

The Effects of ICT and E-business on EU Trade: a Retail Industry Perspective

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Abstract: The retail industry, an important contributor to the European economy, is being affected by changes induced by information and communication technologies (ICT) and e-business. As a result, retailers have come to embrace ICT and e-business to various degrees. This paper aims to illustrate the effects of ICT and e-business on retail firms through adopting a supply chain perspective. The objective is threefold: to explore ICT/e-business effects on e-supply, in-house e-operations and e-sales; to illustrate challenges for e-business adoption; and to identify opportunities for innovation induced by ICT/e-business. In total, 1151 computer-aided telephone interviews (CATI) were conducted with micro, small, medium-sized and large retail enterprises in seven EU countries and the USA. The findings demonstrate that online procurement practice, in-house e-operations and online sales can offer considerable benefits to retailers. Yet, there are also challenges to overcome including the level of readiness for e-business within the retailer's ecosystem. The paper concludes with policy recommendations and areas for further research.

1. Introduction

The retail industry is one of the largest industries in Europe employing more than 15 million people and serving 480 million consumers across the European Community. In 2004, some 3.73 million firms in the EU-27 Member States fell into the retail sector category [1]. The vast majority of the sector's value added was generated by large enterprises and micro enterprises. Overall, EU-25 NACE Division 52 firms generated EUR 1.887 billion of turnover in 2002 with a value added of EUR 351.6 billion [2]. With such strong roots in the European economy, the industry is an important contributor to European productivity and competitiveness. Yet, retail industry performance is heavily dependent on macro-economic developments due to the over-proportional reliance on consumers. In late 2007, the general economic environment for the retail industry has turned less favourable: there is uncertainty about the prospects for economic growth, mainly due to the turmoil in financial markets and rising cost for energy and food. Despite positive developments in real disposable income and favourable labour market conditions, private consumption continues to show signs of weakness in early 2008.

This paper discusses the use of e-business applications and information and communication technologies (ICTs) among European retailers (using data from the US as benchmark). A business process perspective, focusing on three supply chain elements (e-sales, in-house e-operations, and e-supply), is adopted. This perspective provides insight about the role of ICT and e-business in the retail industry and narrows the gap about understanding of entire supply chains: certain 'pockets of research interest' result in a split picture about supply chain management as a whole. There is, for example, a rapidly growing body of knowledge about e-commerce in a business-to-consumer (B2C) context [such as 3, 4] and e-supply in a business-to-business (B2B) context [such as 5] but only few exploit opportunities to study entire supply chains [such as 6].

2. Objectives

The objectives of this study are threefold. The first objective is to analyse to what extent retailers use ICT and e-business to manage the various elements of their supply chains. For this, the retail supply chain is divided into three elements:

1. the upstream supply chain which enquires about the use of supply chain solutions such as e-procurement and e-storage applications by retail firms
2. the in-house supply chain which looks at e-operations within the retail firms such as distribution and logistics solutions
3. the downstream supply chain which covers all ICT/e-business activities between retail firms and their customers such as selling over the Internet.

The second objective is to explore some of the barriers to e-business adoption in the retail sector. Questions about seven challenges to e-business adoption for retail firms were included in the survey and case firms were also questioned about challenges. The seven challenges included in the questionnaire are: (a) the company is too small to benefit from e-business activities (b) e-business technologies are too expensive to implement (c) e-business technology is too complicated (d) suppliers or customers are not prepared for e-business (e) firms are concerned about security risks (f) e-business is plagued by important legal problems or complications and (g) it is difficult to find reliable IT providers.

The third objective is to identify opportunities for innovation arising for retail firms from the use of e-business and ICT. In a highly competitive industry such as retailing, firms can gain an advantage over competitors through either using ICT/e-business innovatively or through using ICT and e-business to support product/ service and business process innovations. One of the foci in of this objective is to explore the extent to which innovations in retail firms are directly related to or enabled by e-business and ICT.

