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## E-COMMERCE EFFECTS ON PACKAGING LOGISTICS RESEARCH

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### ABSTRACT

The new Department of Design Sciences was established as a result of the reorganisation of the Lund Institute of Technology, Lund University. The main ambition of this new department is to facilitate interdisciplinary scientific research and to support the development of new research areas, one of which is packaging logistics where the packaging perspective is used to evaluate and develop logistics. Consequently it includes the product, its package and packing operations as well as the physical distribution system and the information systems involved, throughout the whole logistic value chain, including the end user.

With the Internet as one sales channel, the value chain will have to be modified and the role of the consumer will be different as compared to traditional sales channels. This paper will focus on the impacts of the Internet sales channel on the research discipline of packaging logistics, aiming at identifying the methodologies applicable in the area.

It will also focus on the possibilities of developing theories and methodologies when a new perspective on logistics is adopted. The findings are based on a literature review in the field of e-commerce *related* to packaging logistics seen from a consumer perspective, yielding an inventory of research methodologies in these related fields. Conclusions are drawn about which of the methodologies used are applicable and the development of methodologies for future research in the new discipline of packaging logistics in an e-commerce context is elaborated on. In addition, the handling of problems derived from a consumer perspective and the possible activities caused by end-use demands are briefly elaborated upon. An account of the forthcoming projects in business-to-consumer e-commerce in relation to packaging logistics concludes the presentation.

### INTRODUCTION

Packaging and logistics have been considered two separate disciplines in research and have thus been researched separately in most cases. However, the integration of the two disciplines into one research area offers advantages, as shown by Johnson (1998), in the possibility of influencing costs and effectiveness in the whole logistic process by considering the package a prime element in that process. The possibility of influencing productivity and cost efficiency in materials handling as well as the cost effectiveness of the product by focusing on package design is emphasised. This supports the new integrated research approach in packaging logistics. Unfortunately, few methodologies have been developed in the field so far due to the novelty of the integrated approach.

The new area of packaging logistics creates synergies from an integrated system approach that naturally comprises the product, its package and packing operations, the physical distribution system and the information systems involved throughout the whole logistic value chain, including the end user. It has been suggested that packaging logistics may be described as "*the interaction and relations between the logistical system and the packaging system that "add on" values to the combined, overall system*" Bjärnemo et. al. (2000).

The evolution of e-commerce as an influential factor in the area of packaging logistics is of particular interest, since no previous research in this area can be found. One advantage of focusing on the package as a prime element in the e-commerce value chain is the ability to identify changes as compared to traditional retail in package handling throughout the logistics system, all the way, including the end consumer.

There is widespread awareness of the environmental problems caused by transportation, and a recognition that the amount of transports is expected to increase substantially partly through the influence of increased B2C e-commerce and changing demands on packaging logistics. However, few methods are available for addressing the problem, (Berglund, 1999).

In previous logistics research, Flint and Mentzer (2000) emphasise the importance of understanding changes in customer desires and of identifying driving forces in customer value changes. They also note a lack of empirical understanding of these customer value changes and desires and suggest a qualitative theory-building approach to gain a deeper understanding through interpreting and discovering irretrievable knowledge of individuals.

The different approaches taken in logistics support the idea of using a combination of qualitative and quantitative methods in order to understand the complexity of logistics. Mentzer and Kahn (1995) mentioned positivism as the major orientation in qualitative logistics research, and noticed the lack of theory building based on qualitative interpretative research in the field. The major part of previous empirical research in logistics is based on surveys aimed at quantifying results, while deeper qualitative research is more rare.

This article is based on a literature review where the intention was to take an inventory of the methodologies found in related research disciplines and to adapt them to the field of packaging logistics. Consumer behaviour research, marketing research and logistics research were identified as interesting areas related to this study. The aim of the article is to adopt methodologies in research *related* to e-commerce from a consumer perspective into the field of packaging logistics.

## **METHODOLOGY**

This article presents an inventory of methodologies in related research disciplines with a view to adapting them to the field of packaging logistics. Areas identified to be interesting to this study were consumer behaviour research, logistics research and marketing research. The inventory of methodologies used in these areas is based on a literature review carried out in different databases, including the Ebsco Academic search elite, Emerald library and Compendex. Special attention was paid to the methodology sections in the articles found. A certain notice was taken of articles where the methods sections were missing in order to determine whether this was characteristic of certain journals or certain research areas.

In the first search area, which focused on the field of consumer behaviour in combination with grocery shopping, the purpose was to find research methodologies that are able to capture various aspects of consumer behaviour in the specific area of grocery shopping. It was considered particularly interesting to discover whether both qualitative and quantitative methods were used and to analyse the differences in outcome resulting from different methodological approaches.

