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Competitive advantage or strategic necessity?

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Abstract

Information technology is a "hot" topic. Consultant, software and hardware companies, the specialized press and even some academics present IT as the cornerstone to firm's performance. This claim is even stronger in the logistics sector where the development of the Internet and related technologies has opened some unexpected possibilities. However, despite this enthusiasm, some earlier work in IT research has called for a more prudent view on IT, stating that IT does not automatically provides the firm with a competitive advantage.

In this paper, using both the position-based and resource-based views, we develop a framework for analyzing the contribution of IT in the logistics sector. We conclude that IT will contribute to competitive advantage in limited cases and that most often the "strategic necessity" hypothesis will apply. We suggest a dual approach to information technology strategic management: on one hand, the firm should develop the capability to implement efficiently some "standard" solutions on an opportunity-based approach; on the other hand, it should embed its IT system in the organization with a strong top management commitment and a clear strategic alignment.

Keywords

Logistics – Strategy – Competitive advantage – Information Technology - Assessment - 2nd Swiss Transport Research Conference – STRC 2002 – Monte Verità

1. Introduction

"Internationalization of trade and information flows, market liberalization and new technological opportunities are urging many transportation and logistics companies to take action" (Arthur Andersen, 2000). Customer's requirements expressed whether in terms of reliability, transparence, flow, payments, and international connectivity have put some tremendous pressure on logistics companies (xx). In this context, the race to most sophisticated information technology (IT) applications appears to lots of companies to be the key to success (or at least to survival). This is reflected in the massive investment in IT for logistics activities (for example, Stephens Inc. (2000) estimates it to reach 1 trillion $ worldwide only for cross-border logistics by the year 2005.

However, while the software and consultant companies are marketing the advent of the e-logistics firm, in which IT is pervasive, the question of whether the adoption of these systems can really be a source of competitive advantage is still largely unsolved.

Actually, earlier research on IT and strategic management indicates that IT does not deliver competitive advantage per se (Powell and Dent-Micallef, 1997, Clemons and Row, 1991). Indeed, to do so it needs to fulfill three minimal requirements: first, it needs to bring some value (Porter, 1985); second it needs to support the firm's business strategy (Porter and Millar, 1985) and third, it has to contribute to the development of distinctive resources (Peteraf, 1983).

The objective of this article is to apply these "general, rather abstract" strategic management concepts to the assessment of specific IT solutions and in particular of e-logistics solutions.

We do so by building an analytical framework deduced from both the position-based and the resource-based views, and then by applying it to identify the conditions in which e-logistics solutions may help Logistics Service Providers' (LSPs)[1] creating a sustainable competitive advantage.

Our goal is to help LSPs separating the "wheat from the chaff" in existing e-solutions; a task that can be especially arduous for them due to their relatively limited previous exposure to complex IT.

1 In this article, we use this denomination in a very broad sense. Today, the frontiers between the different companies are blurring, with the different companies extending their reach (at least commercially) to propose at least basic types logistics services. Accordingly, LSPs include companies that provide transport, forwarding, warehousing, commissioning, knowledge based supply chain related advisory and other truly transport-related services. (Arthur Andersen, 2000).

The article is structured as follows: after having briefly introduced the need and context of this study in section 1, we propose in section 2 an analytical framework for analyzing the potential contribution of IT to competitive advantage; this model stems from a review of the role assigned to IT in the position-based and resource-based theories. In section 3, we position the main e-logistics solutions available today in the value chain model. In section 4, we apply the framework developed in section 2 to logistics solutions presented in section 3. In section 5, we discuss the results and issue some general recommendations and suggestions for further research.

2. Information Technology, strategy and firm performance

From the outset, IT researchers advocated tight IT-strategy linkages, asserting that IT affects firm strategies, that strategies have IT implications, and that firms must somehow integrate strategic thrust with IT capabilities (Fabbe-Costes, 2000). However, the role that IT plays in organizational performance has been tackled from two different standpoints in strategic management: the position-based (outside-in) view and the resource-based (inside-out) view[2]. In this chapter, we synthesize their key contributions to build our analytical framework.