3. Method

Data about ICT and e-business in the retail industry was collected using a structured questionnaire instrument administered to appropriate company representatives. 1151 telephone interviews with company decision makers (mainly ICT/e-business decision makers, general managers and area managers) were carried out in total. On average, these telephone interviews lasted between twenty and thirty minutes. The survey, which took place between August 2007 and October 2007, covered seven EU countries (France, Germany, Italy, Poland, Spain, Sweden, and the UK) plus the USA. 1026 interviews were done in the EU-7 countries while 125 interviews were conducted with US retail firms. Ten case studies were conducted to further illustrate the findings from the survey.

Retail firms are defined according to the European industry standard classification system (NACE), Rev. 1.1, category 52. All sizes of firms were included in the study and are hereafter structured into micro (fewer than 120 employees), small (between 10 and 49 employees), medium-sized (between 50 and 249 employees) and large firms (more than 2250 employees). Due to the heterogeneous character of the retail sector which covers many different retail formats and firm sizes, three sub-categories are formed: retailers that sell non-food items in store (NACE Rev. 1.1 Class 52.12 and Groups 52.3 to 52.5) and retail sale of food items in store (NACE Class 52.11 and Group 52.2). Retailers in the non-food items in store group accounted for approximately 50% of turnover while the sale of food in store accounted for 44% of total retail turnover in 2002. The remaining NACE groups are summarised as “other retail” in this report: retail sales not in-store (NACE Group 52.6) and repair of personal and household goods (NACE Group 52.7) which accounted for 5% and less than 1% of turnover in 2002 respectively.

4. Findings

The objectives for this study centred on the three elements of the supply chain; challenges to e-business adoption; and innovation driven by e-business and ICT. Findings are discussed in that order.

4.1 Supply Chain Elements: e-Supply, In-House e-Operations and e-Sales

The function of upstream supply chain management (SCM) is to design and manage the processes, information and material flows between retailers and their suppliers. SCM is of utmost importance to retailers as the supply chain can represent between 40% and 70% of a retailer's operating costs, and may comprise half of all company assets [7]. Technology-enabled improvements in SCM promise a high potential not only to cut costs, but also to improve service levels for customers. Therefore, particularly for large retail chains, supply chain management is a highly strategic issue and can be a critical factor for their competitiveness.

In 2007, retailers accounting for 55% of employment in the sector said that they ordered at least some goods from suppliers over the internet or through other computer-mediated networks such as EDI. Their share has increased since 2003 (43%); however, adoption has increased mainly among SMEs, and not significantly among large retailers (Figure 1).

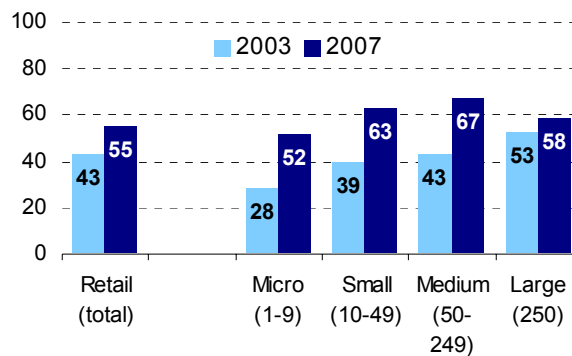


Figure 1: Percentage of Companies Placing Orders for Supplies Online (2003 / 2007)

While the percentage of companies placing orders online is a measure of overall "e-readiness", it does not say a lot about the intensity of e-procurement activity. Hence, retail firms were asked to estimate the share of online orders from suppliers (2007) to total orders. When compared to the number of total purchases from suppliers from 2003 a considerable increase in the intensity of e-procurement since 2003 is evident: the share of those firms for whom e-procurement was a marginal activity has decreased from about 60% in 2003 to 35% in 2007. At the same time, the share of intensive users (procuring more than 25% of goods online) has increased from 17% in 2003 to 40% in 2007.

As retailers do not transform goods, in-house operations supply chain element is concerned with all aspects of organising the in-house processes of receiving, distributing, and selling goods. ICT and e-business applications mainly serve processes inside a company. Interviewees were asked what overall importance e-business has for business processes within the company. They could state "most", "a good deal", "some", or "none". A relative majority of companies representing 47% of the industry's employment said that they conduct some processes by e-business. 22% said "none"; a "good deal" was stated by 20%, and in 11% of firms most processes are conducted electronically.

