can be time consuming. Smaller firms, which are more stringent with resources, benefit if they can utilize a supplier network as a significant source of necessary knowledge (Böhm et al. 2016).

When a firm advances in its service strategy from basic after-sales support to become a development partner the organizational design must follow suit. The service orientation is low in after-sales but assumes more importance on the process-development level, which should be reflected in the company structure. The organizational design is based on corporate values and that emphasize customer proximity and a proper mind set among the personnel (Gebauer et al. 2010). Similarly, Baines et al. (2009) emphasize six factors contributing to the transition: location, team-level vertical integration in the supplier relationship, ICT, performance measurement to demonstrate value, people skills, and the matching of customer relationships and business processes.

2.4.2 Networking and relationships

According to Dyer and Singh (1998), relation-specific interfirm entities such as knowledge sharing, complementary resources and governance structures may be critical resources. Criticality in this sense is contextual, being assessed from a broader industry perspective and from the firm’s own point of view.

Firms are operating in complex dynamic network where the appropriateness of the business model and strategy are tested (Miles & Snow 2007). According to Miles and Snow (1986) network offers synergistic benefits, but requires operational flexibility. There is a need for prospectors generating innovations, defenders

to specialize for better efficiency and analysers who rationalize and develop markets.

The networking takes place vertically and horizontally - with customers, suppliers and partners. Competition and collaboration are concurrent in the business network. Firms compete for a better position in the supply network, and seek to work with supply-chain partners that show the best performance. The development of market and supplier knowledge may involve co-operating with competitors (coopetition). However, value appropriation is firm-specific and individual, whereas value creation is a collective activity (Ritala et al. 2009).

Möller (2013) argues that relationship and networking theories are contingent, explaining why and how firms interact, and that when the market is studied as a network the high contextuality is obvious. Networks evolve, and firms and organizations become intertwined in various phases of the supply chain, forming ecosystems (Vargo et al. 2015).

Competitors in the global economy tend to be collaborative learning communities rather than sole manufacturers. A firm attaches importance to its network position, as networking interactions augment the performance of an individual member (Peters et al. 2010). It is not enough in the purchasing context simply to understand the needs of the firm and the industry within the supply chain. The supply network is broader and competition on the demand side is not always limited to obvious strategic resources. Resources become critical for different reasons among different users, according to factor-market-rivalry (FMR) theory (Ellram et al. 2013). The focus in the theory is on non-strategic resources, the point being that organizational success depends not only on strategic inputs, but also on essential support resources such as transport capacity and skilled labour that other industries could also utilize.

However, relationships are among the key resources of a network and must be carefully maintained. Koufteros et al. (2012) argue that supplier selection is a potential source of competitive advantage through overall performance improvement. However developing established (existing and stable) supplier relationships does not enhance performance, possibly because the supplier in question is from an established domain. This reflects the thinking on organizational congruency: organizations entering into new relationships find ways of improving performance, but once the roles are fixed the questioning ends and development slows down, or deteriorates (Adams 1953).

Relationship maintenance is not a zero-sum game: a well-functioning relationship out-performs two separately working organizations in terms of results. The concept of relationship learning in a buyer-supplier context explains how value creation produces more than the individual parties could achieve separately (Cheung et al. 2010): jointly shared and interpreted information is integrated into a common domain of knowledge that changes the common work outcome in the

same fashion as described above with regard to expansive learning (Toiviainen 2007). Relationship learning essentially serves to build bridges in innovation networks, and the relational and cognitive proximity helps to overcome barriers of geographical distance (Tödtling 2012). It is fair to say that network learning has gained in importance as globalization has lowered cultural barriers and differences, making it easier to connect (Cheung et al. 2010). PSM has to balance different professional cultures, organization cultures and even national cultures in globally distributed supply networks (Ajmal et al. 2009).

Some relationships in a supply chain are formal in nature, whereas others are more informal. Cousins et al. (2006) analysed relationship capital and social ties in supply chains, arguing that informal socialization processes create relational capital leading to improved supplier-relationship outcomes. It is necessary to build social capital rather than relying solely on formal structures. However, too tight and over-embedded relationships tend to disrupt other relationships. This is a risk in small firms in particular, in which the narrower relationship base eventually limits learning and knowledge acquisition.

In line with RBV logic, PSM should acquire new and differentiating resources to facilitate and sustain growth, which may relate to the production process or the product itself. As its resource position changes the firm should have the capabilities to build barriers against competition, and should remain open to accessing new knowledge (Wernerfelt 1984).

It is indeed the relationship in the network that is of interest. Clegg et al. (2013) studied the dynamic change of the supplier's role in fast-moving agile projects, and in an efficiency-seeking vertically integrated structure. Different departments in the firm collaborate with their suppliers, forming collaborative relationships resembling a virtual or extended enterprise, or one that is vertically integrated. In the process of matching customer needs and supplier capabilities, PSM needs skills to manage both supplier relationships and internal integration.

The interaction/network view of industrial marketing and purchasing (IMP) promotes relationship interaction and social exchange in the value network (Grönroos 1994). According to Edwardson et al. (2008), the relationship consists of active episodes but also continues between episodes even in the absence of ongoing business activities. Ballantyne (2006) argues that the basis of the relationship is set within the organization in line with management capabilities to implement service logic and the necessary relationship management. More specifically, relationship management has to find a balance between specialization (efficiency), general competences (sustainability) and long-term relationship (effectiveness) (Spohrer et al. 2007).

The dynamic capabilities needed in relationship management facilitate not only adaptation to the environment but also the shaping of the ecosystem in which they operate. Teece (2007) divides dynamic capabilities into micro foundations that are

shown in procedures, structures, rules and disciplines. The required dynamic capabilities in PSM include, first and foremost, the ability to sense and seize supplier's ecosystem and its inherent knowledge and capabilities.

The business organization is not an engine: there are human individuals who observe and learn, and gather knowledge. Barney and Felin (2013) refer to Durkenheim's social factors that mould individual (micro) foundations. Their focus is on actors and interconnections: knowledge of individuals and how they interconnect is a prerequisite in terms of understanding organizations, and social systems in general.

In sum, in terms of the role of networking and relationships in PSM, networked environments are turning from an internal to an inter-organizational focus. The networking model emphasizes the need to redefine organizational boundaries, effectiveness and strategic management, thereby shifting the emphasis from internal resource allocation to how resources are connected to the network constituting the organization's operational context (Håkansson & Snehota 1989).

According to Möller (2013), the business-network approach is a good basis on which to study supplier development in service purchasing and knowledge acquisition. As Högström and Tronvoll (2012) posit, these networks have their division of labour and their institutions, hence the structure of economic exchange has to be examined through this socially constructed context.

The buyer-supplier relationship goes beyond formal agreements. PSM should employ multiple socialization mechanisms such as shared goals and site visits. Cooperation with suppliers beyond the contract has a positive impact on performance (Cousins et al. 2008b). The best option for PSM is not always the cheapest. Managing relationships in the network means continuously making choices. It means considering what is in the firm but also building capabilities that are related to the external context of the supply network and the broader factor market.

Fisk et al. (1993) describe how the change to a knowledge and service economy led to the emergence of boundary-crossing organizations, of which PSM is a prime example. The supply network connects multiple parties in parallel or sequentially, and different participants may see the same phenomenon differently (Halinen et al. 2012). It is a loosely coupled network of social and economic actors jointly producing a service offering and co-creating value. Such networks could be seen as ecosystems (Layton 2007) in which innovation and knowledge emerge and are institutionalized (Vargo et al. 2015).

Inter-organizational learning involves matching processes and developing an understanding of mutual value creation (Grönroos 1994; Grönroos & Helle 2012). In line with service logic, Vargo and Lusch (2008) describe service as a phenomenon of social and economic exchange. The application of knowledge and skills and the value thus enabled are "always uniquely and phenomenologically deter-

mined by the beneficiary". The value of the knowledge gained in the supply network differs between the supplier and the buyer. Data turns into knowledge when it is learned and used, hence the need for organizational learning to identify PSM tasks in this process.

2.5 Information-processing capabilities in PSM

2.5.1 Knowledge acquisition

Purchasing entails various kinds of interaction, one of the objectives being knowledge acquisition. Knowledge is an entity in itself, being neither a stock-keeping unit nor an exchangeable trade item (Spender 1996). What makes it different from goods is the priority of process over product (Searle 1995, p. 56). One of its specific features is that it does not become worn in use: on the contrary, it is renewed when it is used, and the body of knowledge accumulates the more it is used. More specifically, the accumulated stock of knowledge is socially constructed and its users define its value. In the process of knowledge development routines are institutionalized in innovative reformulations of the division of labour, for example, accumulating both in a physical stores form and as social capital (Berger & Luckmann 1966).

Knowledge acquisition is a learning process during which organizations access body of knowledge and build new constructs (Engeström & Sannino 2010; Larsson et al. 1998). Lukas et al. (1996) studied organizational learning in marketing channels. They describe how accumulated knowledge is stored physically (in individuals, documents and organizational routines) and socio-culturally (e.g. in the social capital of roles, ties and norms and the organizational culture with its rules and discourse). One of their propositions is that the performance of the marketing channel improves as the degree of organizational learning increases. They also note that organizations become more selective in their learning as they grow.

Micro-foundations have been used to access organizational knowledge by reducing it back to individuals, which in turn develops collective routines and capabilities (Felin et al. 2012). The notion of the micro-foundation derives from organizational theory: knowledge is held by individuals, but also in the regularities of co-operation in the community (i.e. the social context). Organizational knowledge is developed in a process of internal (experience) plus external (e.g. JV and acquisitions) learning combined with combinative capabilities (cf. absorptive capacity). Knowledge acquisition precedes the exploitation of organizational and technological opportunities. Unfortunately, over time as knowledge becomes embedded in

relationships and organizational principles new learning faces ever higher level of friction (Kogut & Zander 1992).

Even though the individual is the core knowledge-management unit in the supply chain, the value of knowledge is determined by the context. More specifically, information about the supplier base and the market turns into knowledge when it is interpreted in co-operation in a particular buyer-supplier relationship (Cheung et al. 2010). This is a learning process during which routines are institutionalized in a reformulated division of labour. Knowledge is stored in physical places as well as in the social capital of individuals and organizations (Berger & Luckmann 1966). In other words, knowledge creation in networks derives from individual and organizational learning, and the capability of finding new ways of operating.

2.5.2 Organizational learning

Organizations have to decide whether to exploit current capabilities or to invest in relationship development. In many ways this reflects the process of organizational learning, which involves exchanging information within or between organizations, and possibly also seeking more radical change in terms of what is being made and by whom.

There are periods of active exchange but the process continues during inactive periods. The activity evolves from an awareness of the need and the exploration of possible solutions in terms of expansion and commitment (Dwyer et al. 1987). The parties to the relationship learn by agreeing, transferring knowledge and finding new and common ways of working.

Nonaka's SECI model of knowledge creation (Figure 6) is frequently used to explain knowledge development and the concept of organizational learning (Nonaka 1994). According to the model, there are four conversion stages on the path from individual tacit knowledge to internalized organizational knowledge. Tacit knowledge is shared through common experiences during the socialization stage, and is made explicit and easier to share as the basis of new knowledge during the externalization stage. Explicit knowledge shared in the organization can then be combined in more complex systems. The new systems are finally adopted by the teams and individuals in the internalization phase – forming a new level of tacit knowledge (Nonaka et al. 2000).

Learning is thus understood as a widening spiral in which individual tacit knowledge is coded in such a form that it can be made explicit and externalized to a broader audience. The organization combines the knowledge and forms its own rules and institutions, and during this dialogue forms a common knowledge base. This, in turn, is codified and internalized in the social code of individuals.

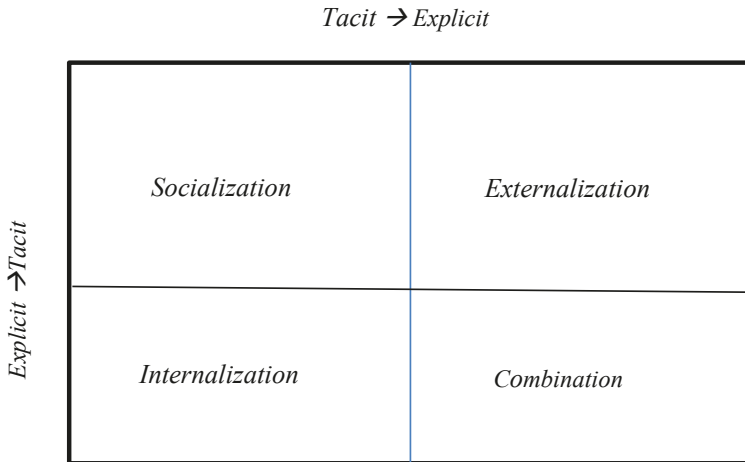


Figure 6 The SECI process

The SECI model demonstrates the basic learning process in which individual knowledge accumulates in a common organizational understanding. The process is a closed system and does not explain why the learning spiral expands. Indeed, in a closed system the organizational congruency (Adams 1953) turns the team's performance and learning in a downwards spiral. Teams become familiar with the routines, and the positions of the team members are established in relation to their expertise. The contradictions caused by problems that once made the team to explore new skills become a threat to its coherence.

Another theoretical perspective on organizational learning is that of expansive learning (Engeström 2008; Engeström & Kerosuo 2007), developed in the context of socio-constructive activity systems. The theory is based on dialectic contradictions and questions, the basic point being to raise questions concerning how things can be and what is the real object of activity: the learning process challenges established practices.

