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Logistics service requirements in the industry for producing pallet and pallet collars – identification and grouping of logistics service requirements

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Abstract

In general, the sawmill industry perceives softwood lumber to be a commodity product and its individual actors' traditional focus is on cost reduction. However, instead of focusing on cost reduction, focus ought to be drawn towards sawmills' total offers in which service is particularly stressed. Therefore, knowledge of the individual logistics service requirements and their internal grouping is of vital importance in order to be able to handle groups rather than individual requirements, thereby keeping costs low. About 20 % of the produced softwood lumber is used for pallets and pallet collars. Producers of pallets and pallet collars thereby constitute important customers to the sawmill industry. Despite this, studies regarding the producers of pallets and pallet collars' logistics service requirements are lacking. Hence the purpose of this paper is to identify and categorize logistics service requirements in the pallet and pallet collar industry. This paper identifies and categorizes the logistics service requirements demanded by sawmills; by learning which those individual requirements are, then knowing how they could be categorized is essential for the sawmills' business development.

This study commences with an interview study aimed at identifying individual logistics service requirements. Thereafter a survey study is conducted in order to be able to categorize the individual logistics service requirements. The study concludes that logistic service requirements, such as delivery precision and goods wrapped in plastic, are important logistic service requirements; there appears to be a standardized set of logistic service requirements required by this category of customer. As this research is constituted by an interview study as well as by a questionnaire study, it is not possible to identify the actual actions with regards to real trade-offs, made by the actors, which are made in business. Therefore additional studies need to be conducted with an in-depth case study approach.

Keywords: Sawmills, Softwood lumber, factor analysis

Introduction

Meeting customer service requirements is generally accepted as a strategic source of competitive advantage. Customer service refers to a company's ability to determine customer needs and requirements and to respond to them accurately. Accordingly, customer service is the measure of how well the logistics system is performing in providing time and place utility for the products (Lambert et al. 1998). Hence the role of customer service in developing and maintaining customer loyalty is important. Naturally it becomes important to establish customer service policies according to customer requirements (Ballou 1999).

The sawmill industry plays an important role in the Swedish economy; in 2012 about 12 million m³ softwood lumber was exported, to a net export value of SEK 22B (www.scb.se). In general there is a surplus of softwood lumber, and competition amongst sawmills is immense (Järvinen et al. 2010). Furthermore, softwood lumber is in many cases referred to as a commodity product which is sold on the world market (Roos et al. 2002). Hence the price of softwood lumber is set on the world market. Further, regarding commodity products, focus is continuously on costs and cost reduction. Sawmills are experiencing a turbulent environment in which customer expectations and global competition set

the landscape for the sawmill industry (Husson and Nybakk 2010). According to a sawmill manager for one of Sweden's largest sawmill cooperations, about 20 percent of the total costs for sawmills are experienced as logistics costs. Therefore achieving cost effectiveness in the distribution channels, and at the same time meeting customer logistics service requirements, is of great importance for the individual sawmill in order to stay competitive. The sawmills have different types of customers; for instance, the retail industry, the prefabrication of single family houses, and the pallet and pallet collar industry; each type of customer has different service requirements.(Gustafsson 2006)

According to Skogsvårdsstyrelsen (2009), 19 % of the total volume of softwood lumber is used for pallet and pallet collars, and as a majority of these actors purchase softwood timber they are important customers for the sawmills. Pallets and pallet collars are used for the transport, storage and handling of products (Jonsson and Mattsson 2011). Standardization regarding dimensions, quality, and shaping has been a prerequisite for the extended use of pallets and pallet collars. Standardization implies that consideration has been taken to material handling methods, handling equipment, and modes of transport. It implies too that pallets and pallet collars can be transported abroad. (Twede and Selke 2005) Producers of pallets and pallet collars have automated production lines implying that the incoming material needs to comply with specific product quality requirements and the possibility of sorting incoming material manually at the production line is limited. The product requirements are governed by ISO 18333 or SS-EN12246.

