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ORIGINAL ARTICLE

Logistics learning mechanisms and capabilities: towards an understanding of sustainable competitive advantage

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Abstract This study explores the relationship between logistics capabilities and sustainable competitive advantage by using the notion of learning mechanisms. It is argued that a set of processes of learning mechanisms may serve as a source of dynamic capabilities that create, develop and maintain logistics capabilities in their role as source of a company's sustainable competitive advantage. The learning mechanisms, in the form of experience accumulation, knowledge articulation and codification, are identified in two best-practice companies within logistics. Results imply that the origin of the sustainability of a logistics-based company's competitive advantage may be found in the dynamics of organisational learning, ultimately based on trial and error and experience accumulation. As such, the research elaborates on the connection between logistics capabilities and strategic competitive advantage, with learning as mediating dynamic capability.

Keywords Operational capabilities · Dynamic capabilities · Learning · Knowledge management

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1 Introduction

The strategic importance of operations has been recognised for some time in logistics literature [1, 13, 15, 18]. Logistics-related operational capabilities have been argued to be intrinsically involved in the formation of competitive advantage, where operational excellence in logistics is measured on a corporate strategy performance scale in terms of profitability and growth [1, 25]. It has been argued that logistics can be seen as a distinctive capability that may be valuable, rare and imperfectly imitable, and hence a source of sustainable competitive advantage [18]. In fact, a considerable amount of research has been devoted to identify such operational logistics capabilities as customer-focused capabilities, supply management capabilities, integration capabilities, measurement capabilities and information exchange capabilities [6].

In recent years, enhanced by the development of a dynamic capabilities view in strategic management theory [4, 10, 23, 24], a discussion on organisational learning has started to appear in logistics literature [6, 13, 18]. This body of literature is focused on how knowledge is recognised, interpreted, expressed, formalised and transformed into business strategy. For logistics research and practice, concerned with the long-term sustainability of logistics-based competitive advantage, it is important to better understand by what processes logistics experience can be gained at an operational level and how this can be transformed into sustained strategic competitive advantage.

This study explores the relationship between operational capabilities and sustainable competitive advantage by using the notion of learning mechanisms. We adopt a resource-based perspective on these issues, where learning feeds into the dynamic capabilities of the firm that recreate, upgrade, change and thus sustains the capabilities that are the basis

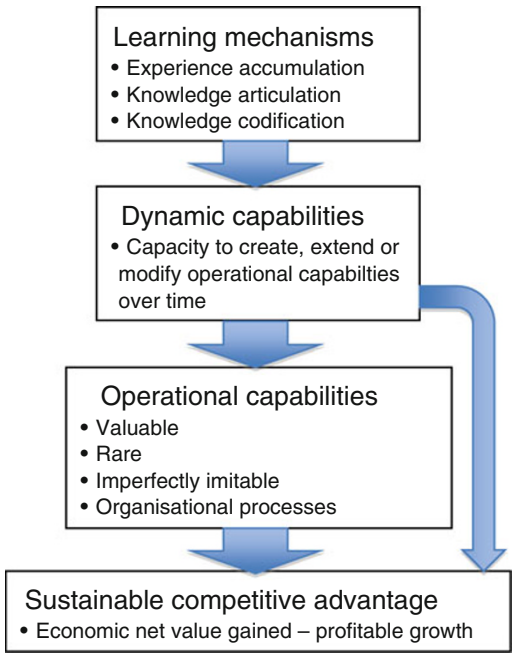

Fig. 1 The structure and major constructs of the article

for competitive advantage (see Fig. 1). The learning process is modelled in the form of Zollo and Winter's [26] three learning mechanisms of experience accumulation, knowledge articulation and knowledge codification.

Our findings are grounded in field studies of the supply chain management practice and strategic behaviour in two Swedish retail companies; Dustin and Clas Ohlson. While predominately operating in a local Swedish context, Dustin is the market leader in computer peripherals distribution and Clas Ohlson is one of the top distributors of DIY products in the Nordic countries. As distributors, logistics is a key operational capability for both firms. While argued neither to be perfect representatives of a class of firms, nor perfectly comparable case studies, the experiences of two 'best-practice' firms have anchored the issues empirically, and field observations have inspired conceptual development.

In this paper, we will first develop a conceptual starting point, successively focusing our interest from capabilities to the specific organisational learning mechanisms. Second, we will discuss the methodology for the case studies and discuss some caveats with the resource-based starting point. Third, we will present and analyse the case studies with the background in the conceptual structure. Finally, conclusions are drawn and implications for practice discussed.

2 Conceptual departure points

In this section, we will construct our conceptual starting point, by using contributions from the strategic management field. Figure 1, inspired by Zollo and Winter's [26] and Winter's [28] work, illustrates our main set of concepts used and structure of our research.

2.1 A resource-based perspective

Employing a resource-based theory language, a firm consists of bundles of resources [20] from which different kinds of capabilities can be constructed. These capabilities should be controlled and managed in such a way so that competitive advantages can be achieved. Competitive advantage is defined in terms of economic net value gained, where either greater benefits are enhanced with the same costs (in comparison with rivals) or the same benefits as rivals are produced to lower costs [2].