2.1 The position-based approach to IT

According to Porter (1984), formulating a competitive strategy turns around two central choices: selecting a competitive domain with attractive characteristics and positioning the firm vis-à-vis the five competitive forces encountered[3]. Then, the only feasible ways of achieving a sustainable competitive advantage is to select one of the three generic strategies: cost leadership, differentiation or focus. In this perspective, the next logical step is to align the activities with strategy (Porter, 1985).

IT has impacts at both industry (meso) and organizational level (micro). At the industry level, IT innovation can alter a full range of industry structure variables that finally determines the sector's profitability; it includes cost positions, scale economies, power relations with buyers and suppliers, and market structure (Benjamin et al, 1984; Cash and Konsynski, 1985; Porter, 1985, Clemons, 1986; Malone, 1987). At the organizational level, the primary focus of IT is to coordinate the value chain (Porter and Millar, 1985; Rockart and Short, 1989). If the first-mover disadvantages are not too high, IT can also deliver a first-mover advantage (Porter, 1985). In any case, IT should support the " strategy" (Rackoff et al, 1985) through some sort of "strategic alignment".

[2] Although both positions converge on the fact that a good strategy must be feasible, consistent and be capable of providing a competitive advantage, they diverge on the means to achieve a fit between the organization and its environment (Rumelt, 1984).

[3] These five forces impinging on the firm's profit potential are "the entry of new competitors, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and the rivalry among the existing competitors".

The general view from the position-based view of IT is quite pessimistic (Warner, 1987; Clemons, 1986) with further empirical evidence that there is no direct correlation between IT adoption and firm performance (Neo, 1988; Floyd and Wooldridge, 1990). In short, it states that (1) IT does not provide competitive advantage per se, that (2) IT can impact the industry structure and the general profitability of an industry (although it is rare), that (3) IT has mainly a coordinating role in the value chain, and that (4) IT should be aligned with the overall strategy.

2.2 The resource-based approach to IT

Whereas traditional (position-based) strategy research has focused on advantages derived from industry and competitive positioning, the resource-based research focuses on advantages stemming from firm-specific, intangible resources such as organization culture, learning and capabilities (Hall, 1993). Resource-based theory begins with the notion of resource heterogeneity, arguing that firms hold heterogeneous resource portfolios – whether by history, accident, or design- and that this resource heterogeneity is responsible for observed variability in financial returns across firms (Peteraf, 1993). Firms achieve sustained performance advantages by accumulating resource portfolios that produce economic value, are relatively scarce, and can sustain competitive attempts at imitation, acquisition or substitution (Barney, 1986). Valuable, scarce resources may survive competitive imitation if protected by imitation barriers, or "isolating mechanisms" (Rumelt, 1984), such as: time compression diseconomies, historical uniqueness (first mover advantages), embeddedness of resources, and causal ambiguity[4] (Lieberman and Montgomery, 1988; Dierickx and Cool, 1989; Barney, 1991).

Considering this set of hypothesis, do IT meet resource-based criteria for sustained competitive advantage? Clemons and Row (1991) pushed forward a commodity view of IT. In their perspective, IT per se does not generate sustainable performance advantages but is rather a

[4] A complete presentation of these notions can be found for example in Peteraf (1983). Basically, time compression diseconomies refers to the fact that a resource may require accumulation over time through learning, experience, firm-specific knowledge, or trained proficiency in a skill; historical uniqueness (first mover advantages) to the fact that resources are inherently unique or were originally acquired under nonreplicable conditions, such as a distinctive location, the cooptation of a sole raw material source, or first mover advantages such as reputation, brand loyalty, or the power to establish standards; embeddedness of resources to the fact that the value of a resource may be inextricably linked to the presence of another complementary or co-specialized resource, and causal ambiguity to the fact that connection between a firm's success results from cultural or social phenomena too complex for managers to understand or manage.

"strategic necessity". This hypothesis consists of two propositions: (1) IT provides value to the firm by increasing internal and external coordinating efficiencies, and firms that do not adopt them will have higher cost structures and therefore competitive disadvantage; and (2) notwithstanding (1), firms cannot expect IT to produce sustainable advantages because most IT is readily available to all firms – competitors, buyers, suppliers, and potential new entrants – in competitive factor markets (Clemons and Row, 1991).