In the context of organizational development the notion of expansive learning has been applied to workplace learning. It has also been used in the development of new forms of teamwork in a co-configuration process during which learning is distributed over long and frequently disconnected periods of time (episodes) in loosely connected activity systems (ecosystems). It is essential to bring about change through deliberate involvement – applying the interventionist approach. (Engeström 2004)

Traditional learning focuses on individual knowledge, skills and changed behaviour, whereas expansive learning focuses on the object of the activity, there being no activity if there is no object (Engeström & Kerosuo 2007).

“The expansive learning theory builds upon the idea of learning as a longitudinal process in which participants of an activity system take specific learning actions to analyze the inner contradictions of their activity, then to design and implement a new model for their activity that radically expands its object, opening up new possibilities for action and development. In expansive learning, the outcomes are expanded objects and new collective work practices, including practices of thinking and discourse” (Engeström & Kerosuo 2007).

The activity system (Engeström & Sannino 2010) maps the subject (who) and the object (what) to the surrounding environment. It is a fundamental element of expansive learning, as shown in Figure 3, The activity system (Engeström & Sannino 2010). As a concept it connects the acting subject with activities to reach the object. The rules and institutions of the rest of the community influence the activities. On the other hand the actors and activities influence the community, its institutions and the division of labour .

The activity system can be used to study the knowledge process more broadly, and it also offers a practical framework within which to study knowledge-centric PSM. It is evident in modern society in the control of socially organized implicit knowledge via the specific division of labour, there being clear rules and norms governing interactions between individuals in the community (e.g. a supply chain) (Alasutari 2004, p. 145). The system is evolving as earlier actions shape the dynamics in the activity system.

Expansive learning reflects the development from simple reproductive action to completely new activity. Actions in the system result in the production of objects and instruments within the current process. Actors in the changed system seek new ways of dealing with the activities. The contradiction between use and exchange value is inherently present in the system following the change in relationships. Different parties (subjects) have their own views on output performance and the overall construct of the system. The focal firm or supply chain constitutes the community working for and within a set of rules and institutional environments (Engeström 2008).

The concept of expansive learning is typically used in connection with workplace learning as loosely or tightly connected teams develop the work processes. Toiviainen (2007) extends this to cover networks of firms, explaining learning as a series of object-creation activities instead of upper-level networking. The learning results in production-level objects within customer projects, and individual knowledge about team formation. Complexity is part of higher-level learning targeting true improvement as opposed to lower-level adaptation and routinization. Dialectic contradiction - questioning and analysing - takes learning forward by means of modelling and applying. Actors in the learning system are involved in

multiple activity systems at the same time on both the micro and the macro level. Toivianen (2007) lists six categories of activity systems: the world, society, the organizational field, organizational population, organization and its subsystem.

The third learning concept to be considered is double-loop learning (Argyris 1986). Whereas expansive learning and the SECI model explain how knowledge develops in interplay between organizations and individuals, double-loop learning focuses on the obstacles in this process. Argyris (1986 1995) coined the phrase skilled incompetence to describe the built-in resistance to change in organizations. The root cause of the problem is the conflict between behaviour and intention. Skilfulness in the work environment is related to the ability to produce what is intended often leading to the avoidance of conflict and misinterpretation.

In other words, we learn in a single-loop system: we detect the problem, resolve it and then continue. When true change is needed, however, it means altering the underlying programme, in other words institutionalized habits. Learning in a double-loop system starts from the governing variables (fundamental reasons for action) so as to remove the reason behind the problem. A snag here is that people who are good at solving problems efficiently may not want to eliminate them and thereby render a valuable skill obsolete. The difference between double-loop and single loop learning is depicted in Figure 7, which summarizes the key points of the model presented by Argyris (1995).

- *Single loop learning*

- *Detect error*
- *Correct*
- *Continue*

- *Double loop*

- *Detect error*
- *Correct*
- *Change underlying program (cause of error)*

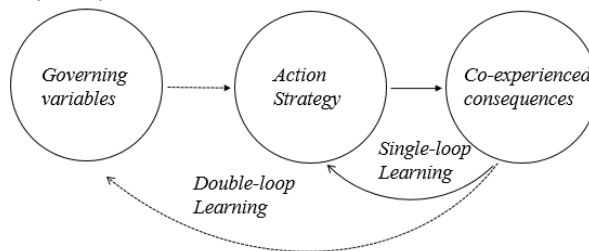


Figure 7 Learning loops

The single-loop copying of routines may sometimes be sufficient, but not when there is need for a more fundamental change. Double-loop learning requires the recognition of activities that inhibit inquiry and turn on the defensive mode. In fact, defensive reasoning may well be based on institutionalized rules.

The building blocks of single-loop learning are a sense of competence and self-confidence. Defensive organizational routines tend to be defined as positive virtues like caring, support and integrity. The creation of a double-loop organizational-

learning process requires the disruption of defensive routines and the questioning of espoused action strategies, in other words of the underlying programme.

According to Levinthal and March (1993), learning myopia may well limit the need for change. First, spatial myopia, referring to the zone of proximity and familiarity, may limit the learning process. Second, temporal myopia may create a disturbance when organizational goal setting stresses short-term learning over longer-term progress. The third form of myopia reflects the human tendency to overplay success and underplay failure. It is easy to find logical explanations and intentions after the event.

One way of tackling learning obstacles in an organization is through motivation and goal setting (Podsakoff & Farh 1989). Feedback and goal setting go on in continuous dialogue based on previous performance and internal comparison. Interestingly, as Podsakoff and Farh (1989) note, regardless of actual performance negative feedback (you are bit below average) increases dissatisfaction and tends to lead to higher goals and improved performance compared to positive feedback (you are doing better than average). This implies the need for some kind of conflict to initiate improvement and learning.

A firm may take different approaches to learning and improving performance. March (1991) distinguishes between exploitation and exploration as organizational learning strategies. The exploitative approach seeks gradual improvement in current practices whereas the explorative approach focuses on more radical new ways of working.

Interestingly, learning orientation and network collaboration are intertwined. Westerlund and Rajala (2010) examined how firms enhanced their performance by collaborating within the supply network, especially in the case of new product innovation. Those adopting an exploitative learning strategy focus more on incremental improvements than explorers and are more likely to avoid collaboration.

Holmqvist (2003) applies the concepts of exploitation and exploration to the selection of an intra-organizational learning strategy: exploitation is a prerequisite for inter-organizational explorative learning, which in turn arises from confrontation.

Different industries and competitive environments require different approaches. Bierly and Daly (2007) demonstrated how exploration and exploitation are complementary learning strategies in different degrees. For example, explorative firms perform better in low-technology and highly volatile markets, whereas the exploitative approach produces better results in hi-tech business, especially when the demand is more stable. As March (1991) states, the returns from exploration are more uncertain and may be realized after a longer period of time compared to the effort put into exploitation.

Bierly and Daly (2007) show how the balance changes as the dynamic nature of learning unfolds. High-level and continuous exploitation begins to reduce returns

given the focus on internal process engineering instead of exploring new competences to meet customer needs.

Teams, like situations, differ. Reflecting March's view referred to above, Joshi (2003) suggests that alignment (consensus) results in better performance in teams with a low experience level. However over time established practices have a negative impact on performance as the team gains in experience.

The dual nature of exploitation and exploration is visible in supplier collaboration. When activities are low in design intensity the opposites (exploration – exploitation) work well together. Explorative suppliers are well suited to exploitative buyers, and vice versa. However when the level of design intensity increases an explorative supplier is preferable to enhance innovativeness and performance (Azadegan & Dooley 2010; Cadden et al. 2013).

Change in the competitive environment puts the learning strategy to the test. Auh and Menguc (2005) measured the impact of such a change on the prospector-type of firm searching for growth and the defender type looking for efficiency. They found that in the former case a change towards the exploitative approach improved performance, whereas if the starting point was defensive and exploitative then a change towards the explorative or an increase in exploitative actions did not bring about an improvement.

Ambidexterity, meaning finding a balance between exploration and exploitation, is adopted in an attempt to reconcile the sometimes conflicting and contradicting requirements (Lubatkin et al. 2006). The firm should be explorative and adapt to future needs on the one hand, and at the same time align its processes to allow maximum exploitation (Birkinshaw & Gibson 2004). Achieving ambidexterity capitalizes on the best features of exploitation and exploration at the same time. According to He and Wong (2004), for example, it is the most beneficial strategy in the implementation of technological innovations.

Ambidexterity has its own choice options, one of which is linked to the strategic choice between integration and differentiation. The development team can be structurally separate in a different organization, or tasks can be divided contextually within a team (O'Reilly & Tushman 2004). This requires consideration of organizational capabilities, and the selected mode of organizational orientation should also match individual capabilities.

The role of the management team is crucial in the SME context in which resources are scarce. Differentiation, meaning the separation of explorative and exploitative activities in different organizations, allows a selective focus, whereas integrating both activities in one team improves performance through coherence. The corresponding downsides are that the former will deplete resources and the latter will slow down the change.

According to Lubatkin (2006), ambidexterity is primarily a management issue. The team integration that is evident in joint decision-making and collaborative behaviour among top management plays a pivotal role in converting ambidextrous behaviour into better performance. In that respect ambidexterity may be more cumbersome in large firms with a fixed structure and an established chain of command, whereas the SME structure is more flexible and the line of command is shorter, bringing top management closer to the operations.

Management in ambidextrous organizations needs continuously to monitor the variation-selection-retention cycle, keeping the organization aware of change and minimizing inertia within it. There is a danger of falling into the trap of either structural or cultural inertia. Exploitation of and adaptation to the current environment fixes the structures, whereas continuous exploration and alignment reduce the speed of implementing changes effectively (O'Reilly & Tushman 2008). As Leventhal and March (1993) note with regard to learning myopia, the human mind is inclined to remember previous successes rather than failures.

Once selected, the way of working soon becomes static and eventually does not follow the dynamic market. Adaptive systems concentrating on exploitation are trapped in a sub-optimized status. When exploration takes the leading role the cost of unfinished experiments may become an excessive burden. Over time organizational knowledge affects the beliefs of individuals, and the code is moulded by their beliefs. The organizational code mediates the knowledge transfer between individuals. Slower learning (slow adaptation to the code) engages learners in allowing for questioning and the exploration of alternatives. A code that facilitates rapid socialization among individuals has its benefits in the form of improved practices (March 1991).

In sum, it is clear that organizational learning is a complex phenomenon. The market and technology move along an s-shaped curve from time invested in innovation to fast-moving differentiation, and further to a stabilized market and cost reduction. The competitive environment does not get less intense, and firms develop contingent strategies to defend their position and find prospective new avenues to explore (Auh & Menguc 2005; Menguc & Auh 2008). Exploration and exploitation could be seen as an intertwined dyad, each complementing the other (Kristal et al. 2010), with parallel features and no clear trade-off point (Rothaermel & Alexandre 2009).

Organizational evolution follows the market, and management has to shift its strategy at the right pace to overcome structural and cultural inertia. One solution is to maintain organizational ambidexterity, being competitive in mature markets by introducing incremental improvements and looking for discontinuities in emerging markets and technologies (Tushman & O'Reilly 1996).

Although cost saving is traditionally the basic driver of supply-chain collaboration, Fawcett et al. (2008) also point out the importance of the service level and

customer satisfaction in improving overall performance. According to them, the usual suspects preventing successful co-operation are technical and process issues. However the people hold the key to success. There needs to be sufficient training, education and, in particular, bridge building to encourage the right people to collaborate.

Notwithstanding its importance, knowledge is not an asset that can be simply exchanged, but is rather a firm-specific intangible resource enabling competitive advantage and actively moving firm boundaries (Spender 1996). Thus, in addition to focusing on knowledge in the supply chain (and in the economic system in general), it is worth paying attention to the learning process – how things are done and how they could be done better. What are the inhibitors and enablers of learning, whether it involves the exploitative use of the current stock of knowledge, the exploration of something new, or expansion of the system through change during the process (Engeström & Kerosuo 2007; March 1991)?

Organizational knowledge develops in the process of learning via changes from tacit-individual to explicit and shared and further to internalized modes (Nonaka 1994). It could thus be divided into what and how components: the former comprises information that can be codified and documented, and the latter consists of skills and operating principles. The organization applies the new process according to its combinative capabilities - a "*repository of capabilities as determined by social knowledge in individual relationships, structured by organizing principles*" (Kogut & Zander 1992, p. 396).

According to the knowledge-based view (Grant 1996), the firm is an institution that organizes production (coordination, structure and boundaries) by applying the knowledge of individuals. Its knowledge lies in the skills and competences of these individuals, which form operational practices. It is challenged in such an environment by the complex utilization of tacit knowledge in productive activity. Codified and common forms of knowledge are explicit and public, can be sold while still being retained, and if not protected by patents or copyright are in-appropriable (freely usable).

A firm's knowledge base as categorized in Table 2 is a mixture of individual, social, explicit (=codified) and implicit (=tacit) knowledge. According to Spender (1996), the trend is towards explicit coded knowledge, and from "craft to system" in both organizational and individual knowledge.

Table 2 The knowledge base of a firm (Spender 1996)

	Individual	Social
Explicit	Conscious skilled practices, education and training	Objectified e.g. standard or scientific
Implicit	Tacit psychological (automatic) knowledge (Polanyi)	Collective type of tacit knowledge (Durkenheim)

Spender (1996) argues that the knowledge of a firm is a process rather than a resource, and according to this constructionist view develops dynamically over relations of entities that are formed in pursuit of economic rents. The knowledge-based firm does not have a top-down type of hierarchy in which top management is the sole owner of the best and most privileged knowledge, as Spender states with reference to the firm as an economic organization: *independent knowledge-creating entities be they individuals or teams with tangible resources, are subordinated to the services they provide.*

This thesis explores the role of PSM in this transition. Traditionally characterized in terms of exploitation related to a cost-and-profit and line-management structure, in a digitalized and networked supply chain, nowadays it is more of an entrepreneurial and empowered organization seeking growth by exploration

2.5.3 *Organizational status and PSM*

SMEs may need to consider a radical reconfiguration of their organizational structures together with a full renovation of the corporate culture in the development of their service capabilities, with PSM playing a bigger role in strengthening inter-company relationships (Gebauer et al. 2012).