A capability that is the foundation for a competitive advantage must be valuable, rare and, in order to avoid competitive parity, difficult to imitate [2]. In addition, for the achievement of a sustainable competitive advantage, it is also necessary to have proper organisational processes that can exploit the valuable, rare and imperfectly imitable capabilities [2]. Value is here, in accordance with having a sustainable competitive advantage, discussed in terms of economic or monopolistic rents. Whereas economic rents are defined as the excess return caused by more efficient usage of resources, monopolistic rents are created when a company can earn money due to scarce competition rather than more efficient usage of resources [21]. Thus, value creation requires that the capability at hand is exploiting opportunities and/or threats [18]. The criterion of being rare gives that only relatively few existent and potential competitors must possess the capability. Finally, an imperfectly imitable capability means that it must either (1) have unique historical conditions, or (2) be causal ambiguous or (3) be a socially complex resource [2].

In the VRIO (valuable, rare, imperfectly imitable, organisation) framework, a structural stance is taken, underplaying dynamism. Operational capabilities have been seen as momentary, static capabilities [11, 28] that explain "how we earn a living now" [28]. However, operational excellence without a dynamic capability is a temporary gain, of possibly short-lived competitive value. 'Temporary' may be more or less stretched out, but a competitive advantage, however, valuable, rare or difficult to imitate, is always bound in time. A capability to continuously be ahead in the striving for operational excellence may, on the other hand, have the potential to constitute a sustainable competitive advantage [9].

Dynamic capabilities may perhaps be best approached on a somewhat metaphorical level as the many, and often relatively open-ended definitions indicate. For instance, Helfat et al. [10] define it "the capacity of an organisation to purposefully create, extend, or modify its resource base" (p. 4). Operational capabilities are created, developed and

maintained over time by dynamic capabilities [4, 23, 24] that are concerned with change [10, 11, 28]. The dynamic capabilities are indirectly contributing to a company's competitive advantage and hence do not replace the traditional operational capabilities that at any one moment constitutes the competitive advantage of the firm [4, 11, 28]. A changing and perhaps volatile environment [4, 6] potentials a situation where the productivity frontier [22] is constantly moving, and a sustainable competitive advantage could be to continuously operate at this frontier [9]. For this discussion, we take learning mechanisms as a starting point.

2.2 Learning mechanisms

In a dynamic global business environment characterised by intense competition, the need to upgrade and improve logistics excellence requires knowledge and expertise, and thus, organisational learning has become an increasingly recognised avenue in logistics research. Results have indicated organisational elements conducive to efficient organisational logistics learning [6]. Logistics learning capability is suggested as a function of four elements: a *cultural component*, characterised by open-mindedness, shared vision and commitment to learn in the organisation; a *structural component*, i.e. an organisational design that facilitates learning, with features such as flexibility and decentralisation. Another important issue here is to have a structured educational practices within the organisation; a *relational component*, meaning the importance of having relationships with other supply chain members where involved companies can learn from each other. Collaboration based on trust is here discussed as on effective way to learn from each other; and, a *temporal component*, i.e. the speed of the learning. Following the logic that capabilities need to be renewed in order to be sustainable, the learning speed of the organisation becomes critical [6].

With a broader perspective, organisational learning is a field that links individual action and experience to knowledge as asset of the organisation and as resource for competitive advantage. Operational level action and experience, often individual, tacit and difficult to access from a managerial viewpoint, need to be transformed from an individual to a collective level [17]. Actions give rise to experience, which may confirm the existing mind-set or suggest a deviance [27]. All daily action on an operational level carries the potential for experiential learning [14].

A key issue is how best to transfer the experiential knowledge gained. One way to transfer tacit, experience-based knowledge is through personal and social processes [16], such as apprenticeships, informal groups or 'collectivities of practice'. The alternative way, which is focused in this study, is to transform the tacit knowledge to explicit, through 'codification' [16], which carries significant advantages, especially in larger organisations.

Organisational learning may, hence, be seen as a set of linked processes bringing the day-to-day practical experience from tacit to explicit [12]. As a set of processes, organisational learning is a foundation of a dynamic capability; reflecting upon, and upgrading, the knowledge as resource of the firm. A model with this orientation is Zollo and Winter's [26] model of 'deliberate learning', connecting practical operational experience with upgraded competitive advantage. The set of learning processes are experience accumulation, experience articulation and experience codification [26]. '*Experience accumulation*' is the tacit and trial-and-error based form of learning as it evolves over time. The second step, of '*knowledge articulation*', introduces a process of deliberation concerning what works and what does not work. Third, the articulated knowledge may, through a process of '*knowledge codification'*, be made explicit and accessible for a collective in manuals, instructions, etc. This set of learning processes is argued to be sequential in nature [26]. Through such a sequence of learning mechanisms, the experiential knowledge gained may be transformed into new or upgraded capabilities [14, 26], providing a link between individual action and reflection on an operational level, and strategic competitive advantage.

In all, the perspective developed herein sees logistics learning not as a structural optimisation of factors, but as a set of processes that dynamically links practical experience to higher-level managerial assets, and eventually to competitive strength.

3 A note on methodology

Well-publicised companies such as Wal-Mart and Dell [19], and Inditex [7], all utilise their supply chains to gain competitive advantages. For these companies, logistics and supply chain practices is their major strategic weapon, and therefore logistics issues are on the agenda for top management. Two Swedish examples of best-practice companies within logistics, Dustin and Clas Ohlson, provide the foundation for our findings here. The two companies have grown extensively over a more than a decade, with above-normal profit in comparison with industry competitors. The companies have also in common a strong logistics profile in their business strategies, as well as committed top management teams where logistics and SCM issues constantly are on the agenda. As such, they provide fruitful ground for exploring the relationship between learning mechanisms, capabilities and competitive advantage.

The companies have been chosen with theoretical sampling [5] in mind, meaning that they are not to be considered as representative for companies in general.