According to this view, firms appear to have only three feasible paths to IT- based competitive advantage: either (1) to reinvent IT advantages perpetually through continuous, leading edge IT innovation; or (2) to move first and erect unassailable first-mover advantages; or (3) to embed ITs in organizations in such a way as to produce valuable, sustainable resource complementarity (Powell and Dent-Micaleff, 1997). Although, the three propositions are theoretically valid, in reality the third one is the most realistic because most developments in IT are either done by third parties and/ or are easily imitable (with some notable exception like SABRE).

If IT per se does not provide distinctive advantages, however firms can use them to leverage or exploit firm specific, intangible resources such as organizational leadership, culture, and business processes (Clemons and Row, 1991; Henderson and Venkataraman, 1993). Walton (1989) and Benjamin and Levinson (1993) classified resources as organizational, business, and technological, and argued that IT performance depends on the integration of resources across these categories. Powell (1997) shows how human and business resources combine with IT to produce competitive advantage through resource complementarity in retailing.

In short, the resource-based view states that (1) IT does not provide a competitive advantage per se but is rather a strategic necessity and (2) IT has to be embedded with other resources, typically human and business resources.

2.3 An analytical framework

Both position-based and resource-based views stress the importance of the integration of IT in a specific organization, whether with its resource or by a strategic alignment. Of course, this can only happen if there is some clear contribution to the value chain. Although, not stated explicitly, there is no doubt that it depends of a given application. From there, we deduce our analytical framework (figure 1) and some illustrative questions (table 1) for strategic IT assessment.

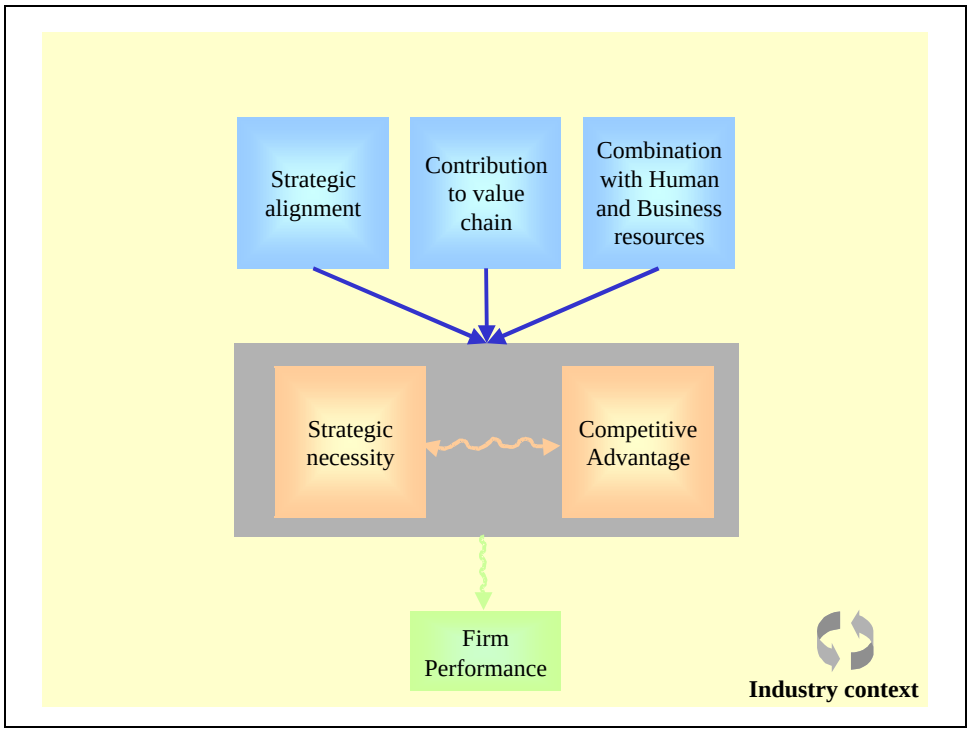

Figure 1 – Framework for analyzing IT contribution to firm's performance

- **Does the system modify the industry structure?**
  - How does it impact on "five competitive forces"?
  - Does it enable new players to come, new business models to emerge?
- **Does the system contribute to the value chain?**
  - What specific activity or set of activity does it support?
  - How much reengineering is needed?
- **Does the system support the business strategy?**
  - Are the customers putting it on their requirements lists? Is it really a selection criterion?
  - Is the system cost, differentiation or focus oriented?
  - Is there some formal "strategic alignment" process?
- **Does the system enables some unique[1] combination with some Human and Business resources?**
  - Are the main players in the sector adopting it?
  - How specific is the IT systems to my business processes?
  - How specific is the IT systems to my human dimensions?