The most considerable differences between size classes is in the share of firms stating no e-business at all: it is largest in micro firms (35%) and declines with increasing size class. 14% of the large firms said they conduct no e-business at all. On the other hand, the

share of firms stating that most of the processes are conducted by e-mail is also the largest in firms with more than 250 employees (15%), while it is similar in micro (7%), small (9%) and medium-sized firms (9%).

While only 16% of retailers use ERP systems, the use of warehouse or depot management systems is widespread among EU-7 retailers: 42% of retailers representing 51% of employment use such systems. The share of firms using warehouse or depot management systems was found to be almost the same in the three sub-sectors. Again the share of firms using such systems was found to increase by size class, with micro firms on a level of 42% and large firms on a level of 65%. In the US (15% of firms, 42% of employment), warehouse or depot management systems are much less prevalent than in the EU-7. The numbers are even lower for ERP with only 6% of US retailers using ERP systems. One e-operations technology that has received considerable amount of interest over the last couple of years is RFID. However, RFID is not very common in the retail industry: retail firms representing 8% of employment reported to use this technology, with usage among micro and small retail firms being scarce.

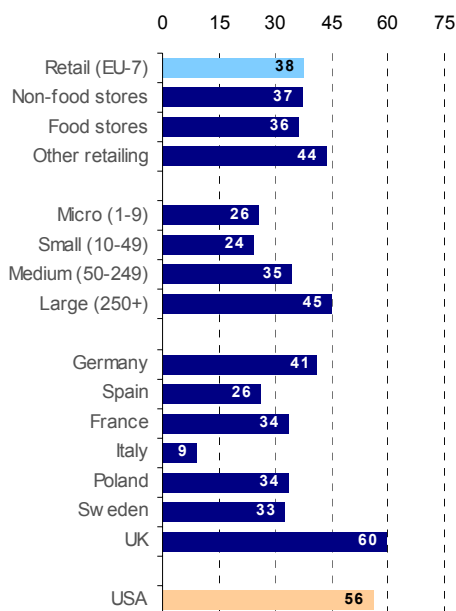


Figure 2: % of Retail Companies Selling Online in 2007

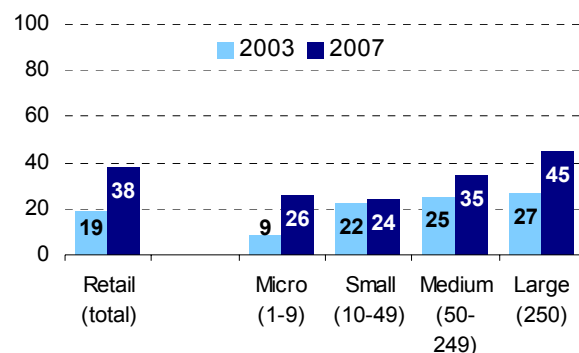


Figure 3: % of Retail Companies Selling Online in 2003 and 2007

The downstream supply chain covers activities and interactions of retail firms with customers. All these activities may take place or may be supported by computerised systems. One of the key changes to the retail industry in recent years is trade via the Internet. Retailers now have the opportunity to sell their products via the Internet to consumers. Retailers representing 38% of the industry's employment stated that they sell goods "through the internet or other computer-mediated networks" (Figure 2). There are no considerable differences between the sub-sectors, but "other retailing" (44%) has a slightly higher share than non-food stores (37%) and food stores (36%). There is a clear distinction between size classes: Almost half of the large retail firms (45%) and 35% of the medium-sized ones sell online, but only 24% of the small retailers and 26% of the micro retailers do so. However, it is notable that micro firms are not far behind their larger counterparts.