Instead they have been chosen, since they are expected to replicate or extend the emergent theory [3]. As Eisenhardt and Graebner [5] argue, they are particularly suitable for the illumination and extension of relationships and logic among constructs. In a similar way, Flyvbjerg [8] argues that a random case selection within a given sample may not be the most appropriate strategy. Instead cases with rich information, content should be selected and these cases often represent some kind of extreme. These cases better facilitate a deeper understanding of causes behind a given problem, and since this is desired more than the description of the symptoms, extreme cases are often preferable. As stated earlier, the two selected case companies are to be considered as best practice when it comes to logistics performance and can, hence, be considered to be what Flyvbjerg [8] labels as extremes.

The case studies were conducted, in a first round, during November and December 2006 with several visits at the headquarters and the central warehouses. In total, 9 interviews at various management levels including the CEOs, were made. In August and September 2008, the companies were revisited for a second round of interviews. In between, secondary material such as annual reports and newsletters have been collected and studied on a continuous basis. The first contacts were made with the CEOs at each company, and the COOs. Thereafter, a "snowballing" approach was used to identify other interviewees until the empirical data was to be considered to have enough theoretical saturation [3], i.e. no further, new, substantial information of interest for the research was provided by the interviewees. The interviews can be described as semi-structured, where the companies' strategy, learning behaviour and facilities and management style, were focused. Even though all interviews have been grounded in an interview guide (the same for all interviews), the questions have been open-ended and no specific order of the questions has controlled the interview. All interviews were typed and later transcribed. Citations have been extracted from the transcriptions in order to illustrate and strengthen the analysis.

Critique has been voiced against some research within the resource-based field for measuring on dependent variables and thus for being tautological in nature [4]. There is reason to pay adherence to this critique, and we have concerned ourselves to avoid this pitfall. A VRIO framework has been used [2], for its comprehensiveness and clarity, to evaluate the nature and existence of competitive advantage, while such a framework has not been employed for the study of the learning mechanisms. We had an ambition to operate with a multi-level approach, locating boxes within boxes and also with what Teece [24] labelled micro-foundations in that we seek specific examples of processes of translating experiential knowledge to explicit business strategy.

The three steps in the learning process modelled above present different methodological challenges, due to the different forms of knowledge we are attempting to monitor. Indicators for the explicit knowledge that is the codified material of the firm is relatively easy to access using conventional interview techniques. Likewise, the formal aspects of the articulation process are something that interviewees can accurately and with confidence comment upon. However, part of the articulation process is tacit and so is virtually all of the accumulation process. For the identification of indicators of the accumulation process, different learning techniques and how operations are developed has been discussed with the interviewees. Important input to these discussions has been personal visits at the warehouse in order to better understand the details in the operations.

4 Case study

4.1 Dustin

Dustin is a retailer of IT-related products and home electronics operating on the Swedish and Danish markets. The company was founded in 1984 and was run as a family business until 2005, when 80% of the shares were sold to a private equity company. Dustin has had an impressive profitable growth recent years, with a profit margin between 3 and 7% last years, while their two main competitors have had between 0 and 3%. In terms of growth, Dustin has grown in average 15% annually in recent years, and in 2007 the turnover was EURO 350 million.

From being a traditional mail-order company, the Internet sales has increased last decade and today represents 75% of the turnover. Approximately 65,000 articles are provided in 22 different product groups and the company has about 350 employees. Dustin is present on the business to business market, mainly focusing on small-sized companies and medium-sized companies, as well as on the private consumer market. On the two markets, targeted by Dustin AB and Dustin Home AB, respectively, a complete palette of IT-related products are offered, including hardware and software as well as installation, configuration and financial solutions. All products are purchased via multinational distributors and delivered to Dustin's central warehouse in Stockholm. From here, the products are delivered to the end customers 1–2 days after the order is placed if available in the central warehouse. At the outbound side, Dustin has a close collaboration with the Swedish mail company, Posten, and goods leave the warehouse 6–8 times every day.

Dustin operates in a rapidly changing market characterised by low margins and short product lifecycles, where

more than 100 new products/versions are introduced on a daily basis (about the same amount are deleted). The two main components of Dustin's business model are high availability and speed, i.e. short customer order lead times. Competitively, price is less important than speed and availability. By linking the four largest distributors to Dustin's in-house administrative software, Dacsa, and having standardised processes in the central warehouse, Dustin's supply chain is cost- and service-efficient with an inventory turnover of as much as 40 times per year. This set-up also supports Dustin's business model components of high speed and availability, which means that Dustin competes with service, large assortment, availability of products and speed of delivery rather than on arguments of having the lowest prices.

To manage this flow of goods in the supply chain and keep the high availability and speed, efficient and standardised processes are required. The warehouse operates more or less in the same, highly standardised way independent from the type of customer served. In addition, the IT system Dacsa has one common platform for the different companies in which employees as well as customers operate—but is linked to different websites that are adjusted to the targeted market segments.

Recent years, Dustin has been transformed from a rather unknown, small family-owned business to a professionally managed corporation. New ownership with new requirements on performance and strategic objectives, major organisational changes where the organisation has been "stretched" with several hierarchical levels, an entrance into the Danish market through the acquisition of Computer store A/S with the ambition for further expansion to the other Nordic countries, and a new central warehouse with 20,000 square metres instead of the former 4,500. The timeline in Fig. 2 summarises this development.