The need to match requirements and capacities is addressed in the information-processing framework (Daft & Lengel 1986; Trautmann et al. 2009), for example. Pagell (2004) and Wisner and Stanley (1999) point out the importance of internal integration in overcoming the barriers and succeeding in this endeavour. A PSM organization focused on improving internal communication and service quality will enhance the company's overall ability to satisfy external customers (Wisner & Stanley 1999). Pagell (2004) also identified practices that encourage operational integration. There is a need for common measures and an internal strategic consensus. In addition to the management support and communication there needs to be a structure that facilitates fluency in the flow of work.

Organizational learning is an internal issue, but also depends on the operating environment. Sorenson (2003) showed how vertical integration and organizational learning provided contingent paths in volatile and stable situations High integration limits learning in stable environments, whereas it succeeds better or at least

suffers less in volatile circumstances with higher-level integration and interdependence between organizations.

Another way of categorizing the organizational environment is in terms of integration and differentiation. A high level of integration works in well-defined structures when the team has a common code and its environment is at least momentarily stable. The situation is different in a complex knowledge-intensive business environment, however, when differentiation gains momentum over integration and the organization benefits from specialization and the division of labour (Lawrence & Lorsch 1967).

Organizations must resolve some critical issues in their quest for new knowledge. They are constrained in making changes by their absorptive capacity to assimilate and exploit external knowledge (Fractalanci & Morabito 2008; Lawson & Potter 2012). Internally, the supplier may turn defensive and see the buyer organization as a potential competitor (Sáenz, et al. 2013).

Strategic alignment plays a major role in organizational integration. As Hult et al. (2006) point out, this involves matching knowledge profiles with SCM strategy. Firms that adopt a low-cost strategy focus on knowledge exploitation and the use of current knowledge, whereas those that implement a differentiation strategy face pressures related to accessibility and the quality of external knowledge. Bierly and Daly (2007), in turn, argue that exploration is beneficial in conditions of high volatility and in low-tech business, whereas exploitation is more feasible in a stable high-tech business environment. Both of the above-mentioned studies reflect the view of Yli-Renko et al. (2001) that the acquisition and exploitation of knowledge relates to competitive advantage by means of new-product development, technological distinctiveness and sales-cost efficiency.

The relationship between a firm's technological capability and the geography of its knowledge sourcing is complex. It is not irrelevant from where and from how far the knowledge is acquired, not to mention how it is used. Notwithstanding the technical advancements the regional aspect is valid in knowledge acquisition, and there are distinctions. The more established the institutional environment is, the more is to be gained from local linkages, whereas in less developed economies knowledge is sought from the international market. The capacity of a firm plays an important role. Emphasis on local knowledge is more common and contributes more to product innovation in firms that are technologically lagging behind, whereas localness has no impact on technology leaders (Wang 2015).

2.5.4 PSM performance and information processing fit

Functional performance is undoubtedly one of the targets of information processing in PSM. Performance evaluation entails the assessment of the situation in

reality compared to the target (Zsidisin et al. 2015). Aspirations related to purchasing performance are not separate endeavours but must be aligned to the firm's strategy. In search of better performance PSM may choose the zero-sum game or act like a trader in an uncertain market (Veal & Mouzas 2010). Purchasing performance is expressed as a combined measure of the financial profit and competitive advantage PSM brings to the firm (Eltantawy & Giunipero 2013).

Purchasing performance has a direct impact on organizational performance and on the firm's overall performance. As far as PSM is concerned, organizational performance traditionally comprises costs related to purchases, on-time delivery, quality and flexibility (Pohl & Förstl 2011). whereas on the firm level management is increasingly interested in its contribution to the innovation process (Foerstl et al. 2013).

A firm may have a contingent market and product strategies, and accordingly may exploit or explore knowledge either in its market or in its strategies. Voss and Voss (2013) found that large and older firms more successfully adopted ambidexterity as an approach, having the resources to utilize the complementary nature of exploitation and exploration, whereas the performance of younger firms attempting to do the same declined. It thus seems that an ambidextrous approach to the market benefits large firms but not old, young or small firms. SMEs simply lack the resources and capabilities to manage the tension in mode change.

Absorptive capacity boosts performance in providing the means to achieve unique competitive advantage, and works as mediator for developing (IT) system efficiencies (Cohen & Levinthal 1990; Flatten et al. 2011; Francalanci & Morabito 2008).

Absorptive capacity also relates to higher performance in cases of environmental uncertainty and manufacturing flexibility, and is essential in balancing learning efforts in terms of maintaining current working processes and implementing novel improvements. Moreover, firms requiring a broad selection of products to ensure manufacturing flexibility could compensate for a shortage of resources if they have absorptive capacity in the right place. The more volatile the business environment is, the higher the impact of absorptive capacity on overall performance. Operational ambidexterity also helps to enhance performance through the balancing of continuity and the introduction of new processes, especially in volatile business environments (Patel et al. 2012).

In cases of high external uncertainty, on the other hand, organizational integration together with a proper fit between information-processing capacity and requirements relate positively to performance (Trautmann et al. 2009). Organizational performance is tied to the operational environment and recognition of the role of PSM in the firm. Well established, cross-functional integration relates positively to both PSM and firm performance (Foerstl et al. 2013). Shared organizational norms undoubtedly enhance SCM performance, as do intra-organizational

knowledge sharing and incorporating the working culture, according to Eng (2006).

The counter-effect of organizational congruency on the team and its performance should also be taken into account (Adams 1953). A recognized status has an initially positive impact on performance on the individual and group levels. Moderate status congruency is superior to high congruency in terms of technical performance, which at first increases, but later when the status congruency (fixed organization roles) is established team performance will significantly decrease. Social performance works in the opposite direction (cf. Joshi et al. 2003): social congruency improves in line with performance, but in the end the willingness to improve will diminish. Reflecting the model of skilled incompetence (Argyris 1986), the organization begins to justify itself and selects appropriate performance measures.

Empowerment contributes positively to the team's own work and its performance in conjunction with other teams (Giunipero & Vogt 1997). Siebert et al. (2004) tested the organizational climate in relation to work performance, and found that empowered teams engaged in information sharing, initiative taking and self-directed acting were more efficient than hierarchically organized teams. Levels of empowerment and group autonomy depend on the organization's reputation and strategic performance. One size does not fit all. Competences required for high performance are different in efficiency-seeking firms than in expertise-oriented organizations (Doorewaard & Meihuizen 2000), and having good external and internal conditions is not enough. Collaborative processes such as communicating, forecasting and integrating are the key drivers of supply-chain performance. When fundamentals are in place the cross-functional business performance can be improved (Teller et al. 2012).

Performance is a combination of internal capabilities and external conditions. Variations in organizational performance derive from the strategies adopted to handle uncertainty. Uncertainty in the business process increases the need to process information. The acquisition of knowledge and the related information processing enable organizations to do their preplanning and to introduce flexibility into the operations (Galbraith 1974). It should be noted that the increased amount of available information does not increase uncertainty, although the increased information-processing needs do affect performance. As Galbraith states, matching information-processing requirements and capacity is a continuous task: without active selection performance automatically weakens. Organizations could reduce the need for information processing by increasing team independence or augmenting slack resources. Alternatively, they could increase their capacity for handling new knowledge and information processing by enhancing vertical information systems and fostering lateral relationships. In other words, management systems, target setting and performance should provide top management people engaged in

operative tasks with coherent data. Moreover, functional teams should not work in isolation on achieving their own targets, but should foster inter-organizational cooperation.

3 METHODOLOGY

The focus in this chapter is on positioning the research and explaining the methodological choices. The first section gives an overview of the philosophy of science as a research approach and the second discusses the methodological choices. The development of knowledge is endogenous, and intentionality (Wright 1971) in human behaviour makes causality ambiguous. One way of tackling the timing problem in the research process is to focus on longitudinal observations and data collection. Another option is to conduct cross-case analyses comparing cases at the same time or over time (Langley et al. 2013).

A mixed-method approach was selected for this research, involving both cross-case qualitative analysis and structural equation modelling. A careful literature review preceded the empirical research. Indeed, it was the literature review that highlighted the increasing role of knowledge acquisition in PSM.

The third section locates the articles comprising this thesis in the theory-development process and describes the research process in more detail. The final section assesses the validity and reliability of the research.

3.1 Research approach (the philosophy-of-science view)

The key element of the theory-building process, according to Sandberg and Alvesson (2011), is summarised in Foucault's statement on problematization: "*Endeavour to know how and to what extent it might be possible to think differently instead of what we already know. Disrupt the reproduction and continuation of an institutionalized line of reasoning*".

Fawcett et al. (2011) stress the relevance of theory development in research on supply chains. The more dynamic and even more chaotic the world around us is, the bigger is the need for a good theory that will help in resolving daily challenges, adjusting to societal and governmental changes and exploiting technological innovations.

Theory provides a snapshot of reality, giving one possible explanation for real-life phenomena. The philosophy of science explores the methods used to explain how scientific research can and should develop a theory and further improve explanations of the phenomenon. There is no single formula to be applied in that process. Philosophers of science provide multiple guidelines on developing the

theory to enhance understanding of the world and broaden the current knowledge base (Table 3).

According to Hempel (1965, p. 139), the function of science is to describe things and events and to establish general laws (theories) with the capacity to explain and predict. Theory sets general empirical rules for establishing subjectively meaningful explanations of phenomena. He advocates the use of an experiment-in-imagination approach (Hempel 1965, p. 164), which may be intuitive (a principle predicted a priori based on past experiences) or theoretical (the what-if model), based on rigor and deductive logic. Hempel bases his philosophy on the two-path governing-law model. On the deductive nomological path general (natural) laws are used to explain phenomena of which the antecedent conditions (sufficient or necessary) are known. On the inductive and probabilistic path, in turn, statistical generalization is used to justify the theory relative to the conditions.

Popper emphasises the principle in critical rationalism that somewhere there is absolute and objective truth, thereby rejecting the relativistic view (Popper 1970, p. 56). Elsewhere (Popper 1968) he states that the core idea of theory building lies in its falsifiability. Confirmation is not good enough because all hypotheses are confirmable if appropriate theories are selected. A proper scientific theory satisfies the criterion that it can be falsified and refuted by means of testing. Falsification is also problematic, however, in that it is not obvious what should be tested and there may a similar problem as with confirmation: hence the requirement that the whole set of theories must be falsified. The evolutionary process following the continuous testing of hypotheses involves finding an increasingly solid theoretical baseline for unchanged truth.

Kuhn's (1996) relativistic view is based on the assumption that new knowledge eventually changes the foundation of old theoretical paradigms: theories and progress of science in general is to be seen relative to the context they were made and used. Accordingly, paradigms (old and new) are incommensurable – there is no right or wrong and no absolute truth. Moreover, scientific progress is seen as puzzle-solving (Kuhn 1970). Normal science is based on agreement about common theories. The paradigm is challenged by anomalies that cannot be explained relative to the established paradigm context. The critical moment is when the paradigm does not explain the new phenomenon, or is not sufficient in the changed environment. What follows is scientific revolution that triggers the development of a new paradigm. The perception of structure of the paradigm what belongs to a discipline and what does not are incommensurable and should be seen as relative to their history and context. If this logic is applied to independent research such as that reported in a thesis, it could be said that the predefined structure of a paradigm establishes the framework but the context and historical development determine the final positioning.

Table 3 Philosophers of science and their worldviews

Hempel 1965	Aspects of scientific explanation	Governing law
von Wright 1971	Explanation and understanding, intentionality	The intentional nature of human action
Popper 1968	The Logic of scientific discovery	Critical rationalism and falsifiability
Kuhn 1996	The structure of scientific revolution	Progress relative to the context
Kuhn 1970	The logic of discovery	Puzzle-solving and critical moments
Lakatos 1970	Falsification and the methodology of scientific research programmes	Predicting and digesting anomalies

Lakatos defines a research programme as consisting of a hard core and a protective belt (Lakatos 1970, p. 132). The former sets out the fundamentals on which the latter is based. A positive programme builds on the shared core of the scientific discipline and “*progress exists when new theories are able to explain KNOWN phenomena and predict the appearance of NEW empirical phenomena (Arlbjörn & Halldorsson 2002).*”

Scientific programmes advance via post-hoc theory development rather than restricted ex-ante rules. Interactions and choices are modelled on the basis of research paths reflecting individual actors’ preferences. Positive heuristics define the protective belt with its “*auxiliary hypotheses that are needed to predict and digest empirical anomalies*” (Lakatos 1970, p. 136). Conversely, negative heuristics determine the core basics and explanatory principles of the theory. Change in the core may entail rejection of the entire programme, which is seldom a target (Herne & Setälä 2004).

Following the structure defined by Lakatos, Arlbjörn and Halldorsson (2002) describe the core logistics programme as “*Directed toward the flow of materials, information and services; along the vertical and horizontal value chain (or supply chain) that seeks to coordinate the flows and is based on system thinking (i.e. holistic view), where the unit of analysis essentially is the flow*”.