As markets become commodity markets, the need to create competitive advantage by offering value-added services is enhanced (Christopher 1998). Competition amongst suppliers of commodity products is primarily based on the suppliers' total offer (i.e. products and services). By having a standardized description of product quality accepted within the industry, and a product sold on the world market (implies setting a world market price), the possibilities for the individual sawmill lie in producing collars. By possessing this knowledge sawmills have the possibility to differentiate their offers to their customers through, for instance, logistics service requirements. Consequently the purpose of this study is to identify and rank logistics service requirements valid in the industry for the production of pallets and pallet collars, and thereby formulate competitive offerings to the industry. From a theoretical viewpoint, knowledge regarding logistics service requirements is lacking from the industry of producing pallets and pallet collars; this study is hence a complement to previous research. The paper continues with a theoretical description of the concept of logistics service requirements, chapter three focuses on the methodology applied, with empirical study and analysis being presented in chapter four. The paper ends with chapter five, which provides conclusions and implications for the study.

Logistics service requirements

Logistics services are the processes for providing value-added benefits to the distribution channel in a cost-effective way (La Londe et al, 1988), and consequently they measure the effectiveness of the logistics system by creating time and place utility. Service could be divided into pre-transaction, transaction, and post-transaction elements. (La Londe and Zinzer, 1976). However, according to studies conducted by Nilsson (1987), pre-transaction and post-transaction elements are less applicable in the Swedish industry environment.

Logistics services can be defined as (Mattsson, 2002, page 139);

„, all value-added activities concerning the order-to-delivery process, and providing accurate information and services in accordance with the material flow.

Following the provided definition of logistics services, a logistics service consists of services related to the physical flow, services related to information regarding the physical flow, and to value-added services related to the physical flow. Hence service can be divided into three parts: delivery service, information service and logistics service. The importance of each service element is determined by the situation. *Delivery service* is considered to be such services as delivery time and delivery precision. *Information service* is the customers' possibility of obtaining information during the business

transaction, concerning, for instance, order status and delivery notification. *Logistics service* denotes all other services that are complementary to the physical flow of products. This service element constitutes among other things bar-coding, special packages, and Vendor Managed Inventories. During recent years logistics services have increased in importance more than the other customer service elements. (Mattsson 1999) The general concept of logistics service has been expanded by Gustafsson (2003), who proposes the phrasing of the individual service elements to be; delivery, information and value-added logistics services.

Several studies have been conducted in order to identify individual logistics service requirements. Table 1 gives an overview of logistics service requirements from an industrial perspective.

Table 1. Previous studies including empirically identified logistic service requirements from an industrial user perspective

Author	Year	Industry	Logistic Service requirement
Cunningham and Roberts	1974	Valve and Pump (purchase of steel)	Ability to meet quoted delivery times
Lambert and Sharma	1990	Chemical	Accuracy in filling orders Ability to expedite emergency orders in a fast responsive manner Accuracy by supplier in forecasting and committing to shipment dates for custom-made products Completeness rate (Percentage of order eventually shipped) Rapid adjustment of rate and shipping errors Frequency of deliveries Order processing personnel located in market area Computer-to computer order entry
Gilmour et al	1994	Various	Delivery time Providing info about delivery Order accuracy Availability Packaging Delivery reliability Ability to fill complete orders Reasonable delivery estimates
Donaldsson	1994	Various	Order – Delivery time Delivery reliability Available information Transaction accuracy Flexibility
Gustafs-son	2006	House-building industry	Accurate products are delivered completely Order cycle time is reliable Orders are filled completely Quick correction of mistakes Short lead-time Possibility to meet special requests concerning delivery Specified delivery date when ordering Possibility to order in entities Keeping supplier stock at production site Bar-coded products

Methodology

This study is conducted in two parts. The first part is an interview study part in which purchasing managers have been interviewed in order to identify individual logistics service requirements. The second part is a questionnaire study in which questionnaires have been used in order to collect empirical data with regards to importance of each individual logistics service requirement.

Identification of logistics service requirements

In order to identify logistics service requirements, an interview study on producers of pallet and pallet collars has been conducted. Differences between the respondents, such as number of units, product line, and type of customers, have been sought, rather than the similarities. A convenience sampling approach was used. Using personal interviews allows for options that are not possible with other methods, such as explaining questions, pose in-depth questions and ensuring complete answers (Churchill, 1991). Hence interviews were conducted until no additional aspects were revealed⁶. The interviews lasted about two hours and a walking tour of the production unit lasted an additional hour; in total about three hours were spent at the interviewed company. In total nine interviews were conducted for identification of logistics service requirements. The interviews focused on logistics service requirements and were divided into two sections: the first set of questions focused on a general description of the company, while the second focused on the logistics service requirements as stated by the respondents with regards to their softwood lumber suppliers.