[1] There is some discussion on the use of words such as "unique" or "sustainable"; in reality, these notions need to be understood in a certain competitive context. None advantage is sustainable for ever, neither any resource nor combination of resource is fully unique.

Table 1 – Illustrative questions for analyzing the contribution of IT to firm's performance

3. E-logistics: A review

The Council of Logistics Management (CLM) has defined logistics as "that part of the supply chain process that plans, implement and control the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customer requirements" (Council of Logistics Management, 1996).

This section provides a comprehensive view of the possibilities to use IT and more specifically Internet related technologies in logistics activities. We refer to it as e-logistics. We start by positioning the different IT systems utilizing a slightly adapted Porter's value chain (1985) then we detail the features of some recent and promising applications.

3.1 IT contribution to the value chain

The use of Porter's value chain model requires the definition of a specific company; we consider a "model" Logistics Service Provider (LSP) that provides multi-modal transportation services, that manages a fleet and a storage capacity (owning it or not), and that handles international operations.

This hypothesis has several advantages:

- It puts the different systems and technologies in an understandable context;
- It makes explicit links and synergies between different systems;
- It provides a comprehensive view of the pervasive use of IT, including its use in so-called support activities.
- It represents dominant characteristics of e-logistics solutions customers[5].

The results are illustrated in figure 2.

5 Indeed, over the past years, there is a clear trend for more outsourcing of logistics activities (Whiteing, 2000). The main drivers behind this phenomenon are the increased complexities of the operations and the general trend to focus on "core competence" (Hamel and Prahalad, 1990).

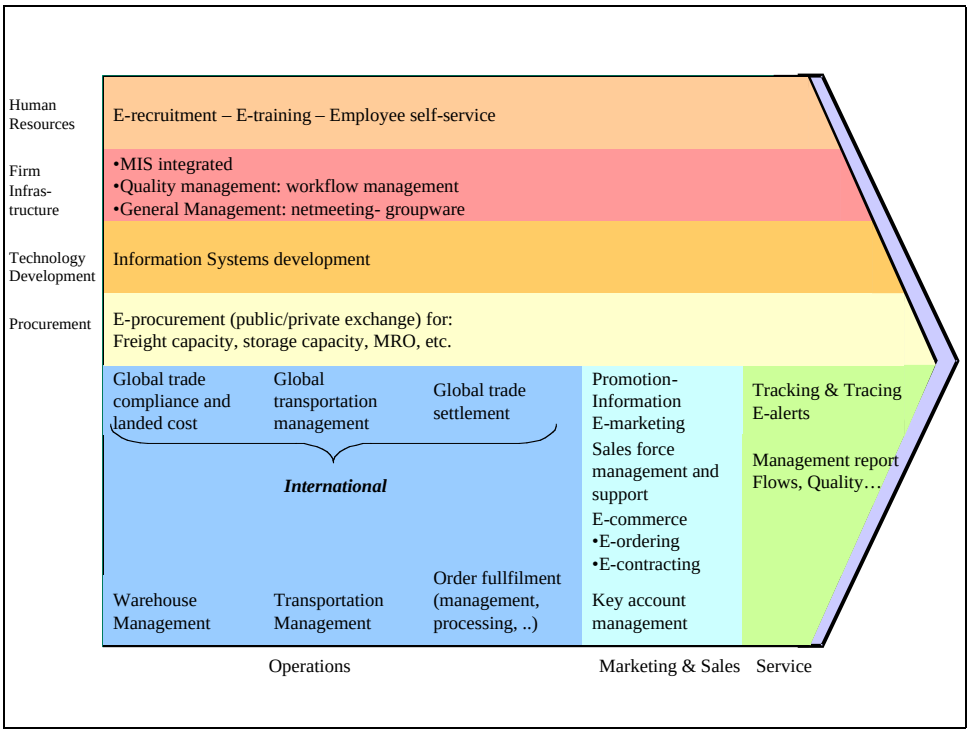

Figure 2 – Contribution of Internet and related technologies to the LSPs' value chain

3.2 Internet and related technologies and systems

Recently, Internet related technologies have enabled fast developments in three areas: (1) E-commerce - public marketplaces and Extranet commerce interface; (2) E-global logistics - technologies and systems that aim to streamline the international flow of goods, information and money; (3) Intranet and Employee Services -technologies and systems to make employees life easier and to facilitate interaction and knowledge management. In this part, we detail these systems.