They provide a framework (Figure 8) that positions theory development in logistics (e.g. PSM). The basis could be a ‘solid’ theory such as the RBV, or more loosely constructed when the target is the generation of new concepts. Theory development entails the descriptive empirical testing of existing concepts (1) and the refining of a well-established theory base such as the KBV, the RBV or TCE to

better serve the specific needs of the discipline in question (3). Research may generate new concepts (2) that are still loosely connected to established paradigms. Finally (4), the knowledge base of the discipline is expanded when new theories are borrowed and introduced, and connected to the core and its protective belt.

	<i>Theory testing</i>	<i>Theory development</i>
<i>Loose theory base</i>	1) <i>Testing of known concepts</i>	2) <i>Generating new concepts</i>
<i>Solid theory base</i>	3) <i>Refining the existing knowledge base</i>	4) <i>Expanding the knowledge base</i>

Figure 8 Knowledge creation in logistics (Arbjörn and Haldorsson 2002)

This thesis fits into the fourth and first quadrants of the framework, being built on theories of the firm reflecting the KBV as well as the RBV. The information-processing framework provides a base on which to test knowledge acquisition in PSM.

The research articles included in this thesis expand the knowledge base in proposing new set of purchasing capabilities. In tighter networks PSM should be capable of managing process automation and integrating purchasing in the delivery of tailored solutions. In looser networks, on the other hand, supplier relations do not need to be controlled by contracts and PSM should be able to adapt service concepts to purchasing.

The articles also investigate the use of organizational-learning concepts in purchasing and supply management. Various learning strategies are considered in relation to observed buyer-supplier relationships. On the empirical level the research focuses on the association between PSM status, knowledge acquisition and purchasing performance. Purchasing actively participates in knowledge creation in the supply chain, which in turn supports the management of goods and information flows.

3.2 Methodological choices and positioning

The positioning of research raises a fundamental ontological question concerning the nature of reality and knowledge. According to the positivist view, reality is knowable and measurable, hence context-free generalizations can be made. An alternative view is that actors interpret reality subjectively and knowledge is socially construed, hence generalization is relative to the context. Other significant questions raised include the epistemological, concerning recognition of the relationship between the knower and the known. One must consider the difference between subjectivity and objectivity: what aspects of knowledge are based on subjective experience and what are based on acquired knowledge (Arlbjørn & Halldorsson 2002).

Gammelgaard (2004) explains how Arbnor and Bjerke's (1997) research model (Table 4) expands methodological choices in logistics research. Their framework helps researchers to position their own work and methods in the relevant paradigm so as to ensure validity and rigor.

First, the analytical approach applies ideas of universal laws and deductive analysis. The object is decomposed into atomistic elements to examine the causal relationships and behavioural antecedents that explain the orientation of the supply chain. However, many logistics systems include feedback loops, which make the causal relations more complex.

Second, the systems approach is based on maps and models that project a more holistic view departing from functional sub-optimization to the targeting of more integrated goals. Third, the actor's approach relies on sociological theories that take account of the actors and the context. The individual context has an impact on supply-related decisions and activities.

The studies included in this thesis fall within the analytical and actor's approaches identified in Table 4. Article 1, "Status of service purchasing capability in networked supply chains" is a conceptual paper analysing the role of PSM in the extant literature within the framework of the activity system. The literature-review-based research mainly follows the systems approach in mapping the extant literature to an a-priori model. There is also something of the actor's approach in it. The content analysis involves the researcher in the process of adapting an a priori structure and developing new categorizations while learning more about the phenomenon.

Table 4 Research approaches (Gammelgaard 2004)

	Analytical Approach	Systems Approach	Actor's Approach
Theory type	Determining cause-effect relations. Explaining and predicting based on universal laws	Models and recommendations with normative aspects. Knowledge about concrete systems	Interpretation and understanding based on contextual knowledge
Preferred method	Quantitative (possible qualitative validation)	Case studies, qualitative or quantitative	Qualitative
Unit of analysis	Concepts and relations	Systems: links, feedback mechanism and boundaries	People and their interaction
Data analysis	Description and hypothesis testing	Mapping and modelling	Interpretation
Position of the researcher	Outside	Preferably outside	Inside, as part of the process

The analysis in Article 2 is based on a case study of supplier development and applied learning strategies conducted to enhance understanding of the mechanisms that function at the boundaries of buyer-supplier relationships. It follows the systems approach in the matrix, with qualitative methodology. Following the data analysis the identified learning strategies were mapped in a relationship model

Article 3, entitled “The effect of external supply knowledge acquisition, development activities and organizational status on supply performance in SMEs” explores the role of knowledge by means of cause-effect modelling and hypothesis testing. It falls into the analytical category in the research-approach matrix. The unit of analysis is the relationship between organizational integration and various organizational orientations in the process of knowledge acquisition.

3.2.1 Sequential mixed methods

The research process followed Creswell’s (2009) sequential-mixed-methods approach. The first step was to conduct a comprehensive literature review. Content analysis revealed various change factors that affect PSM capabilities. PSM takes on more of a strategic role as supplier networks become broader, and could feasibly be considered from an organizational-learning perspective.

This approach was taken further in the second step, which constituted an analysis of the drivers of supplier development in buyer-supplier relationships. The analysis revealed the presence of exploitative and explorative activity types as learning strategies. The third step was to identify the constructs behind these organizational-activity types by means of a survey. Structural equation modelling was used to assess their association with perceived purchasing performance and their function as mediators of organizational status.

The three above-mentioned research articles contribute to the different steps in the concept-building process. Each one describes an independent research endeavour following a specific research process. The aim in this summary is to synthesise the three studies and to assess their respective contributions during the different theory-development stages.

The chronological order of the research is depicted in Figure 9 below. The original plan was revised during the process as a deeper understanding of the phenomenon and the substance developed. The process was not as linear as it looks in the simplified picture. In reality, it was abductive (Dubois & Gadde 2002) and theories were revisited frequently as knowledge was gradually accumulated.

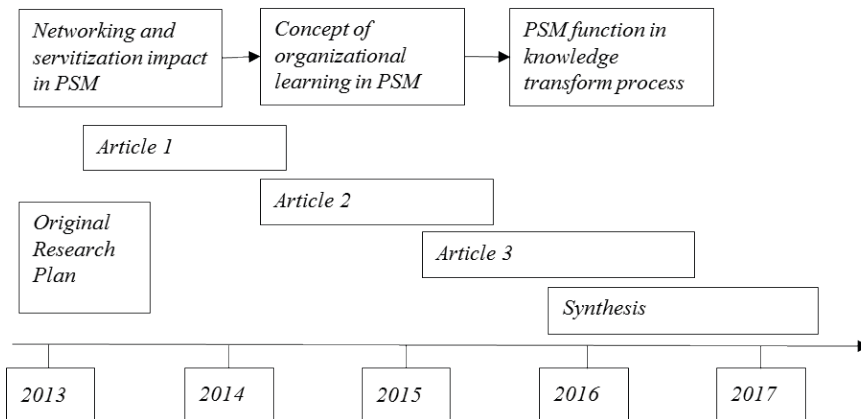


Figure 9 The timeline of the research process

3.2.2 The systematic literature review

The literature reviewed in the first article was subjected to content analysis, an effective analytical method that is systematic and transparent (Seuring & Gold 2012). The process includes four main steps: material collection, descriptive analysis, category selection and material evaluation. The material-collection phase includes sample selection, when the material is delimited according to the defined unit of analysis.

Following the guidelines put forward by Seuring and Gold (2012), the articles selected for the review covered a ten-year period, 2002-2012, to ensure sufficiency in terms of numbers. The search for journal articles covered the digital libraries of known publishers (Elsevier, Emerald, EBSCO and Inderscience), and keywords were used to find articles about service purchasing. The first search round yielded over 600 articles. These were screened by checking the abstract and reduced to 93 to be included in the review, which was sufficient. Creswell (2009) suggests that a literature review should cover some 50 research articles.

The second step in Seuring and Gold's (2012) model is to carry out a descriptive analysis aimed at identifying formal characteristics and patterns in terms of what has been published and when. The descriptive data constitutes the basis on which relevant categories are derived from extant literature in the third step (Eisenhardt 1989).

Figure 10 gives an example of the descriptive data derived from the source material, which is grouped based on the industry sector on the x-axis and the distribution of topics. For example, it shows how service purchasing is of interest in a broad selection of industries. More specifically articles about the service industry are rather generally about value chains and supply chains, whereas knowledge management is a main theme in just nine per cent of them.

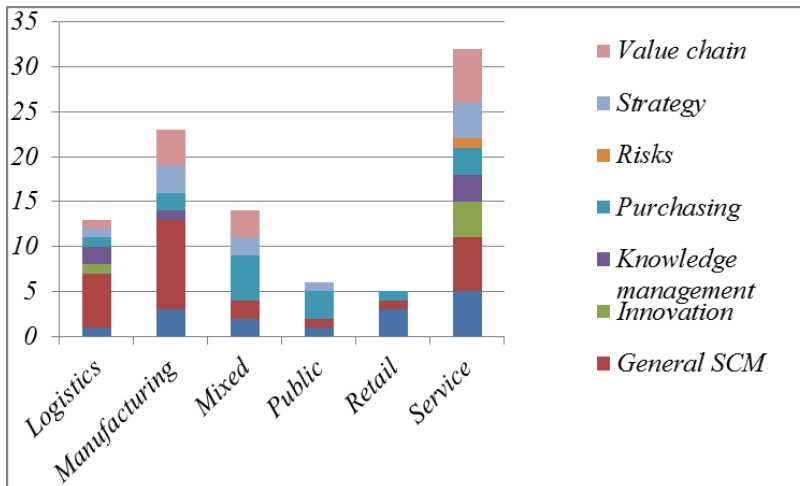


Figure 10 Literature review: descriptive statistics

It is worth stressing that grouping and coding are always based on subjective judgement, no matter how many coders there are or iterations made. Therefore transparency and well-documented coding are both essential contributors to reliability.

The category selection in the third step derived from a-priori models. The first task is to define the themes and features that are sought from the material. The

categorization may be deductive based on existing theory, or inductively constructed from the material. In practice the process is iterative, following the abductive approach (Dubois & Gadde 2002; Kovács & Spens 2005). It begins with an a-priori framework, which is elaborated during the analysis when the data and categories are compared before the theory is revisited.

The fourth step in the Seuring and Gold (2012) process is to evaluate the material according to the categories defined a priori and during the process. This involves reading through each article, marking the category themes and identifying the relationships between them. In the analysis a computer tool such as N-Vivo[®], which is used to code the source documents theme by theme. Theme nodes are created and re-organized during this process. The findings are reported once the coding is saturated and logical.

Table 5 below shows the coding summary. Of the reviewed articles, 29 per cent mentioned the relationship- and supplier-selection process, and 18 per cent were coded under knowledge management.

Table 5 Coding summary

Theme node	Items coded	% share
Articles out of scope	6	2
Contract management	20	7
Knowledge management	49	18
Quality	31	12
Relationship	79	29
Strategy	36	13
Service business	48	18
Grand Total	269	100%

One observation about the coding summary is that the analysis identified six more articles as not within the intended scope. The results do show, however, that the articles included in the review are from the relevant area of interest: the distribution merely refers to the journal articles. It should be noted that one should not generalise the results to imply that 18 per cent of all articles are about service business.

3.2.3 The case study

Qualitative case studies are often conducted when little is known about the phenomenon and theories need to be generated or further tested (Eisenhardt 1989). Creswell (2009) lists some typical characteristics of qualitative research: the data

is collected in a natural field setting and the researcher is the key instrument. When the researcher is working in the field conducting interviews, for example, he or she can focus on the interviewee's understanding of the issue.

The second article of this thesis represents qualitative methodology. The cross-case analysis was based on semi-structured interviews conducted in 16 firms representing different types of industry. The case study does not lend itself to statistical sampling, and therefore relies on theoretical sampling (Eisenhardt 1989; Pagell 2004). The sample in question included buyers, suppliers and project integrators from various industry sectors. The focus in each interview was on the buyer-supplier relationship in the particular industry, which limited the otherwise broad relationship landscape (Halinen & Törnroos 2005).

Respondent firms were mainly from contact database of "Hankintaosaaminen kasvun tueksi"- project. Following the purposeful sample selection practice different types of firms were accessed to obtain variation in size and in level of servitization. All interviewed managers had good understanding on buyer supplier relationship of their organization. Six of interviewees were representing executive (CEO) level of management. Equally six of the managers were in charge of delivery, purchasing or operations in their organizations. Also the interviewed designers, technology and service directors were closely working at buyer supplier interface.

Operations strategy categories of case firms were evenly distributed in prospector – analyser – defender scale (Auh & Menguc 2005; Miles & Snow 1986). Five of the firms fall in prospector category using differentiation and customer oriented solutions as competitive edge. Also five firms can be categorized as analyser having specialized role and demonstrating rationalized delivery projects. Six firms have strategy to defend keep stable volume in their production capability. The fourth group in typology are reactors who typically do not have explicit strategy (Auh & Menguc 2005). In the selected sample there none of the forms fell to that category.

Theory is not used to explain phenomena in qualitative research, but it provides a lens through which to examine them (Creswell 2009). The framework needs to be well established. As Halinen and Törnroos (2005) suggest, cross-case research requires an a-priori theoretical framework as a lens within which to make the comparison. The theory of organizational learning served this purpose in the second article.

Timing is an acknowledged problem in case studies (Halinen & Törnroos 2005). People tend to pay attention to the most recent events, and successful incidents carry more weight than failures (Levinthal & March 1993). Open-ended questions were formulated using the critical-incident technique to focus attention on situations of learning over longer period of time (Flanagan 1954; Halinen & Törnroos 2005).