The share of companies that sells online doubled from 19% (employment-weighted) in 2003 to 38% in 2007 (Figure 3). There was an apparent increase in all size classes: micro firms made a big jump from 9% of firms to 26%, small retail firms increased their share of online sellers from 22% to 24% and medium-sized ones from 25% to 35%. Large firms made the largest leap in terms of percentage points, from 27% to 45%. This means that

while the share of online sellers among large firms was found to be only slightly higher than in SMEs in 2003, the difference was found to be much larger in 2007.

4.2 Challenges to e-Business Adoption

Those companies that stated that they conduct some or none of their business processes as e-businesses were asked why they do not use e-business more intensively. Data indicates that one of the biggest hurdles to e-business adoption for retailers is the business ecosystem: 64% of firms that have not adopted e-business processes report that suppliers and customers are not prepared for e-business. This is the highest overall number of all the seven factors queried, supporting the notion that the business ecosystem can be a major hurdle to e-business adoption. Business ecosystems in the USA seem to be slightly more favourable towards e-business as the overall share in the USA is somewhat lower with 43%. Nevertheless, one could also argue that many firms blame customers and suppliers for not using e-business while their own efforts to introduce e-business are not considerable either.

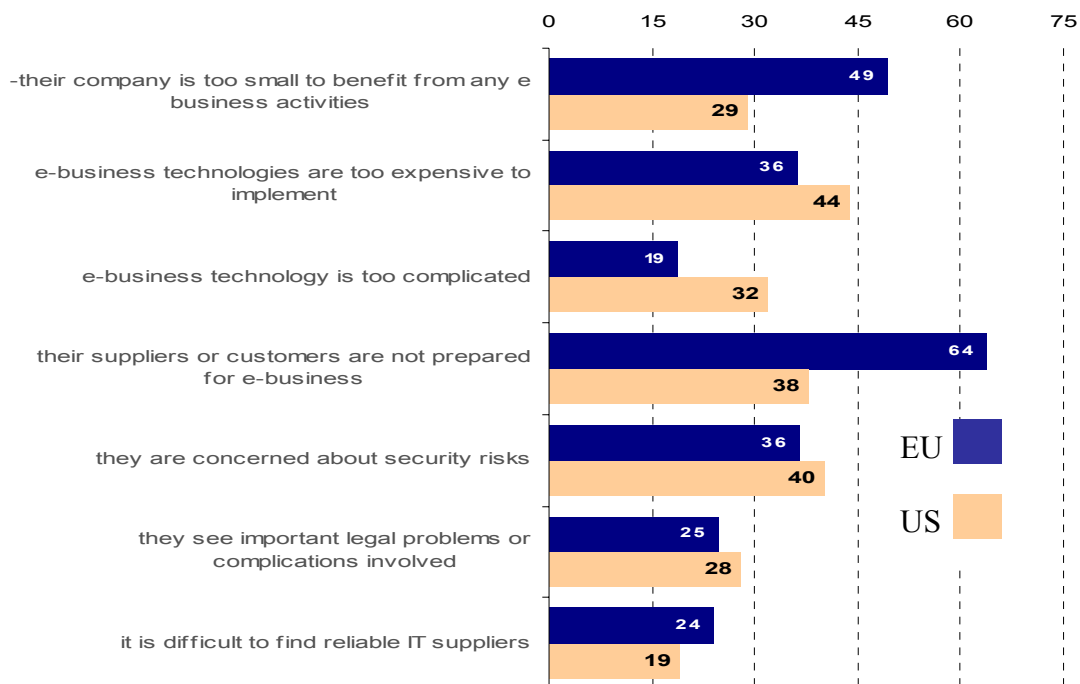


Figure 4: Barriers to e-Business Adoption for Low and Non-Adopters

Firm size also affects e-business adoption: 64% of micro firms and 44% of small firms said their company was too small to benefit from e-business. 47% of micro firms report that ICT was too expensive (average for the retail sector: 36%). These numbers decrease noticeably with firm size from 29% and 30% for small and medium-sized firms respectively to only 20% for firms with over 250 employees. Micro and small firms also consider it to be more difficult to find reliable IT providers than medium-sized and large firms. Security issues in contrast are more relevant for large (40%) and small (39%) firms while only 28% of micro firms and 23% of medium-sized firms report this issue to be a factor affecting the low adoption of e-business. This finding however raises concerns about security awareness among micro and medium-sized firms who might not be fully aware of the exposure to and effects of e-business security issues for their respective companies.