4.2 Clas Ohlson

Clas Ohlson Group AB is a Swedish retailer of do-it-yourself products for house and homes, technology and hobbies, targeting private consumers. It was founded in 1918 as a mail-order company based in Insjön, Sweden, but most of the sales has now transformed into regular stores, representing 97% of the turnover. Clas Ohlson has had a profit margin of in average 13.5% last 5 years, while the two largest competitors have had a profit margin of about 10 and 3%, respectively. During the same period, Clas Ohlson has managed to grow in average 17% annually.

The expansion outside of Insjön started in 1989, and in May 2009, Clas Ohlson had 106 stores in Sweden, Norway and Finland with total of approximately 3,000 employees and a turnover of EURO 460 million in 2008. In December 2008, the expansion continued to the UK market, where 5 stores were operating in the end of 2009. The base remains in Insjön, where the headquarters and central warehouse are located. All goods from suppliers are brought here and then further distributed to the stores.

Clas Ohlson operates, similarly to Dustin, on a market with fierce competition. Although costs always are a concern for this kind of retailer where the underlying products are relatively uncomplex and standardised, the strategic orientation of the firm does not rest squarely with a low cost orientation. Rather, ready availability for an urban population sets the firm's offering apart. It operates its outlets not in shopping centres on the rims of cities but on locations in city centres, providing access and availability coupled with low prices. The customers are offered "good value for money".

To improve supply chain operations is a prioritised area for top management and includes challenges such as cost efficient management of increased purchasing volumes from Asia (31% of products are purchased in Asia), to find new and more environmentally friendly packaging designs, keep high inventory turn over rates in the supply chain (inventory turnover is 6.8 times in central warehouse, and in the stores between 8 and 10 times annually), and manage deliveries to new stores. Crucial for these challenges is the central warehouse—the main hub in the supply chain—in which Clas Ohlson has repeatedly made investments in enlargements and new technology such as an automatic sorting facility and a new mini-load facility. The contemporary central warehouse, which was opened in 1995, has

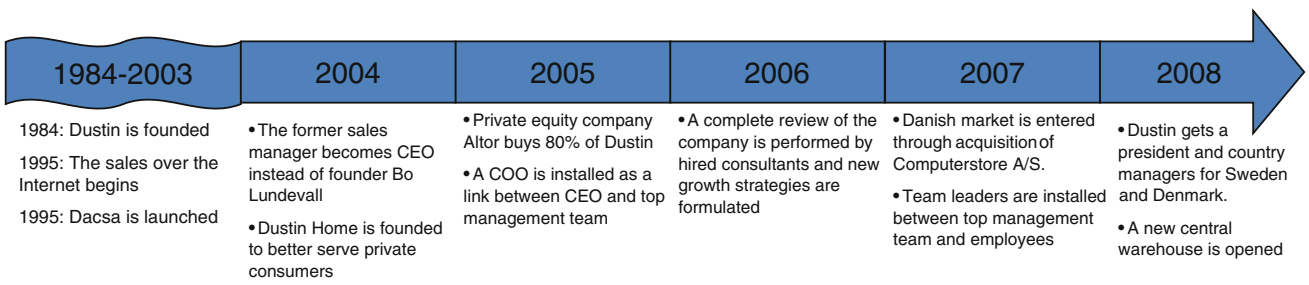

Fig. 2 The development of Dustin

been enlarged and rebuilt in three phases, with two more planned before the end of 2010, see Table 1. In total, the investments in the five phases are estimated to EURO 110 million.

The central warehouse has remained in operation through the opening of 10–15 new stores on an annual basis. In the central warehouse, the opening of a new store is managed in a standardised way, where the only obvious news is that it generates an extra delivery address at the outbound area. In fact, the entire replenishment process to the stores is managed in a highly standardised manner with few differences between e.g. size of stores or destination country. The process is based on a simple pull-based order system with order batches and reorder points individually defined for each product and store.

5 Analysis

5.1 Identified operational capability

Dustin and Clas Ohlson are two companies heavily dependent of logistics for their business success, and logistics operations are in both companies considered as major competitive strength vis-à-vis competitors. Logistics operations, characterised as simple, standardised but thought-through routines, gain a strong support from top management that emphasise the importance of speed and cost efficiency in the warehouse operations as well as transportation. As an important supportive function for this logistics system, both companies have elaborate IT systems linking sales orders to purchasing as well as the operations of the warehouse. The close integration between logistics operations and the IT system are further enhanced by the fact that the IT systems have been developed in-house for many years, which means many advantages:

> "Many of our advantages are due to the fact that we have not considered what an IT-system can do for us and adapted us, but what we want to do and make the IT-system adapt to how we work"
> (Marketing manager at Dustin)

The combination of simple, standardised logistics operating routines such as picking and packing in the warehouse, and the development over time of adjustable, in-house made IT systems can be identified as the companies' distinctive capability considered as valuable, rare and imperfectly imitable [2]. Starting with *value*, the combination of the logistics processes and the IT systems forms the basis for an efficient flow of goods in terms of economies of scale and control and is therefore obviously bringing value to the companies' customers, where high efficiency in operations means excess returns [18, 21] and above-normal profit margins.

The question of what can be considered as *rare* may be a difficult question. Overall, a capability should be considered rare as long as the number of owners of the capability is lower than the number needed for perfect competition dynamics in an industry [2]. It is important to note that the individual elements of the logistics operations, as well as of the IT systems, are not necessarily unique and rare. What fulfils the rareness criterion is the complexity in the combination of them. The complexity in the relationship between the warehouse operations and replenishment process on the one hand, and the IT system on the other, also means that they are to be considered as *imperfectly imitable* [2]. The IT systems have been developed in symbiosis with the operational logistics processes over the years and can therefore be viewed as being path dependent and historically unique [23]. In order to function, the distinctive capability discussed here requires a bundle of resources to be combined in a unique way. The exact relationship between the resources is difficult to clarify, and therefore they can also be considered as causally ambiguous [23], i.e. to imitate this system would be difficult for a competitor.