Each company was visited and the interviews were held with the Chief Executive Officer (henceforth referred to as the CEO) for the respective company (who in a majority of cases was the owner and hence the single informant problem ought to be reduced). The interviews were recorded and filed notes were taken. The material (transcripts and filed notes) was rewritten into a script for each respondent. These were then sent to each respective respondent for the correction of mistakes and to add additional information, thus improving validity and reliability (Yin, 2003).

Ranking and Categorization

Based on the interview study, a questionnaire was constructed. The questionnaire was tested (as recommended by Dahmström, 2000) first on academics within the research area in order to secure measurement validity (see Bryman and Bell, 2011), and then practitioners in order to verify the questions with respect to their comprehensibility and relevance. The process of improving the questionnaire by using “reviewers” with different specialties (academics and practitioners) ought to strengthen the usefulness. The questionnaire consisted of two parts; the first part focused on descriptive questions and the second asked the respondents to mark the importance of each logistics service requirements.

In Sweden there are 83 producers of pallet and pallet collars, according to the PAR-register. To increase the response rate the researcher first contacted the respondent by telephone in order to briefly inform the respondent about the questionnaire and to ask for their participation. During the interviews, it turned out that companies with less than 10 employees did not purchase softwood lumber from a sawmill and hence they were removed from the list. Information regarding the respondents is presented in Table 2. If the respondent agreed to participate he/she was given the option of completing the survey over the telephone, electronically or on a traditional paper copy. By offering these options, the respondent could answer the questionnaire whenever they preferred (Fowler, 2002) The response rate was 93 %.

Table 2. Information regarding respondents

Total number of respondents	83
Small (less than 10 employees)	27
Declined participation	4
Number of responses	52
Total response rate	93 %

⁶ This is in accordance with grounded theory presented by Glaser and Strauss

In the questionnaire, the respondents were asked to mark the importance of the different pre-defined logistics service requirements on a 1-5 Likert scale, where 1 was not important and 5 was very important.

It is appropriate to use factor analysis in order to analyse interrelationships among a number of variables and to explain these variables in terms of their common underlying dimensions (factors). It is a technique for reducing data with a minimum of loss information (Hair et al., 1998). Consequently, factor analysis is used in order to find the categories of logistics service requirements. According to Hair et al., (1998) factor loading greater than +0.30 ought to be considered as significant loadings. However, cutting off more stringent (of +0.40) in conjunction with VARIMAX ought to enable clearer factors to emerge.

In order to assess the validity of the results, follow-up interviews have been conducted. The respondents who declined participation were interviewed in order to validate the results. These respondents, in the follow-up interviews, discussed the results in the same manner and hence validated the results.

Empirical study and analysis

Identification of logistics service requirement

The logistics service requirements identified in interviews are presented in Table 3.

Table 3. Identification of logistics service requirements

Interviewee 1.	<ul style="list-style-type: none"> ○ Fixed delivery days (2 each week) ○ Possibilities for quick deliveries ○ High delivery precision ○ Supplier hold stock on behalf of the customer
Interviewee 2.	<ul style="list-style-type: none"> ○ High delivery precision
Interviewee 3.	<ul style="list-style-type: none"> ○ High delivery precision ○ Short lead-time
Interviewee 4.	<ul style="list-style-type: none"> ○ Short lead-time
Interviewee 5.	<ul style="list-style-type: none"> ○ High delivery precision ○ Short delivery time ○ Wrapped in plastic
Interviewee 6.	<ul style="list-style-type: none"> ○ Short lead-time ○ More than one dimension in one delivery ○ Wrapped in plastic ○ High delivery precision
Interviewee 7.	<ul style="list-style-type: none"> ○ High delivery precision
Interviewee 8.	<ul style="list-style-type: none"> ○ High delivery precision ○ Flexibility in changing in orders
Interviewee 9.	<ul style="list-style-type: none"> ○ Wrapped in plastic ○ High delivery precision

The identified logistics service requirements are (presented in alphabetical order); Fixed delivery days (2 each week), Flexibility in changing in orders, High delivery precision, More than one dimension in one delivery, Possibilities for quick deliveries, Short lead-times, Supplier holding stock on behalf of the customer, and Wrapped in plastic.

Ranking and categorization

In order to increase the understanding of the importance of each logistics service requirement, mean and standard deviations have been calculated for each of them. Each logistics service requirement is presented in ranking order (based on means) in Table 4.