The second search area focused on the methodology of logistics, if possible in relation to food or grocery distribution and preferably in the area of home deliveries. In this area, research articles from the *International Journal of Physical Distribution and Logistics*, *International Journal of Logistics Management* and *Journal of Business Logistics* were studied as well as ongoing work at the Department of Packaging Logistics, Lund University and at the Department of Industrial Engineering and Management, Helsinki University.

The third search area was that of e-commerce and packaging of groceries, not only from a marketing perspective but also from a merchandising point of view. In this field, articles from the *Journal of Consumer Marketing*, *International Journal of Retail and Distribution Management* and *Journal of Product and Brand Management* were studied with the focus on the methodologies used.

## RESULTS

A database search using packaging, grocery, e-commerce and consumer behaviour as keywords, separately or in different combinations, yielded 20 articles relevant to the area. The criterion for being considered relevant was that the article should have sections presenting findings or suggest further research in one related perspective applicable to the integrated approach of this research. It can be concluded that, although the area of e-commerce is frequently represented in the literature, the amount of literature related to packaging logistics and groceries is very limited. This implies that additional research is required to cover questions about e-commerce in the integrated discipline of packaging logistics.

In an attempt to search the same issues from a marketing perspective, a search for e-commerce and packaging of groceries was made in *Journal of Consumer Marketing*, *Journal of Product and Brand Management* and *International Journal of Retail and Distribution Management* from 1999 to 2001. This search showed that the number of articles in areas related to packaging logistics is limited. It is, however, interesting to note that one entire issue of the *International Journal of Retail and Distribution Management* is devoted to e-commerce, where general phenomena of e-commerce covered in the literature are reviewed. Most of the articles in the marketing-oriented journals include a brief description of methodology.

B2C e-commerce is, however, rarely discussed from a logistics perspective in journals such as *Journal of Business Logistics*, *International Journal of Logistics Management* and *International Journal of Physical Distribution and Logistics*. The *Journal of Business Logistics*, which often publishes articles focusing on logistics methodology, did not deal with e-commerce, not even in articles where an integration with marketing was suggested. Packaging in relation to e-commerce or logistics is not found in the logistics journals.

A study of the methodologies used in the three areas of consumer behaviour, marketing and logistics shows that different methodology approaches are adopted in the different fields. However, many articles in the field of marketing had adopted a theoretical, evaluative approach but contained no detailed methodology section, which was probably due to the lack of empirical academic research identified by many authors.

Academic research in the area of the Internet and marketing is limited and the main focus has been to investigate how to use the Internet as a marketing tool rather than focusing on e-commerce issues. It is also found that most studies carried out in this field are based on consumer surveys by means of questionnaires or secondary data collection.

In the consumer behaviour discipline, a lack of empirical research on consumer behaviour in the virtual shopping environment is identified, and the importance of studying consumer behaviour in order to understand the drivers and demands in e-commerce is stressed. A few of the authors establish the fact that package design and graphics will affect consumers' buying behaviour and that new package development will be driven by consumer demands, but otherwise the relation between package and consumer behaviour is seldom covered.

From the logistics perspective it has been established that integration with other disciplines is important, since logistics is becoming increasingly complex and consequently will benefit from borrowing theories and methodologies used in other fields. In logistics research a variety of methodologies was found. One explanation of this may be the integration of research into other

areas. Major logisticians state, however, that there is a lack of theoretical foundation and validity testing of theories in logistics research.

As companies increasingly include environmental awareness in their strategies, logistics should also naturally integrate the environment. The challenge will be to determine how to incorporate environmental management principles into daily decision-making – to understand trade-offs between environmental impact and optimal supply-chain efficiency (Wu and Dunn, 1995).

**DISCUSSION**

Although research on B2C e-commerce is mainly found in business disciplines, a lack of empirical research in virtual shopping environment is identified. In technical disciplines, consumer-related research is rarely focused and, with few exceptions, integration of packaging issues with consumer-related research is found neither in business nor in technical disciplines. E-commerce is placing new demands on packaging logistics systems from all the three search perspectives of consumer behaviour, marketing and logistics. In e-commerce, many single-item orders to several delivery addresses on irregular occasions and different geographical positions represent one shift of demands as compared to traditional retail. Consumer and product requirements also imply changes in the system in terms of specific needs, such as delivery window requirements, temperature conditions, information needs and practicability. Shopping on the web facilitates new buying patterns and combining consumer demands with old logistics systems will not have a positive influence in reducing transport emissions. Instead, it is necessary to understand how consumers will use the web and to develop alternatives that make environmental deliveries attractive (Jönson, 2000).

To reach full system integration of packaging logistics research in e-commerce, a merger of all three research areas, i.e. consumer behaviour, logistics and marketing, is proposed; see Figure 1. Additionally it is suggested that the package be considered the prime element of research, since it adheres to the product throughout the entire value chain. Thus package design will influence the efficiency of the entire value chain in terms of functions, features, information and cost aspects. The efficiency of a product in these aspects will depend on package design, since a package has the potential to improve efficiencies through optimum design.