The data to be analysed is organized by category or dimension, and similarities between in-group and inter-group differences are sought (Eisenhardt 1989). The collected data, the transcripts and all other documents are assigned predetermined codes and codes that emerge from the data (Creswell 2009). For the analysis in question a codebook was made beforehand, and was further developed during the process. Reading the texts and detecting the codes that belong to certain themes is an iterative process, but at some point saturation sets in. At that point the material is coded in themes in such a way that the relations between the themes and the descriptions are logical and justified (Eisenhardt 1989).

According to Creswell (2009), the research process is inductive and the reporting reflects the interpretations of the participant, the researcher and the reader. Eisenhardt (1989) considers the case study to be useful when current theoretical perspectives do not suffice. The method highlights conflicts, which in turn generate new theories when the prevailing ones seem to be inadequate. In the second article, for example, the well-established theory of organizational learning is used in the context of purchasing and supply management, and not only as a supplier-development practice but also as a strategic operational choice.

The interviews were coded using NVivo software according to the operationalized evaluation criteria, which comprised two main dimensions. The activity system dimension included nodes describing network, its rules, division of labor, actors and expected outcome. The other dimension had nodes to capture comments on competitive advantage, learning experience, and supplier capability and development activities.

During the coding process some new nodes were established and some nodes were combined following the abductive research process. When all interviews had been coded and saturation point was reached the nodes were re-grouped. The activity dimension included groups related to phase of a business process – claim handling, contracting, new product development and process enhancement. Claim handling corresponds to reactive learning, contracting mode fits to exploitation and new product development requires explorative learning strategy. In case of new process development can be found it provides an example of expansive learning.

Finally it was evaluated what kind of learning strategy is applied to reach objectives at buyer supplier relationship. It was concluded that most often referred objective was operational flexibility – contract controlled planning supported by responsiveness to unplanned incidents. In the analysis, it was also noticed that there is a need beyond the contract controlled relationship. In addition to the regular flexibility, the firms are looking for any sort of information from the relationship to minimize uncertainty at foreseeable future – feature labelled as “foreseeability”.

3.2.4 *Structural modelling*

The third article of the theses continues on the trail of the sequential mixed-method path. It takes a closer look at the explorative and exploitative orientations of organizational learning, the two activity types that came to light in the case-study interviews. The two orientations were operationalized in detailed questions based on the extant literature. These questions were included in a survey questionnaire dealing more broadly with the purchasing function and its performance in manufacturing. The survey results were analysed by means of structural equation modelling (SEM).

SEM is an extension of multivariate modelling and tests multiple, interrelated serial relationships simultaneously (Hair 1998). At the core of the analysis is a theoretical model relying on the assumption that causality between variables is based on theoretical justification, and it should be remembered that the tool or technique does not provide proof of causality. As the model is being built there is no need for physical temporal antecedence of cause before effect or a lack of confounding variables if the theoretical rationale holds otherwise (Hair 1998, p. 435).

Self-selection bias and endogenous matching are major causes for concern when it comes to making causality assumptions in survey-based studies (Clougherty et al. 2016). One limitation of the product method of mediation analysis is that it does not bring to light possible interactions between the variables, which affects estimations of the total effect. Therefore, given that it is not possible to control for all confounding variables in the test setting, it is not possible to make causality assumptions, either. However the method is suitable (sufficient) for testing the mediation effect (Valeri & Vanderweele 2013).

The first step in addressing the constraints in the analysis was to test for self-report bias using the early-late-response split, and the second was to see if those who performed well in terms of operating margin may have been more likely to respond, thereby causing self-selection bias (Heckman 1979). In this case, there was no significant difference in operating margin between the respondents and those who did not respond, implying the absence at least of firm-performance and slack-resource-based self-selection (see Lavie et al. 2010). However, when conclusions and limitations are considered it should be noted that even though the association is significant, the causality is not proven.

Following the construction of the theoretical model a two-step process was followed (e.g. Cadogan et al. 2006; Cousins & Menguc 2006; Lawson & Potter 2012). First, the reliability and validity of the items were assessed in the measurement model by means of confirmatory factor analysis (CFA) (Cadogan et al. 2006), meaning that construct validity and unidimensionality were evaluated to test the structure of the latent variables and their relationships. Latent constructs are the hypothesized and unobserved variables in the model.

It is advisable in CFA to test the convergent and discriminant validity of the latent constructs, in other words how much variance they share and how they differ from other constructs. The most commonly used measure is Cronbach's alpha (Field 2013), which assesses construct reliability in terms of the extent to which the construct items measure the same thing. It is calculated by summing the variances (s) and covariances (cov) of the construct and dividing the squared number of items (N) multiplied by the average covariance by the sum (Equation 1).

Cronbach's alpha:

$$\alpha = \frac{N^2 \overline{cov}}{\sum s_i^2 + \sum cov_i} \quad (1)$$

According to Hair (1998), average variance extracted (AVE) should also be used to assess convergent and discriminant validity. AVE measures the level of variance captured by a construct versus the level due to measurement error (Equation 2). It is calculated by dividing the sum of squared standardized loadings (λ) by the same sum (λ) and the sum of measurement error (ε) of each indicator.

Average variance extracted:

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum \varepsilon_i} \quad (2)$$

Convergent validity, shows how well the latent construct is measured by its indicators whereas discriminant validity indicates how well latent constructs are different compared to other constructs included in the model. Sufficient convergent validity is obtained when at least half of the variance is attributable to the construct. Discriminant validity is tested by ensuring that the AVE of the construct is greater than inter-correlation with any of the other constructs (Cousins & Menguc 2006; Hair 1998).

The model was tested using maximum likelihood (ML) method, which estimates the parameter values of the model that maximize the likelihood of observed data to occur. The higher the probability, the better is the fit of the data to the theoretical model (Field 2013). Interaction and reflective vs. formative tests were conducted using Partial Least Square (PLS) tool as these tests are not available in ML method. However, the goodness of fit tests of the model were carried out using ML, as it has defined set of goodness of fit values for model identification.

In maximum likelihood estimation method objective is to find probability distribution that makes observed data most likely. The method (Equation 3) seeks the value for the parameter vector w that maximizes the likelihood function L to fit the observed data (y) and the model by given parameter values (w). (Myung 2003)

Likelihood function:

$$L(w|y) = f(y|w) \quad (3)$$

More specifically the maximum likelihood function computed from sample covariance matrix (S) and predicted covariance matrix ($\Sigma(\theta)$) as shown in equation 4 (Anderson & Gerbing 1988). In the model there are p observed variables and $p \times p$ observed sample S covariance matrix. The parameters in $p \times p$ $\Sigma(\theta)$ predicted covariance matrix are estimated so that the likelihood of the sample is most probable

Maximum likelihood function:

$$F(\theta) = \ln \left| \Sigma(\theta) \right| - \ln |S| + \text{tr} \left[S \Sigma(\theta)^{-1} \right] - p \quad (4)$$

It is important in maximum likelihood method to ensure a sufficient number of observations compared to the number of coefficients to be estimated. Hair (1998) recommends a sample size of at least 50 but not over 500. Large samples will make the system too sensitive and goodness-of-fit measures will indicate a poor fit. In order to identify the model and estimate the parameters the number of sample moments – known as variances and covariances – of the data has to exceed or equal the number of parameters to be estimated. In other words, there must be at least as many equations to be solved as there are unknown parameters.

The modelling tool (e.g. AMOS[®]) provides a large variety of discrepancy functions based on the degree of freedom to evaluate goodness of fit (Arbuckle 2013). Some poorly working indicators may be removed from the model during the evaluation to find best balance between parsimony and goodness of fit. Table 6 lists the fit indices used in the analyses. The reasonable-fit values are in accordance with Arbuckle (2013) and Jöreskog (1993).

Table 6 Goodness-of-fit indices

Abbreviation	Description	Reasonable fit
CMIN/DF	Minimum discrepancy divided by the degree of freedom	<2
CFI	Comparative fit index (discrepancy and the degree of freedom are compared to the baseline model), 1 indicates a perfect fit	> 0.95
GFI	Goodness of fit index, 1 indicates a perfect fit	> 0.95
RMSEA,	Root mean square error of approximation (minimum of the discrepancy function divided by the degree of freedom)	< 0.08
PCLOSE	Probability that population RMSEA is no greater than 0.	> 0.5

In the structural model the located explorative and exploitative PSM activities were mediators of organizational status and antecedents of purchasing performance. The model was tested following the model generating process suggested by Jöreskog (1993). The goal of the re-specification is to achieve a good model fit and to be able to interpret every parameter meaningfully.

A bias-corrected bootstrap method, with 1,000 samples in the maximum likelihood estimation, was used to test the hypothesized structural model. The bootstrap method is useful in cases in which there is non-normality in the sampling distribution and multiple mediators are accommodated (Preacher & Hayes 2008; Rungtusanatham et al. 2014). The 95-per-cent confidence interval also confirmed the significance of the path coefficients.

The supply performance is a key outcome measure in the model and we tested the nature of the construct carefully. If the construct is modelled as reflective when it should be formative, the hypothesis test results may be subject to Type I error incorrectly rejecting null hypothesis (Diamantopoulos & Sigauw 2006). Are performance indicators reflecting latent construct of performance or do they form performance as such. Thus the nature of the performance construct is critical in that respect (Foerstl et al. 2013). The direction of the indicator effects was tested using Confirmatory Tetrad Analysis of Smart PLS, which allows distinguishing between formative and reflective measurement models. Confidence interval included zero in the two tailed test result, which indicated that in the model the performance construct is reflective.

3.3 Concept development

The three research articles included in the thesis are connected in a conceptual development that proceeds in steps either describing the phenomenon or seeking more normative causal relationships. Anomalies – such as changes in the supply chain as proposed here – open up new perspectives on the phenomenon (Christensen 2006; Holmlund 2004; Jaworski 2011).

Knowledge acquisition and learning are non-linear processes, which makes the methodological choices more challenging. They both incorporate a feedback loop and cause a change in the status of the object (the learner), and also change the process of how things are done. In other words, does the performance improve because of the learning or because of the new process?

Variance comparison is used to find out what other things may explain phenomenon. The time effect is substituted by comparing variance in a large group, for example. Given the variation in time and context, generalization is a challenge. Case studies usually involve one or a small number of cases and the researcher must provide enough information for the reader to judge the generalizability. The research can and should highlight paradoxes and contradictions based on the dialectic approach, for instance (Langley et al. 2013).

The theory is meant to envision and identify the phenomenon and its relationships. According to MacInnis (2011), a theory explains why and when to bring in the contingency aspect. Existing theories provide stepping-stones to facilitate the formulation of constructs and predictions. Understanding of the circumstances and relationships improves during the research process and the theory needs to be revisited, in accordance with abductive research (Dubois & Gadde 2002).

The process of conceptualization involves identifying patterns, relationships and underlying properties. Its contribution is to bring in something new from the construct level to the whole science – seeing the wood for the trees as it were. According to MacInnis' (2011) framework, this basically means envisioning and identifying new perspectives.

Eisenhardt (1989) developed a consistent and tested theory-building framework. Building theories from case studies is an iterative process linked firmly to the data. The process is initiated via the formulation of research questions and a priori constructs. Instead of starting from set of hypothesis derived from extant theories the development process is a question of developing measurable constructs and hypotheses to be tested and falsified. The starting point is the juxtaposition of paradoxes (e.g. a service paradox) and the extent to which contradicting evidence can be taken into account.

The abductive process involves the systematic combining of and interacting with theory and empirical observation (Dubois & Gadde 2002), and is well suited to the study of value creation in supply chains, for example. The process and the

outcome vary depending on the actors involved, which makes temporal and spatial comparison difficult: things may change, or the things we observe may be temporal outcomes of continuous change processes. (Langley et al. 2013).

Theory and concept building are often described as proceeding in sequential steps. Holmlund (2004), for example, identifies six steps: 1) description (traditional concept/theory); 2) definition and categorization (e.g. business relationship); 3) problem description (e.g. complexity); 4) model description (e.g. interaction layers); 5) explanation of outcomes (e.g. interactions between levels and over time); 6) implications (e.g. consideration of the dynamics).

Jaworski's (2011) seven-step process of concept development is another example: 1) definition, 2) observation, 3) justification, 4) concept formulation (literature review and gaps between theory and practice), 6) construction and 7) matching the concept with the research.

The theory-development process is iterative rather than a stepwise march ahead. According to Christensen (2006), theory as a body of understanding is built on descriptive and normative stages proceeding in iterative steps focused on constructs such as observation, categorization, association and anomaly, and iterating between the constructs and the descriptive and normative aspects.

Both the descriptive and the normative stages proceed in three iterative steps, accumulating in a body of understanding. Inductive and deductive reasoning are both present in the process: models may be formed and confirmed inductively based on observation, or reduced deductively to predict observations and measures.

Normative theory is based on the testing of hypothesized causalities. Research focuses on enhancing clarity in terms of the categorization of situations and circumstances, thus increasing the predictive power of the theory. The point in this process is not to confirm the known but to identify anomalies and contingencies when they occur. The resolution of anomalies takes the theory forward, as Kuhn (1996) points out, until the theory base is shaken more thoroughly in a paradigm shift.

Causality is a major aspect of predictive power in normative development. However, intentionality in the knowledge process and in human action in general has to be recognized. Knowledge acquisition is a consequence of the intention to learn, as well as a predecessor that makes learning and knowledge creation possible.

Table 7 compares the theory-development steps in Christensen (2006), Holmlund (2004) and Jaworski (2011). The contributions of the three articles are added in the far-right column.