Of the six categories of barriers questioned, the numbers for the US are always lower than for the EU-7 except for 'security issues' where 46% of US retailers face barriers compared to 36% of retailers in the EU-7. This indicates that overall, US retailers seem to face other or even fewer barriers to e-business than EU -7 retailers.

Regarding the three sub-categories, trade in food stores, trade in non-food stores and other retailing, the other retailing group appears to be less affected by the barriers questioned in the survey as fewer low and non-adopters in this group state that the barriers trouble them. No significant differences emerge between the food-in-stores and non-food in stores groups although legal challenges with 30% (28% in food stores), security concerns with 44% (16% in food stores) and difficulties to find reliable IT providers with 28% (20% in food stores) are higher in the non-food stores group.

4.3 Innovation Induced by e-Business and ICT

In order to collect evidence about the role of ICT for innovation, retailers were asked whether they had "launched any new or substantially improved products or services" during the past twelve months, and if they had introduced "new or significantly improved internal processes" in the same period of time. Those firms that had introduced innovations, the so-called 'Innovators' were then asked follow-up questions with the focus being on whether the innovation(s) had been enabled by ICT.

21% of retail enterprises (representing 32% of the sector's employment) said that they had launched new or improved products in 2006/07. Firms representing 70% of employment, i.e. almost two thirds of those that reported product/service innovations, said that their innovations had been directly related to or enabled by ICT (Figure 6). This high share indicates the important role ICT plays for innovative behaviour. With 60% and 67% respectively, micro and large firms are the types of firms benefiting most from ICT enabling innovative behaviour (although the 67% for the large firms is indicative due to a small number of respondents). Overall though, fewer SMEs than large firms have launched new products and services in the 12 months preceding the interview: 44% of large firms, 30% of medium-sized firms, 25% of small firms and 21% of micro firms. Hence product/service innovations are firm-size dependent although there are more opportunities for innovation in larger firms due to them being bigger than smaller ones.

ICT also play a crucial role to support process innovation in the retail industry. Firms representing 45% of the industry's employment said they introduced process innovation in the past twelve months. In firms representing 32% of employment, 36% of the process innovations were ICT-related, and in only 9% the process innovations were not ICT-related. In micro firms again the share of firms innovating with ICT was smaller than in small, medium-sized and large firms. Hence, there appears to be evidence for a relatively higher importance of ICT for business processes innovations in larger companies. Compared the transport and logistics sector, the levels of overall process innovation and of ICT-related process innovation in the retail industry were found to be along the same lines.

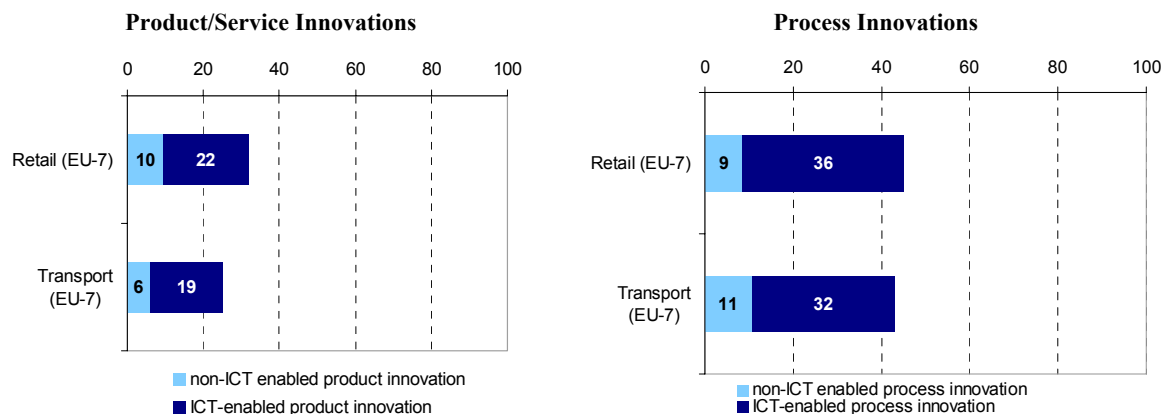


Figure 5: % of Companies Having Introduced Product or Process Innovation (ICT Enabled Versus Non-ICT Enabled, 2007)