5.2 Identified dynamic capability

From a structural standpoint, the operational capabilities may be deemed a valuable, rare and difficult-to-copy capability. This form of non-imitability stems from structural characteristics, such as the complexity of the system. Both firms also display an ability to continuously improve on that structural capability. The firms seem to have developed dynamic capabilities capable of sustaining competitive strength over time. We earlier argued that a company's dynamic capability may consist of the ability to over time develop and change their operational capability, so that they constantly are positioned at the productivity

Table 1 The five phases of enlargement of Clas Ohlson's central warehouse

1995: Phase 1	New central warehouse is opened. Capacity for mail-order business and 8 stores
1999: Phase 2	The central warehouse is enlarged for a capacity of 25 stores
2004: Phase 3	High bay warehouse and automatic sorting facility is installed. Capacity increased to 90 stores
2009: Phase 4	Sweden's largest mini-load inventory. Enables deliveries to 150 stores
2010: Phase 5	Another high bay warehouse for storing capacity to 150 stores

frontier [22]. This is well mirrored in the case companies' view on their market and environment:

> "-We are not a static company, we live in a changing world to which we constantly adapt ourselves. As a consequence, even if you have plans, these are changed during the journey. Both concerning what we sell, in what way we sell, and the way we reach the market."
> (CEO at Dustin)

The understanding of this change process may be grounded in three different learning mechanisms; experience accumulation, knowledge articulation and knowledge codification [26], which have been explored in the cases.

5.3 The learning mechanisms

Several indicators, through which the learning mechanisms have been explored, have been identified in the companies (see "Appendix"). Even if it can be argued that all three mechanisms are equally important, the degree of utilisation of them varies between Dustin and Clas Ohlson.

On a company level, the 25 years of history of Dustin may be seen in two distinct phases coinciding with shifts in learning mechanisms. Over the first, entrepreneurial phase of development, from the foundation to 2004, the family controlled firm was largely dependent on tacit experience accumulation among a tightly knit management team, led by the founder and CEO. Still, many of these practices are present in the company and indicators for this experience accumulation found in this study are a strong personal involvement of top management, where not always fully thought-through solutions are launched, called 90% solutions, and Dacsa as an engine for development and learning in the company.

Following a new CEO appointment, new management structures and a new central warehouse, a major overhaul was made of both strategy and organisational structures and processes. According to company management, a major thrust of that work was articulating experience made, and subsequently using that articulation as a major input into the formal strategy formulation process. Indicators for knowledge articulation found are increased professionalism in management, formalisation of the organisation and the launch of user groups.

In terms of knowledge codification, Dustin has also started to document their work and deliberately launched a test and learn culture in the organisation that goes in line with the founder's philosophy. Overall, the trust to experience accumulation is, however, still dominating the company development. As argued by the COO:

> "The processes and how we work are in our heads. We have until now not picked them out but we are on our way now. That work has begun. Because we know that if there would be a walk-out there are a number of people who leaves with a lot of knowledge."
> (COO at Dustin)

Clas Ohlson has also a considerable amount of experience accumulation in the company. Similar to Dustin, a strong culture, expressed in what is labelled "the Clas Ohlson spirit", has preserved much of the company's entrepreneurial thoughts. Inspired by this, parallel working routines are in place at the central warehouse, where the best, most efficient ones, outperforms the others in the long run without much interference from management. Knowledge is thus accumulated in the company routines without any explicit articulation or codification.

> "I believe the best way to find out how to work is not to manage it too much in detail. Imagine we get a new working task here at the DC. We then let the workers test by themselves how to work and perhaps 5-6 different alternatives come up. After a while perhaps two main alternatives for how to work have been developed. In general, learning by doing is what it is about. This is I believe the fastest way to find out the most efficient way of working."
> (COO at central warehouse at Clas Ohlson)

In contrast to Dustin, Clas Ohlson exhibited a more developed knowledge articulation and codification in how logistics operations were handled. An indicator for articulation is the specific reference groups used for the enlargement of the warehouse where experiences from employees are articulated. Other, even more defined standardised project forms, the formal education centre, the 'Clas Ohlson Academy', to which all staff are sent for training, and the formalised information flows between the central warehouse and the IT department, are examples of knowledge codification at Clas Ohlson.

Both companies show that all three learning mechanisms are in place simultaneously, which means that the three learning processes long term should be considered as parallel ongoing processes. Although the companies utilise all three learning mechanisms simultaneously at an overall level, individual indicators reveals a translation process moving from experience accumulation, through articulation to codification. For specific issues, the three learning mechanisms are hence coupled in sequence, starting with tacit experience accumulation, ending up in structured, codified clear working routines. One example for this is the formalised information lines between Clas Ohlson's central warehouse and the IT department, where all development

of the IT system Raindance is conducted. From initially having an ad hoc approach to development of new functionalities in the system, based on informal wishes of the employees at the warehouse, the development process was structured, including formal IT groups for development at the warehouse and priority lists of improvements.