3.2.1 E-commerce: Powering marketing, procurement and sales processes.

B2B e-marketplaces

B2B marketplaces can be broadly defined as "platforms for exchanges between purchasers and suppliers wishing to trade among themselves"[6]; their basic claim is to reduce the transaction costs and especially the searching and negotiating costs in the procurement process. In logistics, they focus on two types of services: spot transactions (typically single door-to-door shipments), and complex contract negotiations that involve repetitive shipments and eventually some complementary elements ranging from warehousing to more complex value-added services.

The first type of transaction corresponds to a commodity view of logistics services where parties adopt a transaction view (short-term relationship) even if it possibly implies some repetitive expeditions. For example, on on-line freight platforms, customers specify their order (quantity, origins and destination, time constraints), ask for the best quotation and conclude their contract on-line. In fact, after a much publicized start-up, it seems that most of these marketplaces are not viable for many reasons including mistrust of customers, non-participation of logistics providers, legal issues, technical issues (Badir et al, 2001).

In the second type of transaction, the marketplace is used as an electronic support for the usual submission process. In fact, the complete contracting process can often spans up to 18 months and implies some frequent exchange of information. This process is standard to most contracts but it has been traditionally poorly structured. By pooling the demand for such services, marketplaces could overcome the drawbacks of heavy workflow management systems. There seems to be a huge potential in this direction.

Extranet

Logistics companies have invested heavily on the development of Extranet and Internet sites. An Extranet site is an Internet site dedicated to a specific partner. Dell pioneered this approach with its Dell Premium pages that are customized to a customer's needs and specificities. For logistics companies, Extranet is instrumental in service activities (such as tracking and tracing, management reports, etc.) and increasingly for complete order manage-

[6] Association Française pour le Commerce et les Echanges Electroniques (AFCEE).

ment because it facilitates considerably the exchange of information. The issue however is the appropriate updating of the data, because the volume of information to manage is colossal.

3.2.2 E-Global logistics: Streamlining the global operations

E-global logistics refers to the Internet technologies that streamline the process of moving goods and funds across borders (Roberts and Eichler, 2000). As indicated on figure 2, it is composed of three main sub-sectors: (1) global trade compliance and landed cost solutions that facilitate the customs clearing process and provide the total including cost of moving the product from one country to the other; (2) global transportation management solutions that include the software and services that facilitate the procurement of global transportation services, the management of transportation contracts, the provision of track-and-trace information, and carrier yield/price management; (3) global trade settlement solutions that help ensuring that the seller gets paid and the buyer gets what is paid for in particular by enabling paperless international settlement (Roberts and Eichler, 2000).

