An Exploratory Analysis of Reverse Logistics in Flanders

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This paper reports on a reverse logistics survey of shippers and logistics service providers in Flanders, one of the leading logistics regions in Europe. We characterise the reverse logistics activities with respect to return reasons, recovery options, outsourcing, lifecycle length and value of products. Practically all the respondents have to deal either with short-life cycle or low-value products, or both, stressing the importance of efficient reverse logistics handling. Yet, in spite of the increasing attention that reverse logistics is receiving in management literature, its full potential still appears to be under exploited in practice. Respondents consider reverse logistics processes to be out of control, especially for packaging and support materials and still with relatively modest management attention. In addition, we assess the future outlook and potential growth. Almost all companies expect an increase of management attention for reverse logistics, and the results show a large potential with respect to third party service providers, including decision support tools in this area. Furthermore, we examine the underlying causes of the relatively low reverse logistics performance and point out issues that need improvement.

Keywords: Reverse logistics, closed loop supply chains, survey, Flanders

1. Introduction

Over the past few years, reverse logistics has been gaining increasing attention and awareness in the supply chain community, both from practitioners and researchers. Reverse logistics has become the focal point of many improvement initiatives, even for non-profit organizations (see Reyes and Meade, 2006). This can be attributed to increased regulatory pressure such as extended-producer responsibility, consumer expectations and societal sustainability demands, as well as to the intrinsic value that can be regained from collected products (De Brito, 2003). For instance, about 7.6 million vehicles are recycled annually in the EU-15 following the end of life vehicles European Directive, the International Maritime Organisation is regulating the shipping industry and both Airbus and Boeing have initiatives with respect to the recovery of decommissioned airplanes (ACEA, 2004; Gerrard and Kandlikar, 2007; De Brito et al., 2007). Another example is of Recellular (www.recellular.com), a firm that smartly retrieves value from mobile phones by remanufacturing them, being a major player in what is estimated to be 5-8% of the mobile phone market. (Guide et al., 2005). The sustainability movement and the climate change discussion have increased citizens' awareness. Customers expect companies to take action including to be active on product recovery (see GreenBiz.com, 2007). The overall result is an increase on reverse logistics activities on a whole range of industries, from the transport sector, consumer electronics, press and media to textiles and clothing, to mention just a few.

A 1998 U.S.-based study estimated that reverse logistics costs amounted to four percent of all the logistics costs in the country, or half percent of the U.S. GDP (Rogers and Tibben-Lembke, 1998). This would amount to $66.2 billion in 2006 (www.bea.gov). Since then, the literature on reverse logistics has grown significantly covering case studies, decision-support tools, and theoretical insights (see e.g. Verter and Boyaci special issue at Computers & OR, 2007; Guide and van Wassenhove's special issue at Interfaces, 2003; Dekker et al., 2004 and Flapper et al., 2005). There are some sector surveys addressing this, as in the catalog industry (Autry et al., 2001; Daugherty et al., 2001), or automobile industry (Daugherty et al., 2005). Multi-sector surveys touching the topic are however rare. The exceptions are basically

resumed to Rogers and Tibben-Lembke (2001) and Aberdeen Group (2007). These surveys are however U.S. based with European firms amounting to a maximum of 21% in the latter survey. Furthermore, until today, reverse logistics metrics as published for the U.S. by Tibben-Lembke are unknown for other countries or regions, including Europe.

This paper empirically investigates reverse logistics in a leading European logistics region in order to assess both its actual size and status and its future outlook and potential growth. In order to do so, the authors analyze a cross-section of companies from a variety of industries in Flanders. Flanders is a prime location for European Distribution Centers (EDC) and logistics facilities (Cushman and Wakefield, 2006), hosting more than 350 EDC's (i.e. an average density of 3 EDC's per 100/km²). Flanders constitutes therefore an appropriate region to conduct this study.

In section 2 we present a briefly review of the literature, section 3 describes the methodology, and section 4 characterizes the respondent group with respect to turnover, manpower, and type of industry. We report in section 5 on the return reasons, management drivers and recovery options, and outsourcing levels. An analysis of reverse logistics handling is given in section 6, together with the degree of management commitment and the existence of return policies. The main conclusions and directions for further research are summarised in section 7.