> "We have now formalised the contact between the DC and the IT-department. We had to do that rather recently. Our IT-department consists of 40 people now and it did not work any longer that 10 different people from the DC called ten different people at the IT-department talking about the same things. So we had to formalise it… We did that about a year ago. Now we have a specific IT-group here at DC with people from the different areas and backgrounds. The group has monthly held meetings and works with a wish-list where different changes are given different priorities. This list is then of course changed continuously. The list is communicated by one person here to one person at the IT-department."
> (COO at central warehouse at Clas Ohlson)

6 Discussion and conclusions

The purpose of this study has been to explore the relationship between logistics capabilities and sustainable competitive advantage by using the notion of learning mechanisms. Applying the theoretical concepts of operational and dynamic capabilities, as well as learning mechanisms to a logistics context, we have sought to contribute to the emergent debate on organisational learning in logistics literature.

6.1 Operational capabilities

Operational capabilities are here seen as the momentary competitive advantage that at any one point in time provides an advantage in quest for performance, i.e. allowing the firm to capture above-average return and achieve growth. Our findings support previous research that argues logistics to be such an operational capability [6, 18]. The case companies' competitive strength depends greatly on working process efficiency and costs handling. They both display a remarkable speed of throughput, coupled with a very broad array of product range. Customers expect ready availability and accurate delivery in a very complex retail operation, and the firms are therefore highly dependent on logistics skills. At the core of the competitive strength of both companies lies a complex combination of efficient, standardised logistics processes and well functioning, tailored and in-house developed IT systems. Thus, the full measure of the competitive strength of the two companies cannot be identified in the logistics function alone, but in the interrelationship between logistics and IT.

We evaluated this combination based on a set of structural criteria, the VRIO framework. This combination can be identified as valuable, because of their fundamental importance to the business, rare, because of the in-house developed systems and imperfectly imitable, because of its path dependency, social complexity and to some extent causal ambiguity [2].

6.2 Dynamic capabilities

The recognition of dynamic capabilities, we argue, is crucial in order to understand why operational excellence in the form of a bundle of logistics routines and IT system may be intrinsically involved in shaping business strategy. The interrelationship between logistics and IT suggests a co-evolutionary quality over time, where the two functions, albeit distinct, follow parallel trajectories. With this perspective, the substantial and risky investments in in-house IT systems development of both firms also gain a rationale. It is a highly adaptive mode of proprietary knowledge development, tuned to the business model and very difficult to imitate. Earlier discussion lead us to conclude that the interwoven and co-evolving capabilities in logistics and IT of the two companies here studied constitutes a set of advantages, where the productivity frontier [22] is continuously pushed.

6.3 Organisational learning

The discussion above permits identification and classification of how logistics forms the basis for a sustainable competitive advantage. However, it lacks an explanation as to why these logistics-related capabilities are at work. Pushing the productivity frontier as argued above requires adapting the present level of knowledge to new requirements; reactively or, perhaps preferably, proactively. The logic for this is straightforward; to be able to develop and improve capabilities over time the company needs to be a learning organisation. To address that issue, we applied a knowledge based perspective in this research by using Zollo and Winter's [26] conceptualisation of the learning process into experience accumulation, knowledge articulation and codification.

The identified indicators of the learning mechanisms all represent important cornerstones for development and improvements of logistics operations, and, as such, they are the foundation for the companies' dynamic capabilities. For instance, experience accumulation in the form of parallel working routines, where the most efficient routines outperforms the others, means that Clas Ohlson has been

able to continuously improve efficiency in warehouse operations. Knowledge articulation in the form of an increased formalisation of the organisation at Dustin has enabled new installed middle managers to better cope with information from staff and bring use of this. Knowledge codification in the form of documentation at Dustin has enabled the organisation to improve the roles of the different employees and the interfaces between different functions and is an important tool for the spread of tacit "know-how".

6.4 Implications and further research

From a managerial perspective, our research confirms existing logistics research findings [1, 6] that operational logistics skills and performance can be of strategic importance for top management. A natural continuation of previous research is a call for an agenda of how logistics leaders can manage and exploit the learning concept [6]. This research answers this call in the sense that the three learning mechanisms explored here can help to understand logistics learning in a more systematic way. As such, the three mechanisms described and exemplified in this research may help logistics managers to structure their work towards improved logistics learning. Thus, although it is not at first hand a management tool for practitioners, Zollo & Winter's [26] three learning mechanisms utilised here may function as the foundation for improved logistics learning in the company. The fact that the three learning mechanisms in the case companies are applied simultaneously over time and that there is a transformation of individual learning indicators from tacit experience accumulation to explicit knowledge codification indicates the necessity for top management to strengthen and reinforce all three mechanisms and to balance managerial attention given to each of them.

Another managerial learning from the case companies highlighted in this research is the close relationship between logistics operations and the in-house developed IT systems at the case companies. From a learning viewpoint, this interplay has been of crucial importance for the companies, and it indicates the importance of having in-house control of the IT development. In fact, one conclusion may be that the IT systems have been a driver for the translation of logistics experiences to codified management routines. The nature of information technology systems is such that they require formal codes of operations, and throughout the years of perfecting their respective logistics practice, the IT systems have required attention to articulation and formal codification. Since the practice of logistics and IT has co-evolved in the two firms, the learning cycle of accumulation, articulation and codification may be interpreted as the mechanism for that co-evolution. Thus, any initiative from the experience of logistics practice has been articulated and codified in and through the IT systems in the form of e.g. new applications.