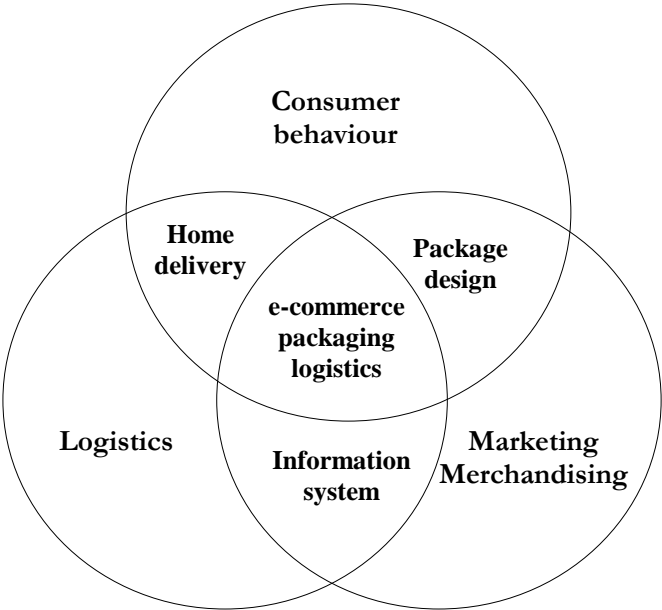


Figure 1: Integration of research areas

Discipline integration is pointed out as advantageous by many authors in the logistics area, in particular with marketing in order to gain enhanced transparency of information throughout the value chain. However, consumer or end-customer aspects as well as packaging aspects are often neglected in these suggestions for integration, where information systems have usually been considered the main common denominator for the integration of marketing and logistics. Package handling, package distribution and package storage in the area of Internet grocery shopping will add another perspective to the combination of logistics and marketing, since the package is the main carrier of information.

From the articles found in the combined area of marketing and logistics it can be concluded that the main part of consumer research is based either on questionnaires or on secondary data. Future research would benefit from empirical qualitative studies aiming at adding consumer interaction to the marketing and logistics perspectives of virtual shopping. Qualitative studies will provide a deeper understanding of the consumer demands placed on the system of grocery packaging and home deliveries in an e-commerce context.

The researchers at the Department of Industrial Engineering and Management, Helsinki University dealt with home-delivery issues through a combination of consumer behaviour or demands and logistics research, where simulation was the method used. Consumer demands for certain categories of groceries and different delivery alternatives were elaborated on in the simulation models. However, this research did not cover such effects of packaging in home-delivery transports as filling grade, weight of packages, information, and environmental aspects. Additional research where these package aspects are considered would provide a better understanding of the integrated area of packaging logistics and e-commerce, thus contributing additional parameters to the simulation models.

Consumer behaviour and marketing, the third combined research area identified in the literature, embraces consumer demands and segmentation based on consumer behaviour. A few authors addressed the issue of how package design affects consumers. Distribution issues, however, were neglected, and the package was considered an isolated phenomenon in these articles. By adding elements of logistics to these findings, the integrated approach will be further enhanced, since packaging technology combined with distribution technology are important factors in meeting consumer demands on the package logistics system in e-commerce.

When, as suggested, the aspects of all the three areas of consumer behaviour, logistics and marketing are considered in the research of e-commerce and packaging logistics, an integrated research approach is adopted and the benefits of interdisciplinary methodology can be seen, as Stock (1997) has suggested. In future research, the demands of the different perspectives can be considered and the aim of the research can be to suggest solutions to meet these demands. As an outcome of the integrated research approach, these solutions have to be weighted against the efficiency of the whole system from economic and environmental perspectives. With the package system in a central position, important aspects such as product protection, information needs, distribution issues, and consumer practicability needs are considered at the same time as these needs are balanced against environmental aspects as well as towards the main driver of economics. Five concrete approaches to integrating the transport environment into this research could be to 1) differentiate products and what is offered to consumers (an environmental approach may attract customers); 2) manage competitors (influence the development of standards concerning packaging logistics with regard to regulations and industry standards to force competitors to adjust); 3) save costs (cost reductions and environmental considerations should go hand in hand); 4) manage risk (transport cost can make up >20% of the total cost of the product (Sund, 1997) and environmental issues may then be a risk in packaging logistics

and related costs); 5) redefine markets ( similar to point 2: initiate changes in what is offered to consumers) (Berglund, 1999).

The development of these approaches opens the possibility of including commercial aspects, which is important to companies. The use of fixed solutions, i.e. to reduce transports, change transport modes, use certain fuels and evaluate the transports with fixed emission values will not provide the tools needed in daily decision-making. Therefore, scientists must take the responsibility for developing methods that make the packaging logistics environment part of the company business system.

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