Observation and the definition of the current state and understanding is a common starting point, facilitating the observation and detection of anomalies or problems in the model in question. The current literature provides tools for forming

constructs and models to build and correlate relationships. Constructs facilitate identification of more normative causal relations and justification of the necessary phenomenological conditions.

Table 7 Theory-development processes compared

	Christensen (2006)		Holmlund (2004)	Jaworski (2011)	Article Contribution
Descriptive stage	Observation Measure- ment Documenta- tion	Develop con- structs	1. Descrip- tion of tradi- tional con- cept	1. Defini- tion	A3 Exploit/ex- plore PSM activi- ties
	Detect Anomaly	“Disruption”	3) Problem description	2) Obser- vation	A1 Servitization and networking impact on PSM
	Categoriza- tion Simplify and organize	Building frameworks and typolo- gies	2) Categori- zation	3) Justifi- cation	A2 Organizational learning in PSM
	Association	Defining rela- tionships Correlations of constructs – models	4) Modelling	4) Formal- ization	A3 The associa- tion of exploita- tion and explora- tion activities with PSM performance
Normative	Causality	Prediction based on causal model	5) Explana- tion	5) Con- struct	A3 How do ex- ploration and ex- ploitation mediate the association be- tween PSM status and performance?
	Circum- stance cate- gorization	Situations and circumstances What has caused the un- expected re- sult?	6) Implica- tions	6) Match- ing	A3 Organiza- tional-learning strategies and drivers of supplier relationships
	Observe	Anomalies	3) Problem description	2) Obser- vation	A3 Increased role of knowledge in PSM

The fundamental change in SCM is at the core of this thesis. It is therefore natural that the overall research process that was followed throughout follows Christensen's (2006) theory of disruption. According to this model, theory development is an iterative process going on within and between normative and descriptive stages. A common starting point is a description of the construct to explain the phenomenon. This may help the researcher to detect anomalies that cannot be explained and possibly require a new categorization to shed light on the related correlations. In turn, it provides tools with which to consider causalities and thereby enhance understanding of the circumstances in order eventually to gain predictive power and advance normative theory.

3.4 Validity and reliability

Research validity and reliability are rooted in the design principles. Reliability means that the same results are consistently obtained in repeated tests, whereas validity refers to how accurately the explanation reflects the target phenomenon (Eriksson & Kovalainen 2008, p. 292). The research design, the foundation on which reliability and validity are built, combines the strategies, methods and underlying philosophical worldview (Creswell 2009).

Creswell's framework distinguishes three distinct methodological strategies: quantitative, qualitative and mixed. Quantitative research emphasizes the post-positivist worldview and relies on surveys and experiments; qualitative studies reflect the constructivist worldview and utilize case studies; and the mixed-method approach concurrently applies both quantitative and qualitative strategies. The constructivist worldview adopted in qualitative research emphasizes contextual understanding, multiple participant meanings and social construction, and aims at theory generation. It is a relevant perspective from which to study interactions between individuals and organizations, how learning and knowledge are generated in the process, and how the new knowledge changes the process.

The Validity Network Schema (VNS) (Brinberg & McGarth 1985) serves as a tool with which to assess the validity and reliability of research in various domains (see Table 8). Table 8 below summarizes the VNS in the light of the methodological choices.

Validity basically concerns what is examined and how, and why the research was done in the first place. It is part of the research process not just a criterion. In the substantive domain phenomena and their relationships are observed through the collection of data; conceptual research is based on causal relationships among activities and comparisons of different systems; and in the methodological domain the theoretical paradigm is on the strategy level – which method is valid.

The VNS offers alternative pathways depending on the research domain. In the substantive domain the empirical research begins with the substance (S) or the selection of a valid method (M); in the conceptual domain the concept (C) is tested on a set of hypotheses, or alternatively the hypotheses are based on substantive knowledge (S); and in the methodological domain the aim is to test the method (M) using a valid conceptual framework.

The research reported in this thesis represents both the conceptual and the substantive domains. For example, the research path in the structural model described in Article 3 starts from the selection of certain theories and concepts such as RBV and KBV, which are built on and used to explain purchasing management as a substantive phenomenon of interest. In the case studies reported in Article 2 the theory was used to interpret the observations. However, the interview questions and initial constructs were formulated in advance in line with theories of organizational learning and relationship management.

Table 8 The Validity Network Schema (Brinberg and McGarth 1985)

Domain	Substantive	Conceptual	Methodological
Pathways	SMC, MSC	CSM, SCM	MCS, CMS
Paths	Empirical	Theoretical	Experimental
Step 2	Set observations	Set hypothesis	Study design
Step 3	Interpretive observation	Test hypothesis	Implement design
	variables, set of findings, body of evidence		
Follow-up	Replication, Convergence, Boundary Search		
Validity	Ecological	Explanatory	Methodological

According to the VNS, validity is based on how well the theory under development eventually explains the phenomenon – in this case knowledge in purchasing and supply management. The final explanatory power is constructed during the different phases of the research process. Table 9 shows how validity was addressed throughout. The comprehensive literature review highlighted the factors of change in supply chains during the pre-study phase. Networking and servitization are gaining momentum and SMEs need to develop their capabilities accordingly. The manufacturing industry is heterogeneous in many ways, but is still constrained by limited resources. The solid RBV, TCE and KBV theory base constitutes a common governance framework. A mixed-method approach was taken to capture the rather abstract process of knowledge acquisition. Cross-case analyses and the inclusion of multiple industries allowed generalization of the conclusions.

Correspondence and generalization are important attributes of any research, and warrant closer scrutiny here given the heterogeneous nature of purchasing as a research area, even when, as here, restricted to SMEs and manufacturing business. Moreover, the landscape is changing at an increasing pace. The technological revolution is fundamentally transforming how information networks are used in supply chains, and the minimal cost of data transfer is reducing temporal and spatial limitations. The role of small and medium-sized firms is increasing in developed economies, but they seldom succeed by implementing a low-cost and large-volume strategy. There is thus a need to integrate and further develop the global knowledge base to foster innovation.

Table 9 Validity in the research process

Phase	Criteria	Thesis evidence
Pre-study	Importance	Comprehensive literature review
Realization	Correspondence (Theory, method, substance)	Mixed methods Solid theory base
Conclusion	Generalization Robustness	Triangulation Multiple industries Cross-case analysis

Table 10 lists Christensen's (2006) and Yin's (2003) requirements for internal and external validity, which are assessed in terms of how well the selected methods, theories and substance correspond. Hence, the broad research area and the mixed methods strengthen validity. The conceptual work based on the extensive literature review helped to identify the key constructs. The phenomenon is investigated by means of cross-case analysis in the second article, whereas the third article verifies the construct correlation and explains the causality logic.

Table 10 External and internal validity (Yin 2003; Christensen 2006)

Validity	Christensen (2006)	Yin (2003)
Internal	1-Conclusions are unambiguously drawn from premises 2-Plausible alternatives ruled out	Establish causal relationships
External	Relationship outcome (X-Y) is generalizable to other contexts.	Domain to which theory can be generalized

When the validity of various theories is compared it is worth considering their incommensurability (Kuhn 1996). For example, the purchasing of well-defined raw material according to a well-laid-out manufacturing schedule is different from the process of knowledge creation within a supply network. On the other hand, they may be two sides of the same phenomenon. The raw material may have been developed jointly with the supplier to better suit the process or the end customer's needs. Knowledge of the process and its application is commonly generated. Moreover, the production plan may be a result of mutual learning and the continuous sharing of information.

Internal validity derives from the careful literature review, which provided the premises on which conclusions were reached in the four research articles as well as in this synthesis. The analysis of previous research also opened up alternative paths: when key concepts such as knowledge, learning and PSM are clear it is possible logically to formulate their possible causal relationships.

According to constructive approach validity is determined in practice, whether the model solves the problem in concern. The theoretical validity depends on model's connections to the theoretical framework, which also is basis for the generalization of the result later on (Kasanen et al. 1993). In the thesis the external validity is established on case selection. (Eisenhardt 1989). All of the cases had relevant experience on supplier development either as supplier or as buyer. On the level of overall result of the thesis the construct of learning model, which emerged from the analysis, the internal validity was ensured by iterative process and verified by using multiple sources.

To ensure generalizability and external validity the thesis should reflect changes in the purchasing and supply chain. It was noted in the a-priori model that environmental change in the supply context was causing a change in inter-organizational knowledge management, which in turn was driving change in PSM capabilities. The thesis focuses on PSM, but the logic and reasoning are generalizable to the supply-chain domain. Nor is change in the supply chain limited to PSM: the same drivers (networking, servitization and ICT) are changing the value process in the whole chain, from manufacturing to retail and down to the end customer. Given its central position in the supply chain, the change is easily observable in PSM.

Generalization of the result is thus based on structural similarity, internal logic or observed causality (Eisenhardt 1989). Linking to previous literature provides way to assess generalization of the results (Kasanen et al. 1993). For example in case study, the implemented learning strategies at buyer supplier relationship complement strategic taxonomy of Miles and Snow (1986) and are in line with Auh and Menguc (2005). Prospectors are looking after flexibility in their buyer supplier relationship and apply different learning strategies. Defenders are either imple-

menting exploitative or reactive learning strategy but clearly looking relief for uncertainty as they expect better flexibility or foreseeability from the relationship. Analysers are more towards exploration regardless if they are looking for quality improvement or solution for uncertainty from the relationship.

The philosophy of science does not offer a particular model or recipe for theory development. The selection of what path to follow depends on the subject matter as well as the researcher's worldview, and the ensuing research will eventually reveal whether or not the selection was justified and worthy.

Focusing on the evaluation of theory development, Whetten (1989) defined six criteria required to constitute a theoretical contribution (Table 11). These criteria describe (What & When), explain (How) and in general justify why anyone would be interested. Contributions to theory development and research can be assessed following these guidelines.

Table 11 Making a theoretical contribution: six criteria

Criterion	The contribution of this thesis
What is new?	The adoption of an organizational-learning perspective on purchasing and supply management
So what? (will the theory change anything)	The identification of a new PSM role in knowledge acquisition as a mediator between customer needs and supplier capabilities.
Why so? (logic)	PSM knowledge stock accumulation is an outcome of organizational learning.
Well done? (complete and thorough)	The impact of knowledge on PSM is analysed from several angles
Done well? (written, logical flow)	The research papers are based on the same key question: What is the role of knowledge in PSM?
Why now?	External knowledge is required more than ever and more firms are becoming knowledge integrators

The novelty of this thesis lies in the use of organizational-learning theories to observe PSM strategies and performance. It combines supplier-development activities, knowledge acquisition and internal knowledge development in firms, thereby shedding light on the increasingly strategic role of PSM in the knowledge-acquisition process, and on the significance of organizational status and aligned strategies. The logical backbone of the thesis is a constructivist understanding of knowledge accumulation within and between organizations, which as a continuous process differs as a phenomenon from traditional transactional purchasing. A sequential, mixed-method approach was adopted to give a comprehensive view of the new role of knowledge. Last but not least, the timing of the research is inherently of interest.

Globalization in the supply-chain context is entering a new phase as China and India are increasing their development capabilities and becoming knowledge exporters. These changing roles are reflected in the World Investment Report (Unctad 2013), for example, which shows how developing economies are increasing their share of investment inflow and outflow. Growth in trade is 30-per-cent faster in knowledge-intensive goods than in labour-intensive goods. In 2012, 38 per cent of the cross-border flow of materials, services and finance came from emerging markets, whereas years earlier they repressed only a 14-per-cent share (Manyika et al. 2014).

4 CONCEPTUAL AND EMPIRICAL RESULTS

This thesis is based on three articles on the capabilities PSM organizations may need when managing knowledge related to external resources.

The first article is a conceptual literature review of PSM capabilities and the effect of service business and networking on them. The second article reports on a qualitative cross-case analysis of supplier development as an organizational-learning process. The third article describes a survey-based study based on structural equation modelling in which the aim was to find out how external knowledge is transformed into better PSM performance. The influence of organizational status (e.g. integration) is mediated through the exploration and exploitation of orientation styles when knowledge is acquired from either the current supply base or the market in general.

4.1 Article 1

The first article describes how the service-purchasing phenomenon is explained in the current research literature. Service logic has brought concepts of modularity, systems and value co-creation into marketing. In many ways, goods-dominant logic still serves as a paradigm in PSM. For example, despite the increasing importance of service purchasing the research focus of strategic PSM is on the procurement of goods (Ellram & Tate 2015). Hallikas et al. (2014) point out that traditional methods do not suffice for systemic value creation in a world in which multiple parties are involved in the delivery process. Not only are manufacturing firms coping with higher levels of service content, they are also facing increasingly intense global competition (Rosado Feger 2014).

Two types of management logic meet in the supply chain. Conventional logic dominates in the purchasing of goods, whereas on the marketing side there has been a paradigm shift during the past ten years towards systems capabilities, and more research is being done on development drivers and capability needs. The service view expands on networking and creates new needs for PSM. Ellram and Tate (2015), for example, suggest that meaningful involvement requires the sourcing of value-added features in addition to traditional cost reduction. The purchasing function should also have a service role in the early stages of system development involving multiple stakeholders. Supply management should be capable of

handling supplier relationships when the level of collaboration intensifies (Hallikas et al. 2014)

Article 1 maps the current status of service-purchasing capabilities as defined in the literature on supply chains. The content of 93 articles on service purchasing published since 2001 is analysed in the content-based literature review. The aim was to find out how current capabilities comply with the requirements of networked supply and continuous development.

The opportunities provided by innovative information technology, global supply markets and integrated supply chains are modifying the supply of services. Adaptation in terms of knowledge specificity and tailored solutions increases when networks are more tightly knotted. Loose networks need to be aligned to facilitate change management and service definition.