Table 4. Descriptive statistics for each logistics service requirement

<i>Logistics Service Requirement</i>	<i>Mean</i>	<i>Standard deviation</i>
High delivery precision	4,67	,706
Wrapped in plastic	3,37	1,858
Possibilities for quick deliveries	3,25	1,655
Short lead-time	3,25	1,655
More than one dimension in one delivery	2,44	1,685
Flexibility in changing in orders	1,96	1,371
Supplier holds stock on behalf of the customer	1,67	1,184
Fixed delivery days	1,50	1,245

The different logistics service requirements vary in mean and standard deviations; high delivery precision being the logistics service requirement with the highest mean value. The respondents have ranked high delivery precision as being very important, whereas, for instance, fixed delivery days appear to be not as important; this indicates that the producers of pallet collars are concerned about getting the ordered softwood lumber on time. Standard deviation increases for requirements that are ranked as average (i.e. 3) and it decreases as the mean decreases, indicating that the respondents are to a larger degree of similar opinions with regards to the requirements ranked as very important or not important. Sawmills, as suppliers to the industry for producing pallets and pallet collars, meet a customer who requires basic logic service requirements and hence they ought to focus on these in order to create value for their customers.

SPSS has been used in statistical analysis and the reduced factor structure is displayed in table 5. All non-significant loadings have been deleted and hence only significant loadings $+0.40$ are indicated. After studying the scree plot, three factors ought to be involved in the factor analysis.

Table 5. Rotated Factor Matrix

<i>Logistics service req.</i>	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>
Wrapped in plastic	,991		
More than one dimension in one delivery	,477		
Fixed delivery days		,880	
High delivery precision			,595
Supplier holds stock on behalf of the customer			,550
Flexibility in changing in orders			,502

Extraction Method: Principal Axis Factoring, Rotation Method: Varimax with Kaiser

Short lead-time and possibilities for quick deliveries had a significant loading of 0,288 and 0,396 respectively are hence removed from the analysis

The factor analysis of the logistics service requirements identifies three factors. *Factor 1* includes “wrapped in plastic” and “more than one dimension in one delivery”. *Factor 2* consists of “fixed delivery days”, while *factor 3* consists of “high delivery precision”, “supplier holds stock on behalf of the customer”, “flexibility in changing in orders”, and “possibilities for quick deliveries”. According to Mattsson 1999, logistics services could be divided into delivery, information, and logistics services. This study identifies three factors; however the operationalization of the groups in Mattsson, (1999) is not coherent with the contents of groups proposed by this study. “Wrapped in plastic” and “more than one dimension in one delivery” are coherent with the group *Logistics service* whereas “high delivery

precision”, “supplier holds stock on behalf of the customer”, and “flexibility in changing of orders” are aligned with *Delivery service*. However, “fixed delivery date” is clearly not aligned with *Information service*.

Conclusion and implications

This research takes its starting point in identifying eight logistics service requirements important for the actors in the industry for producing pallets and pallet collars when purchasing softwood timber. The study continues with grouping of the identified logistics service requirements. Knowing and understanding the customers’ logistics service requirements are an essential input in the sawmills’ work with developing and deploying a logistics strategy that aims at meeting customers logistics service requirements.

This research is based on the industry for producing pallets and pallet collars, and when removing the actors not sawing their own softwood lumber or having one sawmill within the cooperation, only 54 actors remained. Despite the high response rate, the number of responses for statistical analysis is low. Therefore this study needs to be complemented by additional studies. The additional studies need to deploy other methods, for instance in-depth case studies for identifying the actual actions taken by the actors, such as an in-depth study focusing on the conscious and unconscious needs of the respondents, as well as focusing on business models. A possible enlargement of this particular study is to focus on the respondents’ customers and the nature of the product (standard or special). This study complements previous studies by its operationalization of logistics service requirements. Further the identified factors are complementing previous studies by Mattsson (1999) and Gustafsson (2003). The industry for producing pallets and pallet collars is, from a sawmill perspective, the type of customer who has made the most in terms that resemble traditional manufacturing industries. The studied industry is characterized by low refinement, low inventory levels and rapid turnover, and this makes the actors dependent on their suppliers’ delivery of softwood lumber (which is reflected in the study's results). In order for sawmills to develop they therefore ought to examine these actors rather than others.

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