2. Reverse Logistics: brief literature review and definition

2.1 Brief literature overview

Since early nineties, reverse logistics has been gaining attention in the logistics and management literature Several books have been published on the challenges and opportunities of reuse and reverse logistics programs (Stock, 1992; Kopicky et al., 1993; Stock et al., 1998)

Research on reverse logistics management has predominantly relied on normative quantitative research methods, covering network design production planning, and inventory management topics (see Fleischmann et al.; 1997; Dekker et al., 2004; Rubio et al., 2006). Business aspects and case studies on reverse logistics have also been reported in a wide range of industries, concerning a variety of recovery options (see Guide and van Wassenhove, 1999; De Brito et al., 2005; Flapper et al., 2005).

Theoretical frameworks (see e.g. Thierry et al., 1995; Toffel, 2003; De Brito and Dekker, 2004) and surveys are in minority in the literature on reverse logistics. Survey methodology was used in less than 5% of the reverse logistics articles published between 1995 and 2005 (Rubio et al., 2006). Prahinski and Kocabascoglu (2006) identifies that survey methodology is a valuable research opportunity, which is needed to complement current research on reverse logistics.

For more on the existing literature, we refer to the ten-year review of literature on reverse logistics by Rubio et al. (2006), and to the recent special issues on 3PL, 4PL and Reverse Logistics in the International Journal of Physical Distribution (Sahay, 2006) & Logistics Management Reverse Logistics in Computers & OR (Verter and Boyaci, 2007).

2.2 Definition of Reverse Logistics

As new insights came along and ways of thinking in this area evolved, the definition of the term reverse logistics itself underwent significant changes.
In the late nineties, Rogers and Tibben-Lemke (1998) defined reverse logistics as "the process of planning, implementing and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal". This definition did not take into account e.g. packaging materials.
A few years later, the then EU-funded European Working Group on Reverse Logistics (2002) expanded this view and defined reverse logistics as the process of planning, implementing and controlling the backwards flows of raw materials, in-process inventory, packaging and finished goods from a manufacturing, distribution or use point to a point of recovery or proper disposal.
Most recently, according to the Reverse Logistics Association (2006), reverse logistics deals not only with returns processing but also with repair, customer service, parts management, end-of-life manufacturing[1] and order fulfillment. Other approaches exist as well: for example, the Supply Chain Council takes a purely operational, process-based view on the matter. Its SCOR model (version 7.0, 2006) has been gaining popularity with large companies as a means to benchmark and re-engineer supply chain flows and processes.
For the purpose of this paper, the authors define reverse logistics as all physical and administrative processes related to the movement of trading and packaging materials from the point of use to the point of manufacturing, encompassing collection, inspection, disassembly, re-processing and/or disposition of returned items.

3. Methodology

To investigate reverse logistics in Flanders, a leading European logistics region, we conducted a cross-section descriptive survey, which is an appropriate tool to understand the relevance of reverse logistics in the region (see Forza, 2002). In addition we triangulate the survey data with in-depth interviews.
Along with the Netherlands and small parts of Germany and France, Flanders can rightfully be called the "logistics gateway to Europe". Flanders' preferential position can be attributed to its strategic location in the heart of the so-called "Blue Banana region" (which encompasses the major production and consumption centers in Europe), its high quality and density of the hinterland transportation network, moderate rental prices for real estate and the availability of a multilingual and highly productive logistics workforce. Thus, given that logistics is an activity very much alive in this region, Flanders forms an adequate field to assess the reverse logistics size and status and its future outlook and potential growth.
The questionnaire addressed general company information (sector, location, turnover, manpower), reverse logistics facts and figures (type of returns, magnitude of return rates, dedicated manpower, outsourcing), reverse logistics processes, procedures and organization (priorities, responsibilities, drivers and policies) and IT monitoring and supporting systems.