Article 1 contributes to KB-PSM in assessing the current status and suggesting a future path forward. Service supply chains are complex networks that are constantly modified in line with technological advancement.

Some PSM supply networks comprise a tightly knotted group of relationships with a specific division of labour, whereas others are looser and value open choices.

When firms implement servitization and service logic in their marketing and delivery any changes will also affect PSM. Increasing process automation, modularity and knowledge specificity is characteristic of tight networks. The delivery of tailored solutions requires systems-integration capabilities. If PSM prefers to keep its options open it may decide on a loose network. Purchased products and services are well defined and managed through contracts.

Article 1 also contributes a taxonomy of purchasing capabilities in the transition towards a networked mode of operation, which follows when firms adopt a systems-delivery approach and develop build-to-order capabilities. PSM should understand customer needs as key drivers of the purchasing process alongside in-house manufacturing plans.

4.2 Article 2

The focus in the second article is on the buyer-supplier relationship and the learning strategies applied in supplier development. The argument is that small and medium-sized enterprises also have abundant resources within their reach, but they have to implement new strategies in order to utilize the external resource base proactively.

The buyer-supplier relationship is the unit of analysis in the qualitative research, thereby capturing both buyer and supplier views in the joint development process.

The cross-case analysis compares 16 cases of supplier-development activities representing different industries and business sizes. Semi-structured interview guidelines were formulated based on the critical-incident approach, and the research followed abductive logic.

The principle argument is that SMEs are somewhat conservative and reactive in their supplier development. Basic quality issues tend to undermine their innovativeness and joint knowledge creation, and they concentrate on leveraging current knowledge rather than exploring new alternatives. Everyday problems hinder more explorative development and limit innovative expansive learning.

In terms of management implications the results of this study show how, in a networked business environment, the development of competences also takes place in the supplier network. Management should invest in proactive purchasing development, and build capabilities to facilitate inter-organizational learning.

As a contribution to the literature on purchasing and supply management the article offers PSM a set of four contingent learning strategies, which are mapped in line with four supplier-relationship expectations. The model is applicable on the level of concept development and in the practical implementation of business-development strategies.

4.3 Article 3

The basic argument in the third research article is that knowledge management related to the supply of external resources may be a critical resource. However the liability of smallness challenges knowledge acquisition in SMEs, and its further transformation into performance. The research objective, therefore, was to investigate how PSM transforms knowledge into performance in the supply context, concentrating on SMEs. The focus in the article is on efficiency in knowledge acquisition and how it is affected by organizational status and integration, and on the impact of various novel developmental orientations.

This quantitative research is based on the responses of 143 PSM professionals to the Hankintakysely 2014 survey (n=143). Conditional process analysis was used to measure the mediation effect of exploration and exploitation on purchasing performance.

The results confirm the tendency in explorative PSM to utilize both the current supply base and broader market knowledge, whereas exploitative PSM concentrates more on the current supply base and less on the broader supply market. It was hypothesized that the recognized status of PSM would have a positive effect on organizational performance (Carr & Smeltzer 1997; Handfield et al. 2009). The

analysis therefore focused on how an organizational orientation towards exploration or exploitation operates as a mediator explaining how organizational status influences PSM performance.

When both exploitative and explorative orientations are present only exploitative activities affect performance. However both types of activity must be present to mediate the impact of PSM status.

Performance measurement is an ambiguous activity, and should reflect the success of each individual firm with its unique strategy. The construct is measured in the model as a combination two kind of indicators. First, there are indicators that include the explanatory results of well-performing operations such as inventory rotation and on-time orders. Secondly, it is measured, how PSM influence on the firm's quality process, and its capability to react to sudden changes in demand.

Basic requirements concerning product and service quality have to be fulfilled before new knowledge about the supply base can be successfully utilized in the search for improvement and learning. Well-performing PSM will achieve recognition and status, and will also explore new supply markets efficiently. Through exploration it can keep ahead of the competition. Finding a balance between exploitation and exploration is a constant challenge, however. Focusing on the exploitation of current processes may end up as internal process engineering, whereas a high level of exploration may override the steady utilization of current knowledge and cause a deterioration in performance (Bierly & Daly 2007).

5 DISCUSSION

5.1 Overall results

The important role of purchasing and logistics in information management in conjunction with the traditional management of goods inventories and transportation has been acknowledged for quite some time (Cooper & Ellram 1993). The trend in purchasing and supply management has been away from earlier adverse cost cutting and sufficiently-on-time delivery targets to the comprehensive management of external resources. Supply is much more than goods, as Hult et al. (2006) and also Miles and Snow (2007) both emphasize, and knowledge is one of the strategic resources in the supply chain. Tanskanen and Aminoff (2015) describe the task of PSM today in terms of economic, behavioural, resource-related and bridging-based perceptions. In an evolving supply network PSM needs dynamic capabilities to access current knowledge and develop it in the supply chain all the way from the customer to the supplier.

In spite of the risk of increased dependence on suppliers, external knowledge is essential, especially in more complex tasks (Y. Wang et al. 2014). PSM actions are pivotal in terms of adapting and aligning external knowledge and internal processes in a risky place such as a network in which one's own knowledge resources are heavily protected.

Knowledge acquisition is more of a business-model strategy than the implementation of a new ICT system. Bowersox and Daugherty (1995) explain the paradigm shift in the logistics concept, suggesting that disruptive technology change such as the Internet brought about is the catalyst that triggers fundamental changes in a firm's structure and strategy. They base their argument concerning changes in logistics on four main points. First, changes in information technology will lead to the emergence of more strategic logistics management. Second, increased transparency in the supply chain will turn fixed organizations into information-based entities and networks of specialists. Third, timely and accurate information sharing will increase the numbers of strategic alliances in the supply chain and fourth, this development will speed up time responsiveness when logistics needs to be adaptable, and force it to become less highly structured.

The strategic nature of PSM has gained increasing credibility since the focus shift from the buying of goods towards the management of the supply base (Monczka et al. 2008). Organizational integration and the management of external

resources are emphasized in the supply-chain literature, but the changing role and function of PSM has attracted less attention (Handfield et al. 2013).

New requirements arising from evolving supply-chain and corresponding PSM capabilities are analysed in this thesis from the theoretical perspective of information processing. The core argument is that PSM needs dynamic capabilities to access and develop external knowledge in an evolving supply chain in which networking, service logic, and technological advancement modify information-processing requirements.

The research questions are mapped with change factors in the supply chain in the theoretical a priori model (Figure 2). The change is enacted via increased networking and technological advancements, together with servitization as the business model. The described changes in the supply chain will increase the importance of external knowledge acquisition and management.

Figure 11 shows how the two research questions have been addressed. Servitization, meaning the increasing use of knowledge-intensive services purchased from the market, is also changing the use of supply markets. Supply chains may be rather loose networks of service suppliers delivering more or less critical competences from the buyer's point of view. The new requirements are closely intertwined with advancements in information and communications technology.

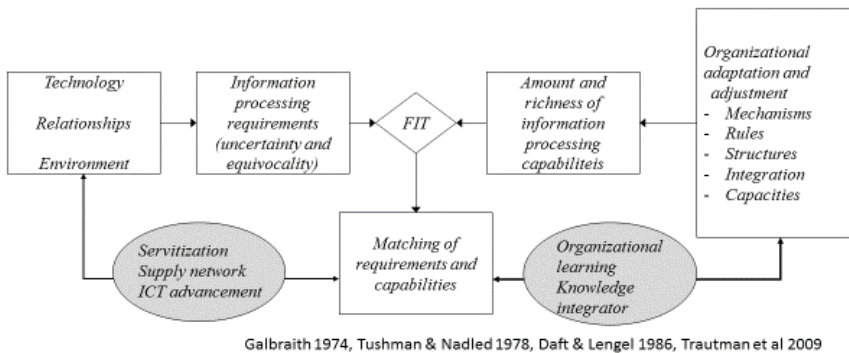


Figure 11 Information-processing capabilities in PSM

PSM is in a key position to integrate customer needs and supplier capabilities in the delivery of servitized offerings. Service delivery is a continuous process in which various participants generate new knowledge, and in this rather dynamic environment PSM needs to become a knowledge integrator and to implement appropriate organizational-learning strategies.

The three articles included in this thesis address the two research questions from different perspectives. Service-purchasing capabilities are compared to supply-network tightness in the first article. A systematic content analysis of the extant literature identified six competence areas, which are mapped on the networking vs capability chart (Figure 12).

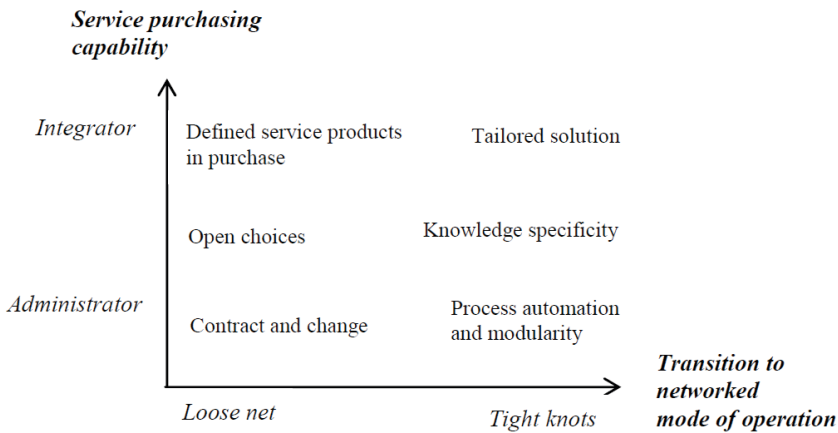


Figure 12 PSM competence areas in service networks (Article 1)

Moving towards networked mode of operation the complexity increases. Tailored solutions require higher level of autonomy of the teams and supplier knowledge is more specific. However, process automation and product modularity can limit the variation of supply and thus reduce the complexity.

The proposed framework of competencies in figure 12 is in accordance with the enfolding literature about autonomy of teams in complex business networks. Network is a metaphor depicting complex set of business relationships and boundaries to understand spatial categories and temporal causality. Network is shaped by the actors whose view on it is subjective. However, more subjective the knowledge is, increase of knowledge sharing will improve the activity of the organization (Geiger & Finch 2010).

Each actor in business network has a dual role as a provider and a user. In the network, actors pursue their own targets and perceive value of resources from their own stand point (Cantù et al. 2012). Hearnshaw and Wilson (2013) made a distinction between supply chain and a network. In the network cooperation and competition co-exist and the complexity arises when the network turns to be self-organizing. According to Espinosa and Porter (2011) complex networks are self-organizing, non-linear and adaptive system formed by autonomous business units. Organizational learning capacity is essential for adaptation when operational environment is changing (Espinosa & Porter 2011)

Autonomy and empowerment are central factors of success. Autonomy of self-managed teams especially in knowledge intensive environment offers independence but may also create isolated silos. Combining external knowledge and team autonomy helps in avoiding isolation and makes teams more efficient (J. Gammelgaard et al. 2012; Haas 2010). Busquets (2010) emphasizes the business network orchestration. Aim there is to develop new process to gain efficiency and to control cost and manage the benefit equilibrium in a continuously varying supplier network. Understanding the operation and development of business relationship is necessary to access new knowledge. Innovation gains weight only when the business network recognizes it and develops itself accordingly (La Rocca & Snehota 2014). Indeed capability to implement innovation depends on focal firms inter organizational orientation and internal cooperation, learning capability and autonomy. Successful implementation of innovation requires network that trusts, has co-operative information systems and has joint programmes (Van Bommel 2011).

Moller (2010) provides a concept of managerial sense-making and agenda construction in emerging business networks and in changing business environment while forming of a network. Moller emphasizes cognitive capacities of the management in process of building new construct by recombination and innovation and how innovations will be eventually institutionalized and agreed.

Automation of the purchasing process further tightens the relationships in the network. In order to utilize integrated information systems with supplier, it is beneficial to define modular service concepts. PSM has to be able to manage suppliers with specific knowledge, and to integrate this knowledge into the delivery process. On the other hand, the firm may wish to keep its options open and avoid lock-in with a particular supplier. If supplier services from loose networks are to be integrated into the overall delivery they need to be defined in advance. The supplier is tied into more strictly defined contracts and PSM needs to administer a more formal administration of change process.

Article 2 addresses the second research question concerning the new information-processing capabilities of PSM. It focuses on how different learning strategies moderate the buyer-supplier relationship to enhance performance and competitiveness. As the cross-case findings indicate, firms have different expectations of their buyer-supplier relationships and apply distinctive learning strategies accordingly (Table 12).

The results reported in Article 2 show how the different case firms described their applied learning strategies in the buyer-supplier relationship and identified the drivers. The typical approach is to exploit the current relationship to achieve flexibility. There was a wish for better communication and a demand for planning collaboration beyond contractual commitment to enhance foreseeability

Table 12 Learning strategies and the buyer-supplier relationship

Learning strategy	Relationship driver			
	Efficiency	Quality	Flexibility	Foreseeability
React		x	x	x
Exploit	x		xxxx	xx
Explore		x	xx	xx
Expand			x	

The benefits of supplier development are well recognized but not exploited in purchasing practice, and development work seems to be beyond current SME capabilities. Short-term flexibility needs also override development tasks, the focus being on internal processes to the detriment of common target setting.

The need for collaboration promotes explorative learning as a strategy. However the development of new capabilities and expansive learning seem to be confined to consultative software development. The resource constraint that is typical of SMEs came up in the manufacturing firms: it is difficult enough to meet current quality requirements, and even if there is a desire to broaden the supply base the current problems inhibit any related investment.