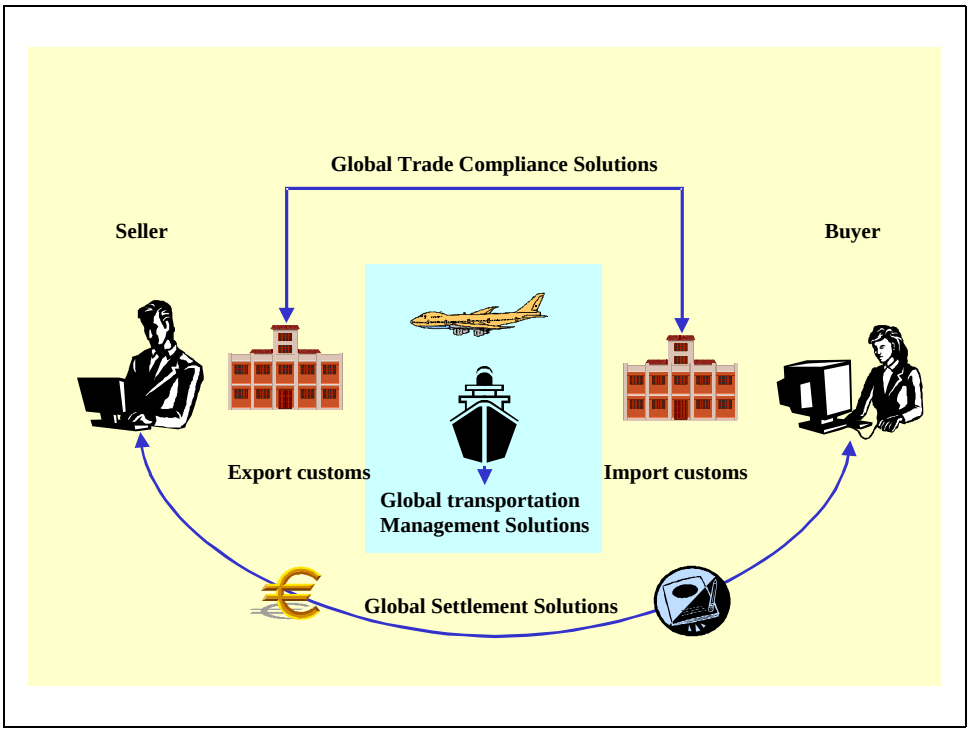

Figure 3 –e-Global Logistics Solutions – *Source: Adapted from Stephens Inc 2000*.

3.2.3 Intranet and the e-organization

The Intranet is a powerful support to provide information and services to meet the needs of the firm's employees. Its use is not specific to logistics industry and there are already running applications in most leading companies such as Cisco (Kraemer, 2002). It typically includes interactive tools for facilities, travel arrangements, technical documentation, human resources, training, sales and marketing, and financial matters. In addition to standard selections by geographic area, type of services, business functions, company and employee information, it can have a number of repositories, which group links on particular topics or for a targeted population (e.g. for new hires or for professional staff).

4. Strategic use of IT in logistics

After describing the potential use of IT in logistics, we use the analytical framework developed in section 2, to assess its contribution to firm's competitive advantage and performance. We start by giving some comments on "general" IT in logistics before focusing on most relevant Internet related applications.

4.1 Some general considerations

In this part, we analyze IT role in logistics along the four dimensions of the analytical framework. It provides the background for the more detailed analysis presented in §4.2.

- Change in industry structure

The development of IT has enabled a certain unbundling of logistics activities (Stephens Inc,2000; Häcki, 2001); this unbundling in turn has enabled some new players to appear, sometimes referred as fourth party logistics[7]. However, like other business models that was deemed to succeed with the development of the IT powered network organization, there seems to be a strong resistance from incumbents. Altogether, IT in general did not really revolutionize the logistics sector structure (Malone, Polzin).

- Contribution to the value chain

IT can coordinate activities in the logistics companies' value chain. Even if there may be a general tendency to underestimate the total costs, the usual cost/benefits studies (either by calculating the rate-of-return (ROI) or the pay-back period) globally indicate a significant contribution of IT to the logistics value chain.

- Strategic alignment

The logistics sector is extremely cost driven with limited possibilities to differentiate. This is due in particular to the limited internal technology development and to the limited effects of traditional marketing on industrial markets with little information asymmetries (often, shippers used to operate directly their logistics operations) (Colin). Even the development of E-

[7] Expression introduced by Andersen Consulting to characterize the logistics companies that have no assets, to be differentiated from traditional Third-Party Logistics (TPL) who at least control the warehouse and often some distribution facilities (if not the transportation vehicles itself).

commerce[8] has not enabled companies to really differentiate. Accordingly, IT focused on cost leadership may be in the long run more profitable.

- Combination with some human and business resources

Worldwide Express Mail pioneered by DHL (and followed by FedEx, TNT, UPS) was based on a combination of IT systems and business processes, the hub system. However, most of the current systems implementations in logistics do not support such unique business innovations. Then the learning curve should be determinant for most applications. Therefore, human resources management (of both end-users and the project management team) is critical.

From this analysis, we can draw a set of rather provocative conclusions concerning e-logistics solutions. For most logistics companies IT is more a threat than an opportunity, more a "strategic necessity" than a source of "competitive advantage"; it results mainly from the difficulty to differentiate specially when introducing "standard, ready-to-use" solutions. This correlates with the relatively poor-performance of IT heavy users (Bot, 2000).

4.2 The Internet and related technologies and systems

We need to refine the general observations made in the previous paragraph and to provide some concrete illustration of our approach, we detail the analysis of the Internet based systems presented in §3.2: e-commerce, e-global logistics and e-employee services.

These findings are summarized in figure 4.