[1] Support of products that will soon go or have already gone "end-of-life", consisting of e.g. repairs or manufacture of small volumes of products or subassemblies for future support.

In July 2005, the authors constructed a draft questionnaire, which was first discussed with a focus group with 10 industry experts. Focus groups are known to be a useful tool in developing surveys (see Flink, 2003). The fine-tuned questionnaire was sent to 250 Flemish logistics service providers (LSP) and shippers over the period of September to December of 2005.

The sampling method was non-probabilistic. We used theoretical sampling (Strauss and Corbin, 2000): the expertise of the Flanders Institute for Logistics (VIL) was employed to approach companies that had a reasonable volume of reverse logistics. Companies that after a first telephone contact with VIL indicated to have significant reverse logistics flows were primarily targeted. In doing so, an attempt was made to reach as many different industry sectors as possible. In order to limit the workload for the respondents and to increase the response rate of the survey, the selected companies were asked to identify a single key informant, preferably in the logistics department. Checking his/her function within the company validated the competence of this informant. For more information and suggestions on selecting key informants, we refer to Kumar et al. (1993). All respondents were considered to be sufficiently knowledgeable: 55% held a logistics management position, 17% belonged to general management and 28% had another relevant professional background such as customer service.

By February 2006, 55 filled-in surveys were received, resulting in a response rate of 22.5%. This is a high rate given the fact that response rates for academic studies have been known to show a general decline in recent years (Griffis et al., 2003).

4. A basic characterisation of the respondent group

In total, we had responses from 13 different industry sectors. Logistics service providers together with companies in the fast moving consumer goods and healthcare sector have the highest response frequencies to the survey. Information and Communication Technology (ICT) and telecommunications companies, the public sector and textile / clothing companies are the sector with the lowest response frequencies (see table 1).

Table 1. Response percentages per sector

Sector	Percentage (%)
Logistics Service Provider (LSP)	12.7
Fast Moving Consumer Goods (FMCG)	12.7
Healthcare	10.9
Agriculture	9.1
Automotive	9.1
Construction and Do-It-Yourself (DIY)	9.1
Consumer Electronics	9.1
Press & Media	7.3
Industrial products	5.5
Retail (including mail-order)	5.5
Government	3.6
Information and Communication Technology (ICT) & Telecom	3.6
Clothing and Textiles	1.8

Among the respondents there are medium-sized to large companies, both with respect to turnover and workforce. The middle fifty percent that responded have higher than 10 and lower than 250 million euros in turnover and in between 50 and 500 employees (figure 1, left and right respectively). Twenty-four respondents are active on a global scale, thirteen have a European presence and eighteen are only active in the so-called Benelux region (i.e. Belgium, the Netherlands and Luxemburg).

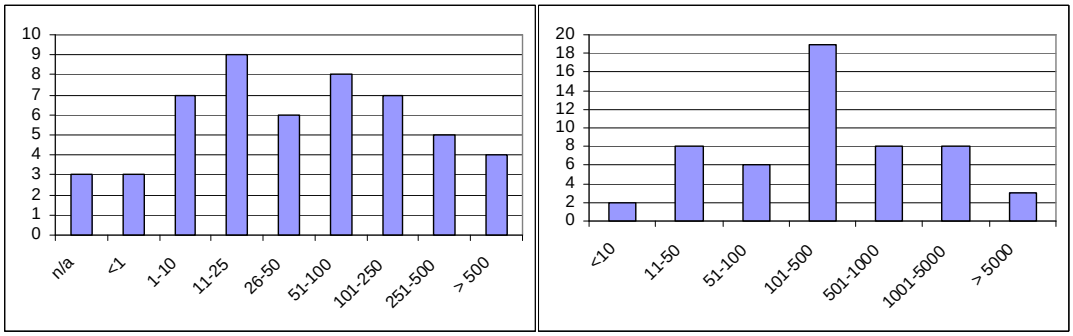

Figure 1. Histogram of turnover in (left, in million Euro) and workforce (right, in full time equivalent units) in Belgium