From a theoretical perspective, logistics has in strategic management literature been considered to be operational and a tool for strategy implementation rather than important for the strategy making process [22]. A capabilities-based and dynamic view of logistics changes that perspective, in the sense that logistics now may play a crucial role for a proper understanding of how competitive advantages may be achieved and upgraded. In this article, we have outlined a structure that combines sustainable competitive advantage with organisational learning via operational and dynamic capabilities. In summary, this means that logistics operations cannot generically be detached from the strategy of the firm, and the explicit strategy making of the firm not detached from its operational base, but reinforces the logistics orientation. In fact, one may even suggest that sustained logistics excellence is a driver of competitive advantage, where learning is a critical process. The findings emphasises the role of micro-processes of learning in sustaining competitive advantage and identifies interfunctional, co-evolutionary processes of experiential learning as a challenging avenue for further research.

Zollo and Winter's [26] model applied in this research highlights knowledge transfer through explicit, coded forms of knowledge and the generation of coded knowledge from tacit and experiential on an operative level. Not discussed in this research is the role of learning speed, i.e. how fast companies transform experiences gained to codified knowledge. The speed of the transformation process may be vital for a company's competitiveness, in particular to for companies operating in highly volatile markets [4, 6]. The issue of learning speed hence remains to be an interesting future research topic.

For further research, it is also prudent to raise issues concerning an alternative dissemination of organisational learning where tacit knowledge is transferred through informal and personalised learning rather than with the process of codification. This would be connected to cultural issues, and there are indeed observations pointing to the importance of cultural characteristics and support from earlier research in logistics [6]. Examples from this study that are in a similar vein include open door policies at the IT department, informal and spontaneous communication patterns, tightly knit and vision driven management teams, and the efforts to preserve an entrepreneurial culture at both firms.

Another interesting research area related to this research is the extension of learning mechanisms towards relations with other supply chain members. Whereas this study is based on one member of the supply chain, it could be argued, in line with supply chain management literature [6, 15], that well-developed relationships in the supply chain could enable learning not only for the individual

company but also for other supply chain members. Organisational learning would here be extended to 'supply chain learning'.

Appendix

See Tables 2, 3, 4.

Table 2 Indicators for experience accumulation

Company	Indicator	Description
Dustin	Personal involvement—entrepreneurial founder and young, energetic functional managers	Informal, fast decision-making by the founder, described as a great entrepreneur with many ideas, and a team of young energetic functional managers has played a decisive role for the development of operational routines at Dustin. Top management themselves has been involved in the operations, which has enabled them to identify problems and rapidly find solutions
	The IT system Dacsa as a tool and driver for change	Development of Dacsa, which has been initiated by a need from the logistics operations, has led to, for example, new tools and KPIs. These have in turn developed the logistics processes and, in the long run, meant that new people and functions have been employed in the company. As such, Dacsa has been an important tool and platform for experience accumulation
	90% solutions	The functional managers have in-depth technical and operational knowledge about the company, and trial and error and "hands-on" have been the main development approach. Typically, not everything has been planned in detail before launching a project or a change in the warehouse routines. The working style consists of *"90% -solutions"* where the last 10% have been optimised later on when the project already has been launched
Clas Ohlson	Entrepreneurial culture	Despite a long history, Clas Ohlson has preserved an entrepreneurial culture in the company, the so-called "Clas Ohlson spirit", in which the personnel's own initiatives and willingness to come up with ideas for improvements are encouraged. Improvements are expected to be accomplished without any specific, outspoken arrangements from management. In fact, suggestion box and other similar tools for general improvements are considered as counterproductive, since these hampers the speed of the changes
	Parallel working routines	The development of operational working routines in the central warehouse might be compared to Darwin's theories of development, where the best (most efficient) routines finally outperforms alternative ways. This can, for instance, include new routines for how to pick items or where to place forklifts in the warehouse

Table 3 Indicators for knowledge articulation

Company	Indicator	Description
Dustin	Professionalism in management	Recent years development in Dustin has necessitated more professionalism in the management of the company, which affects also the logistics activities. This professionalism above all means clearer, more distinct responsibility areas are given to different functions. For logistics, clearer interfaces towards other functions in the company and more pronounced demands in terms of, for example, delivery times and capacity have been established. These interfaces means that knowledge about how logistics activities are performed in the company, and what they require in terms of, for example, time and capacity, to a higher extent has to be formalised in order to be communicated to other parts of the company

Table 3 continued

Company	Indicator	Description
	Formalisation of organisation	Dustin's organisation has been stretched out in terms of hierarchical levels as a means to cope with information and management of the staff. About 28 team leaders have been installed in all important departments in the company, including the central warehouse. The team leader, organisationally placed between employees and department managers, is thought to better integrate different functions in the company and care for influences and ideas from employees. Through the new team leaders, initiatives and experiences from the personnel are expected to become formal inputs into the decision-making process
	User groups	Dustin has in recent years formalised the communication lines in the company in terms of formal meetings. One example of this is that specific cross-functional user groups have been established in order to better integrate people and Dustin's technology, i.e. Dacsa, the web and a new CRM system. The user groups function as a platform for further changes and improvements of the systems. In short, different suggestions from employees are gone through and discussed if possible to implement. As a result of cross-functional presence of people, a good overview of systems implications will immediately be gained
Clas Ohlson	Specific reference groups	Parallel to the entrepreneurial spirit and low reliance on, for example, organised suggestion schemes, Clas Ohlson has developed and formalised the organisation, for example with specific reference groups of employees for intended changes. These groups are set up in order to comment and give input to different aspects of above all the enlargement of the central warehouse. In connection to the different enlargement phases, a number of groups have been set up each time. The mission for the groups has been to gather knowledge from employees and organise it into useful knowledge for the enlargement, e.g. how the outbound area in terms of gates should be designed