5. Conclusions

5.1 Key Findings

This study finds little indication that the retail industry is doing any better or any worse than other industries studied in terms of e-business. When viewed through the lens of supply chain management, a slight imbalance appears within the industry: retail firms are more active in electronic upstream supply chain and in-house management activities; e-business activities involving customers are not that popular.

Due to the fragmented nature of the sector, firm size differences also become apparent while no significant differences between food and non-food trading in stores emerge. Micro and small retail firms in particular lag behind medium-sized and large firms in almost all indicators of ICT and e-business use. However, micro and small firms have been increasing their ICT adoption in recent years. A previous study on e-business and ICT in the retail sector carried out in 2003 found that the use of e-business in the retail sector was far from being a pervasive reality and below the average adoption rates in other sectors. In 2007 in contrast, ICT and e-business use have become more prevalent in retail firms of all size classes. The 2003 study argued the main opportunities for e-business stem from efficiency and productivity gains and, thus, cost savings. This was found to be still the same for 2007.

For most indicators studied, EU-7 retailers are lagging behind the US: in some cases the differences are large, for example for placing online ads on other companies' website (43% in the US versus 16% in the EU) and for options offered to pay online (higher percentages in the US for all options). Exceptions include the share of firms with Internet access, the average share of employees with internet access, and the use of internal systems for which the levels are similar or even higher in the EU. Surprisingly, the overall importance of e-business stated by the firms is very similar between EU-7 and US retailers. The reason may be that US retailers answered the question about e-business importance with a higher reference level in mind.

5.2 Policy Recommendations

The aforementioned findings call for policy recommendations that consider firm size issues and supply chain management proposals, especially for the downstream supply chain. The following recommendations for policy are considered appropriate:

- Promote electronic supply chain management among SMEs. The share of SMEs placing orders online to suppliers is smaller than in large firms. SMEs therefore could benefit from the increased adoption of e-supply applications and access to e-supply networks through providing opportunities for participation. Similarly, the adoption of e-sales and related downstream supply chain management practices often presents a challenge for retail firms of all sizes because it requires particular management strategies and operations. The retail industry and SMEs in particular could benefit from learning about challenges experienced when adopting e-sales.
- Foster the dissemination of e-business knowledge in the retail industry. Many retail firms may consider ICT as a cost factor rather than an investment in benefits. Improved awareness and knowledge about the effects and sustainability of e-business technologies is therefore deemed an important issue.
- Promoting e-business on a regional level. Since many retailers (with the exception of large multinationals) are usually rooted in the local and regional economy, support to e-business should predominantly take place at the local and regional level. Retailing associations or chambers of commerce could take a leading role in promoting the adoption and extension of e-business practices in retail.

- Promote electronic ordering among European consumers. The low level of e-sales penetration in the EU may be down to a relatively low affinity towards ordering over the internet on the part of the consumer. Retail firms with the support of policy makers should aim to improve trust in online sales through for example better establishing so-called ‘trustmarks’ for online shops. Another strategy could be to better educate consumers in the use of e-business technologies.

5.3 Further Work Needed

Future research on ICT and e-business in the retail industry could differentiate to a greater extent between micro, small, medium-sized and large firm retailers. The firm size effects identified in this study give good reason for greater attention to issues related to firm size. The heterogeneous structure of the retail industry also calls for further in-depth studies on the different sub-sectors within the NACE classification. Firms in the various sub-sectors engage in quite different retailing activities hence generalisations about the various sub-sectors might be useful for policy makers and retail firms (who could benefit from learning about the experiences of their peers) alike.

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