Across these industries, the value and nature of goods sold is different. Table 2 shows segmentation percentages based on the product lifecycle (PLC) and value for the respondents' most important products. Almost two thirds (63%) are dealing with products of relatively low value and more than three quarters (76%) are dealing with products with short lifecycle (table 2). Fast moving consumer goods and agricultural products tend to have a relatively low value and short product life cycle. ICT, telecom and consumer electronics are typically sectors where products have a relatively high value and short PLC. Construction and DIY products have a relatively low value and long PLC, and products in the automotive industry have a relatively high value and long PLC. Only 4% of the companies belong to this category while the remaining 96% have to deal either with short-life cycle or low-value products, or both. Any delays or inefficiencies in the processing of return flows can be expected to have a significant negative impact on value recovery. This stresses the importance of paying attention to the return processes.

Table 2. Grid of responses in (rounded) percentages: product value and product life cycle

		Short PLC	Long PLC
Value	**High**	33%	4%
	Low	43%	20%

5. Analysis of the return flows intensities and characteristics

Here we describe the return reasons, the management drivers, the recovery options, and the outsourcing levels. Though there are a number of formal classifications of return reasons in the literature (see e.g. De Brito and Dekker, 2004), we used mainly the focus group that provided input to, and tested, the questionnaire, to develop a list of return reasons. In this

way, the wording is most familiar to the respondents. The final list of return reasons, after consecutive refinements, is as follows

- product damaged in transport
- product does not meet customer expectations (not happy with the product)
- delivery error (e.g. delivery has missing parts)
- product shows a quality defect (e.g. malfunction)
- cancellation of sale by customer
- customer does not state a specific reason
- product was delivered too late
- stock adjustments (bad forecast/overstock/unsold stock)
- return after use

The previous list is rather detailed when compared with formal return reasons typologies in the literature. This is as expected because while the previous expressions closer reflect real-life situations, formal typologies favour, by definition, parsimony.

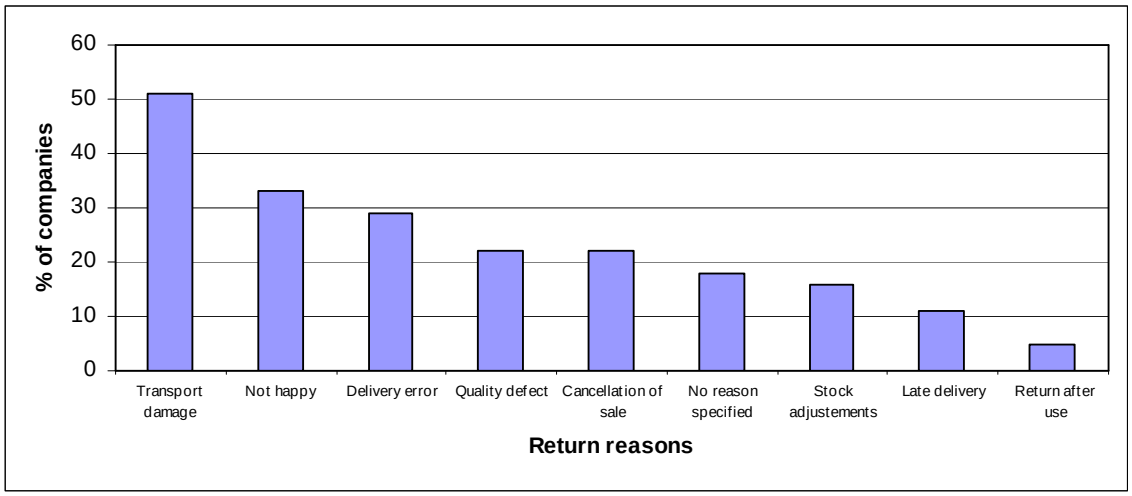

Figure 2. Return reasons

The most popular return reasons are: damaged in transport (50% of the respondents), 'not happy with the product' and delivery errors (about 30% each). About 20% of the companies included quality defects and the simple cancellation of the sale by the costumer without specifying a reason. About 10% identified late delivery, bad forecast and overstock as being some of the return reasons dealt with by their organisations. Less than 10% included return after use as a return reason their companies have to deal with (see figure 2).