Table 4 Indicators for knowledge codification

Company	Indicator	Description
Dustin	Documentation	The work of documenting working processes, working descriptions, etc. has started. Knowledge about how things work, and "know-how" that previously have been tacit in the company, is now to a higher extent than previously codified
	The launch of an explicit test and learn culture	Another part of Dustin's professionalism and increased awareness of the importance for organisational issues is the increased interest in the personnel and the need for taking care of initiatives and ideas. Dustin has therefore launched a so-called 'test and learn' culture as a means to encourage personnel to take own initiatives. Except for an external consultancy firm, which has been hired, the team leader roles are seen as extremely important communication tool between employees and the top management team
Clas Ohlson	Standardisation of work in project form	Standardisation is seen as a key element in order to cope with Clas Ohlson's future growth. Larger change projects are organisationally managed in a standardised way where different and hierarchical levels are normally present. For example, the opening of a store is one example where a project team form is used. The project team is set up 10 weeks before the store is planned to open for customers and consists of around 8 people that are internally recruited from their normal jobs within Clas Ohlson. The people have different positions in the company and the logistics function is always represented in order to at an early stage develop routines and design suitable for Clas Ohlson's logistics processes. Here, typically knowledge about order size, purchasing batches from suppliers are matched against shelve-spaces for each product. All projects are thus in forehand very well described with timelines, suggested number of participants, budget in some occasions, etc. The projects are also always followed up and evaluated in a standardised way

Table 4 continued

Company	Indicator	Description
	Education centre	In recent years, accelerated by the geographical expansion into new countries with different business cultures, the education centre, the Clas Ohlson Academy, has become increasingly important. The purpose of this centre is to educate all new employees in the company's working routines, policies, products, and above all, the Clas Ohlson spirit. As stated by the Director of central warehouse, all new employees should be 'vaccinated' by this spirit
	Formalisation of information flows	Information flows between employees from the central warehouse and the IT department, responsible for development of new functionalities in the IT system Raindance, has been formalised recent years. Today, formal IT groups at the central warehouse meets on a monthly basis and compiles priority lists for changes. Thereafter **one** person from this group communicates the list to **one** person at the IT department

References

1. Abrahamsson M, Aldin N, Stahre F (2003) Logistics platforms for improved strategic flexibility. Int J Logist Res Appl 6:85–106
2. Barney J, Clark D (2007) Resource-based theory: creating and sustaining competitive advantage. Oxford University Press, Oxford
3. Eisenhardt K (1989) Building theories from case study research. The Acad Manage Rev 14:532–550
4. Eisenhardt K, Martin J (2000) Dynamic capabilities: what are they? Strat Manage J 21:1105–1121
5. Eisenhardt K, Graebner M (2007) Theory building from cases: opportunities and challenges. Acad Manage J 50:25–32
6. Esper T, Fugate B, Davis-Sramek B (2007) Logistics learning capability: sustaining the competitive advantage through logistics leverage. J of Bus Logist 28:57–81
7. Ferdows K, Lewis M, Machuca J (2004) Rapid fire fulfilment. Harv Bus Rev 82:104–110
8. Flyvbjerg B (2006) Five misunderstandings about case study research. Qual Inq 12:219–245
9. Gagnon S (1999) Resource-based competition and the new operations strategy. Int J Op Prod Manage 19:125–138
10. Helfat C, Finkelstein S, Mitchell W, Peteraf MA, Singh H, Teece D, Winter S (2007) Dynamic capabilities: understanding strategic change in organizations. Blackwell Publishing, New York
11. Helfat C, Peteraf M (2003) The dynamic resource-based view: capability life cycles. Strat Manage J 24:997–1010
12. Huber G (1991) Organizational learning: the contributing processes and the literature. Org Sci 2:88–116
13. Hult G, Ketchen D, Arrfelt M (2007) Strategic supply chain management: improving performance through a culture of competitiveness and knowledge development. Strat Manage J 28: 1035–1052
14. Levitt B, March J (1988) Organizational learning. Annu Rev Sociol 14:319–340
15. Mentzer JT, DeWitt W, Keebler JS, Soonhoong M, Nix NW, Smith CD, Zacharia ZG (2001) Defining supply chain management. J Bus Logist 22:1–25
16. Nonaka I (1994) A dynamic theory of knowledge creation. Org Sci 5:14–37
17. Nonaka I, Takeuchi H (1995) The knowledge-creating company. Oxford University Press, Oxford
18. Olavarrieta S, Ellinger A (1997) Resource-based theory and strategic logistics research. Int J Phys Distrib Logist Manage 27:559–587
19. O'Marah K, Hofman D (2009) Top 25 supply chains. Supply Chain Manage Rev 13:12–19
20. Penrose EG (1959) The theory of the growth of the firm. Oxford university press, Oxford
21. Peteraf M (1993) The cornerstones of competitive advantage: a resource based view. Strat Manage J 14:179–191
22. Porter ME (1996) What is strategy? Harv Bus Rev 74:61–78
23. Teece D, Pisano G, Shuen A (1997) Dynamic capabilities and strategic management. Strat Manage J 18:509–533
24. Teece D (2007) Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strat Manage J 28:1319–1350
25. Tracey M, Lim J-S, Vonderembse M (2005) The impact of supply-chain management capabilities on business performance. Supply Chain Manage: Int J 10:179–191
26. Weick K (1979) The social psychology of organizing. McGraw Hill, New York
27. Winter S (2003) Understanding dynamic capabilities. Strat Manage J 24:991–995
28. Zollo M, Winter S (2002) Deliberate learning and the evolution of dynamic capabilities. Org Sci 13:339–351