The focus in Article 3 is on how in the SME context the new supply chain provides access to a broader source of critical resources when PSM is aligned. PSM is an important actor in conveying supply knowledge to enhance the firm's performance. The impact of external knowledge on purchasing performance is explained in terms of organizational status, the effect of which is mediated in an explorative manner or via the exploitative orientation of PSM.

The results reported in the article address the second research question in modelling PSM engagement in exploitative activities focusing on the use of external supply knowledge in its existing supply base. Organizational status is less impact in the exploitative operational mode than in the explorative use of external knowledge. Explorative PSM also uses the supply market more efficiently than if the orientation were more towards exploitation. In general, the results confirm the complementary nature of exploration and exploitation, and the need to select the approach that best suits the current context (Voss & Voss 2013).

There are significant differences in the roles of the organizational status of PSM. Whereas on the exploitative level it can work successfully in a rather independent manner, the explorative approach needs internal integration. Status and internal integration are specifically underlined when PSM is given an increasingly strategic role in the firm (Paulraj et al. 2006).

5.2 Research contributions

In the thesis it about how does the change in information processing environment of supply network impacts to purchasing and supply management. At first it was necessary to gather comprehensive understanding on the underlying theories and develop the conceptual framework. The construed concept was then further elaborated in the case study. In the third phase, the developed model was tested using statistical analysis. Finally the theoretical connections were scrutinized in the theses to examine overall applicability of knowledge based PSM. The thesis contributes to theory of PSM development and to practical PSM management.

The contribution of the thesis is in adding understanding on PSM in supply chain facing major change due to business process changes (digitalization and servitization). The thesis provides a contribution to the general analysis of the PSM conditions for success in practice by clarifying the role of knowledge acquisition and purchasing performance and then combining this with the framework of organizational learning. The paper contributes to the literature by suggesting a concept of knowledge based PSM and evaluation of different organizational learning strategies

First, the thesis continues the discussion on the importance of knowledge acquisition and knowledge management in the research on strategic PSM. Knowledge development is socially constructed, and by definition (Searle 1995, p. 56), process (act) comes before product (object). Knowledge acquisition in purchasing is a learning process, and develops in cycles of individual and organizational interaction.

The capability of managing coded knowledge about supply markets is a fundamental competence in PSM (van Weele & van Raaij 2014). However, its acquisition and management constitute just one part of the purchasing reality. PSM may have to explore and exploit implicit and tacit knowledge in loose supply networks, and in addition to acquiring contract-management know-how to focus on organizational learning and the development of the knowledge base.

Second, the value-creation concept of service logic is adapted to purchasing and supply management. Like knowledge, service logic emphasizes process over structure. Hence, the process view is a rather fundamental PSM requirement given that a functional structure tends to produce sub-optimized solutions, whereas process management takes broader view on value generation in the supply chain (Grönroos 2007).

Third, inter-organizational learning theory (Levinthal & March 1993) is applied to categorize knowledge-related PSM capabilities in networked and service-oriented buyer-supplier relationships. Exploitative and explorative learning strategies are complemented with expansive learning (Engeström 2001). The first two describe the orientation of the organization's activities, whereas expansive learning

5.3 Management implications

The research provides tools with which to develop purchasing capabilities and find ways of improving overall innovativeness and competitiveness in the supply chain. Organizations with limited resources need innovative ways of accessing global markets, and the flexibility to meet varying customer needs in rapidly changing situations. The suggested framework identifies various new capabilities that PSM needs and could utilize in the management of external resources to expand its own knowledge base. Innovation and time to market have become key issues in strategic management, and PSM is a potential source of capability expansion.

According to Möller (2010) sense-making and agenda building are necessary but not sufficient condition in knowledge management process. In a complex, self-organizing and adaptive networks team autonomy is necessary for efficient functioning of the organization. Autonomy is not an automate but the team needs to have capacity to learn and use learning to be viable (Espinosa & Porter 2011).

PSM's task has traditionally been to ensure the availability of raw materials and to buy goods at the lowest possible cost. These virtues have not become obsolete, but there is also a need to align the mode of operation to facilitate the management of intangible processes of knowledge acquisition in purchasing (Modi & Mabert 2007). Knowledge in the supply network is developed, accessed and institutionalized in a dynamic and expanding cycle. PSM can develop supply capabilities and a shared understanding of information (Handfield et al. 2015).

PSM service quality has positive direct effects on external customer satisfaction, and effective supplier-relationship management contributes positively to the latter. (Stanley & Wisner 2001) argue that internal integration and supplier collaboration are not mutually moderating. However, the results reported in Article 3 imply that, for PSM, the organizational status within the firm is an influential factor in supplier collaboration and in the further use of acquired knowledge.

Meaningful involvement of supply management in service purchasing, in which knowledge is an important external resource, needs a strategic approach and development capability. There is also a need to translate customer value into supply-market capability (Ellram & Tate 2015). PSM does indeed have an instrumental role in connecting customer knowledge with the supplier base, and in making knowledge a key resource in the firm and the supply chain

6 CONCLUSIONS

6.1 Purchasing knowledge

The overall objective of the thesis was to give a concise explanation of the role of knowledge in purchasing and supply management in an increasingly networked knowledge-based business environment. Knowledge is an extremely broad and ambiguous concept, and there is a substantial risk of drifting too far into the deep seas of ontology and epistemology – what is true and how we get to know about it. On the other hand, knowledge in purchasing may appear rather trivial: all PSM professionals surely know what they are doing so what's the big news?

Knowledge is something we need if we are to understand the world around us. We know things that are familiar to us and we may know how to do things, in other words knowledge can be tacit “know how” or explicit and coded “know-what” (Grant 1996; Spender 1996). Regardless of how fact-based our worldview is, there are facts in our real world that are facts only because we believe them and act accordingly. According to Searle, knowledge is about the brute facts of natural science, and comprises institutionalized agreements and beliefs. Searle (1995) mentions property, money and government as examples of institutionalized facts.

Knowledge is a unique resource, which expands the more it is used, and if unused it gets less useful over time. As an external resource in the supply chain it is a complex phenomenon, and firms wishing to achieve competitiveness have to implement new and even radical changes in their supply network (Gebauer et al. 2012). Value creation and knowledge accumulation are continuous processes rather than one-off transactions of value exchange (Grönroos & Ravald 2011). In terms of delivery, knowledge evolves according to the environment, and at the same time new knowledge changes the operational context (Jaakkola & Halinen 2006).

According to service-dominant logic, service exchange is the application of knowledge and skills (Vargo & Lusch 2004). In line with servitization, the role of knowledge management in supply chains is increasing, thereby changing the meaningful-involvement rules of purchase and supply management. PSM should change from goods to services as well as changing its operating environment. (Ellram & Tate 2015).

Service-dominant logic as adopted in marketing is transferring the focus from the exchange of goods and what is being made to value creation. Measures of value show how what has been done serves the needs of the supply ecosystem (Lusch &

Vargo 2014; Vargo et al. 2015). In the supply-chain context this implies that deeper knowledge intensity followed by servitization is increasing the complexity. The increasing intangibility of purchases makes it more difficult for both buyers and suppliers to explain their needs (van der Valk & Axelsson 2015). Moreover, new supply markets offer more choices and require faster responses to customer needs. As the level of complexity in the supply chain increases so does the expected value-added in the organization. Both of these drivers set new requirements to which supply management must adhere.

Whereas firms in earlier years gradually moved towards internationalization, nowadays many are born in global business networks (Johanson & Vahlne 2009). Global networks, together with the increasing knowledge intensity and further application of service logic in business are bringing about fundamental changes in the role of PSM in global business networks, which are characterized by continuous change in relation to location and time. This knowledge-intensive and dynamic operational environment may well be a heuristic combination of experience and innovation (Coe et al. 2008). It constitutes a network that provides tools to facilitate more effective adaptation and response to changes than a vertically integrated hierarchy would allow. Competences, relationships and information hold networks together.

The networked way of working has changed relationship management in marketing. Indeed, marketing has adopted this mode, and firm boundaries have been blurred (Möller & Halinen 1999). The results reported in this thesis indicate a similar development in PSM. Once the basics are in place the collaboration may explore new products and processes. The buyer-supplier relationship is not solely based on the power of contracts, and the networking aspect adds the need for flexibility (or foreseeability) to relationship drivers.

Activities pursued in relationships are motive-driven. Johnsen and Hammervol (2012) shows how buyers contribute to the capabilities of suppliers through development. They compare how different collaborative-learning approaches in different interaction types depend on value-creation initiatives. Information supply is workable solution in unilateral learning when the supplier gets basic information on what to do. Coaching is used in unilateral development when the supplier needs to acquire new skills. Nevertheless, the assumed strategy share in relational management is not sufficient for bilateral learning. The collaboration needs to focus more on daily business that enhances the value of PSM relationship-management skills in the value-creation process. An example of the practicality requirement is the indicated need for foreseeability – a common understanding of the mutual targets on top of the agreed contractual commitments and fixed orders.

Kraljic's purchasing portfolio matrix (1983) has guided purchasing managers in categorizing and paying attention to critical components and costly items from the perspectives of production and manufacturing. With regard to cost and criticality,

Choi and Krause (2006) make a valid point in arguing that a supply network as such brings in complexity, which in turn leads to increased costs. On the other hand, cutting costs by reducing the network may negatively affect overall competitiveness. McIvor et al. (1997) observed how the PSM role was changing from adverse to collaborative cost cutting, and from operational to more strategic functioning. This increased the need for organizational integration (Zheng et al. 2007). It is worth taking a closer look at knowledge management processes in PSM.

SMEs are in a contradictory position. There is limited capacity to absorb external knowledge and also severe limits in terms of maintaining a high level of development in-house. Networks provide resources for growth, but at the same time the growing number of network connections ties own resources. Social networks benefit from spatial proximity, whereas distance brings up the need to focus on and define core measures.

Salancik and Pfeffer's (1977) critical contingency theory describes organizational power as "power to get things done". This works in two opposing ways. Contingent, e.g. critical, situations align organizational power in one direction, but the same situations may produce change resistance – the fear of losing power. Assigning PSM a critical function in external knowledge acquisition will re-shape the whole firm, not just the purchasing and supply function.

In the SME context PSM is characterized by resource constraints that limit its growth-generating performance. These constraints are attributed to its limited absorptive capacity and simultaneous capability needs to align current practices and at the same time adapt to changes in the system (Gibson & Birkinshaw 2004). The supply network of PSM operations establishes the division of labour and corroborates the specialization of skills, and also constitutes the external knowledge base of the firm. These external resources are maintained in the network and accessed via the buyer-supplier-relationship.

6.2 Limitations and further research

The theory development in the thesis reflects the suggestion of van Weele and van Raaij (2014) that research should reflect the strategic function of PSM, and be more deeply embedded in management theories such as the RBV. As Halldorsson et al. (2007) note, there is no single unified theory of supply chain management, and several theoretical perspectives are required.

Knowledge management is one of the core processes in any business organization, and its fundamentals are explained in many theories. The theories of transaction cost economics (Williamson 1979), dynamic capabilities (Augier & Teece 2009; Teece et al. 1997) and the resource-based view (Penrose 1995; Wernerfelt 1984)

all have their own perspective on knowledge. TCE posits that knowledge is managed, protected and acquired through contracts, whereas according to the theory of dynamic capabilities, the proper and timely development of organizational knowledge is the key to obtaining competitive advantage and keeping the organization on a growth trajectory. Organizational knowledge is seen as asset that is controlled and accessed by means of contracts. From the resource-based perspective, firms are inclined to control knowledge as it is one factor that provides valuable, rare, inimitable and non-substitutable (VRIN) competitive advantage (Barney 1991).

The aim in this thesis is to present research results and give concise explanations of how a body of knowledge builds up in PSM. The objective of theory building is that it can be generalized to apply in various markets and industries. However, any generalizations based on the thesis should take account of the fact that the empirical results are from Finland, which is a developed and open market in the midst of a major structural shake-up in the industry sector. The forest industry is reshaping its business as paper consumption declines; in ICT the manufacture of mobile phones is reverting to small, agile start-ups with a global reach.

The research focus is on small and medium-sized enterprises, which constitute a heterogeneous and large community. Although the research articles included in the thesis are based on methodological triangulation it is still possible only to reach a fraction of the firms. Reviewing the results reported in the emerging literature in the introduction strengthens the justification of analytical generalization. The industry-specific features should be given more attention. For example, automation is changing the manufacturing process at a varying pace depending on the industry sector

Constantly evolving supply market keeps firms alert and they have to continuously consider their position in network and select appropriate strategies. In service business model and in service business in general networked relationships may be complex and further study of knowledge development needs in purchasing needs more attention.

There is plenty of work to be done to better explain knowledge development and acquisition. Learning and knowledge development have both temporal and spatial dimensions, and endogeneity is present. Knowledge is constructed and accumulated by users while they are using it. Longitudinal research could expose new relationships between constructs affecting performance. For example, learning and relationships are both strongly time-dependent in terms of performance, but how do they interact, and in what order? Moreover, the impact of new (or obsolete) knowledge may be realized only after several years.

Performance as an outcome measure has some built-in intentionality: as the saying goes, “you get what you measure”. The contribution of PSM to the supply chain is often limited to the dyadic buyer-supplier relationship. However supply

relations should be analysed in a broad network of actors (Kähkönen & Lintukangas 2012).

Given the current focus on a developed European economy, it would be beneficial to investigate the knowledge-acquisition concept in a developing economy, too: it may be possible to access and accumulate a knowledge base instead of building on low-cost labour.

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