To the majority of the respondents, the drivers to deal with returns of commercial products are customer satisfaction (72%) and cost reduction (60%). In addition, further customer-oriented or profit-oriented drivers were listed such as speed & flexibility/process quality/process reliability, and value recovery/stock reduction respectively. In some industries, such as the automotive sector or the consumer electronics industry (cell phones, PDA's, computers, etc.), value recovery of returned items can be significant. In addition, through swift reprocessing of products and packaging materials, company inventory levels can be reduced. About 30% listed legislation as a driver. This reflects the sectorial composition of the respondents, as pro-environmental legislation is affecting paramountly the

automotive sector (end-of-life vehicles directive), the consumer electronics, and ICT & telecom (through the waste electrical and electronic equipment directive). Consumer rights related-legislation also demands a 'cooling-off period' for distant selling such as mail orders, during which customers can change their mind and return the product (see http://europa.eu/). Ethics & ecology appears as a driver referred by just below 20% of the organisations, showing that a considerable group is as well values-driven. All in all, the responses indicate that these companies are rather service-oriented (while profit remains an important bottom-line), focused on the customer.

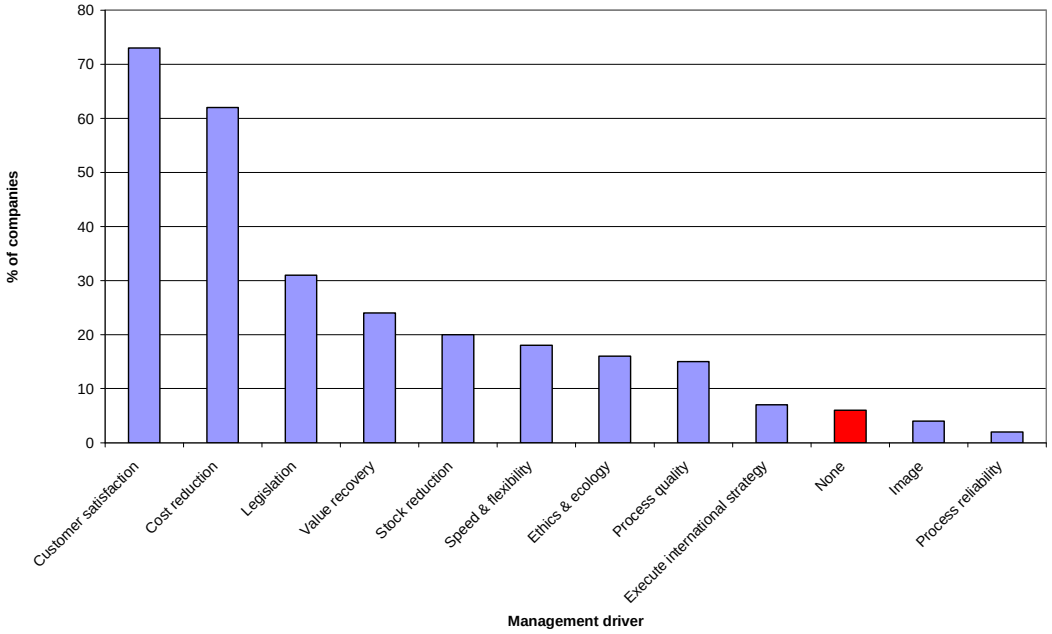

Figure 3. Management drivers for reverse logistics for returns of commercial products

When asked on the drivers to deal with packaging returns, then cost reduction became the first driver when compared with customer satisfaction. As customer involvement is lower for packing and support materials, cost reduction is the primary focus. Less than 25% of respondents focus on value recovery, although the value of durable packaging and returnable transport items such as the 'europallets' (approximately 7 €/piece) should not be underestimated.

There are several recovery options for products and materials being returned. Here we consider the following (see also de Brito and Dekker, 2004):

- Direct recovery (re-selling and re-distribution)
- Product recovery (repair, refurbishing, remanufacturing)
- Recycling (materials recovery)
- Proper disposal and write-off

Furthermore, we distinguish between products that are being recovered for the original versus for other markets.