[8] And in particular of B2C, which requires complex distribution capabilities (reduction of shipment size, multiplication of shipment numbers, problem of return and non accepted goods, last mile issues, tracking and tracing, final delivery) (OCDE Seminar, 2001)

Criterion / IT System	Industry Structure Change	Strategic Necessity	Contribution to Value Chain	Strategic alignment required	Combination with other resources	
					Human	Process
B2B market-places	After the Internet-bubble, third party MP seems to be not viable	90% of logis-tics are done through long-term contract that restrict the use of MP	Reduction of transaction costs, specifi-cally on searching cost	Only if it be-comes a major sales channel	Not really - possibly some training of sales forces	Not really
Extranet	No	Not yet, only for big custom-ers	Streamline marketing, sales and op-eration proc-esses	Yes, the im-plementation can imply im-portant set-up cost	Not really	If it involves different units, it requires a stan-dardization of procedures (prices, delivery terms)
Intranet	Little	Not yet, start-ing for big companies	Yes, it can streamline the Human Re-sources Man-agement	Yes, the de-ployment in the organization needs to be aligned with the strategy	Yes	Yes
Global logistics	Not really, dot.coms are be-coming IT service providers rather that des-intermediating forwarders	Not yet, the actual imple-mentation of these systems depend on regulations	Yes, if imple-mented they could stream-line the proc-ess	Can be imple-mented locally but with some kind of central planning	Not really	No, not really

Figure 4– Strategic assessment of main Internet related logistics solutions.

5. Discussion, recommendations and further research

In this article, we have presented an analytical framework for assessing the role of IT as a source of competitive advantage. This framework is derived from the integration of two major strategic management paradigms, the position-based and the resource-based views. We have used this model to analyze the recent development in logistics of IT and in particular of three Internet related applications, E-commerce, E-employee services and e-global logistics.

We find that to create a competitive advantage, IT must fulfill several demanding requirements and that in practice IT tends to be a "strategic necessity".

Indeed, the application of the analytical framework to assess IT use in logistics shows some interesting results: (1) Logistics IT applications are mainly outsourced and are available on the market (in fact, most of the logistics companies who first develop their own systems have switched to commercial, standard solutions) and therefore limits the differentiation by IT per se;(2) Although in most cases these applications are creating value by increasing the productivity or the quality of the operations, the gains are difficult to keep by the logistics company due to the industry structure; (3) As expected the determinant of competitive advantage lie in the combination of human and business resources with IT.

The last point deserves further discussion because it suggests two complementary (but distinctive) strategies depending on the IT system.

- For standard solutions (like most e-global solutions), the quality of the implementation process is determinant. In this time-based type approach, companies aim at reaping the short-lived "first-mover advantages" before the system turns into a "strategic necessity". The new system has to be marketed intensively and on the right customers. In this context, some sort of evolving multi-disciplinary "implementation team" that combines the thorough understanding of one's company process, the local specificities, with a state-of-the-art technical knowledge may be instrumental. The implementation path should be opportunity based and focused (a company can not be first everywhere).
- For more complex solutions (in terms of human and business resources coordination), it calls for a holistic approach, which has to be strongly aligned with the company's organizational strategy. In this case, the CEO commitment is determinant and benefits and costs are harder to assess (often diffuse and not immediate). Initiatives such as e-employee services and knowledge management systems fall in this category. These applications may in fact bring sustainable competitive advantage to LSPs.

This paper aimed at providing a general view and assessment of the existing and developing IT solutions in logistics. However, it has some limitations. First of all, due to its conceptual nature, it does not consider the detail of the applications and the specificities of their implementation (in particular the integration aspect) and as such is only the first step of a full assessment process. Also, the hypotheses need to be empirically tested for example by analyzing the impact of the implementation of these solutions on the firm's performance. Further work could imply longitudinal or survey studies on logistics companies. However, such work should be carried out with extreme care due to the pace of change in this sector and to the rather dispersed way it happens.

To conclude, IT will remain on top of the agenda of logistics companies for the coming years and requires proper strategic management. In this perspective, taking it as a "strategic necessity" or as a source for "competitive advantage" or stated more simply as "a pain to cope with" or as a "strategic opportunity" is consequential. By applying strategic theory to a specific case, we hope this article provides some valuable insights to both practitioners and academics.

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