Figure 4 shows that, on average, almost 30% of the products are (directly) resold on the original market, and more than 25% are properly disposed and written off. Only a limited

percentage of products are repaired for reselling, or recycled. Thus, only a limited percentage of recovered products is resold on alternative markets.

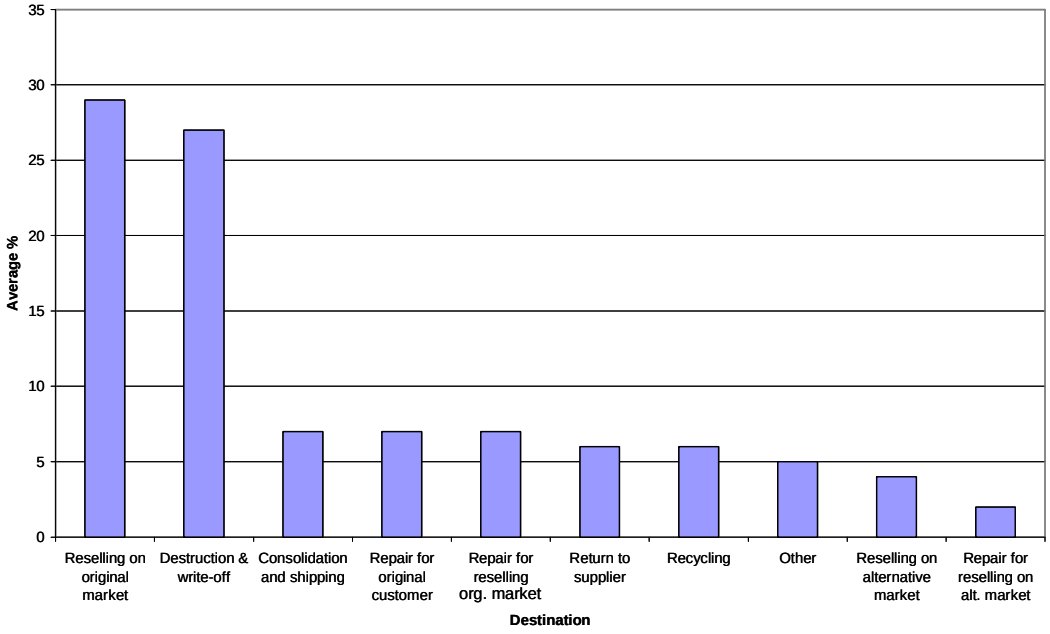

Figure 4. Destination of returned trading goods

Recovery is only one of the processes in the reverse logistics chain (see Guide and Wassenhove, 2002). There are other processes, as follows:

- Administrative processes
  - Complaint handling;
  - Finances;
- Transportation (to collect the product)
- Inspection and testing
- Sorting
- Direct Recovery
  - Auctioning;
  - Repackaging
  - Redistribution
- Product recovery
  - (Disassembly)
  - Refurbishing;
  - Repair;
  - Remanufacturing;
- Recycling
- Composting (perishables processing)
- Proper disposal and write-off

Figure 5 shows that activities involving customer contact (complaint handling, administration and finance) are not very often outsourced. Likewise sorting, inspection & testing,

disassembly and auctioning are rather kept in house than outsourced. We observe the opposite with transportation, proper disposal & writing off, repair, recycling, refurbishing, remanufacturing and perishables processing, where there is a larger share of outsourced operations. It is not surprising that laborious recovery activities are rather outsourced than kept in-house, as those diverge from the core know-how of companies, which prefer to focus on their key competences (see Discount StoreNews, 1999). Currently, only about 25% of the respondents outsource one or more reverse logistics activities. From the remainder 75%, who keeps reverse logistics in-house, about 60% of the respondents could outsource in the future, with 30% explicitly expressing a positive attitude towards outsourcing. This is relatively in line with previous studies on the outsourcing of reverse logistics. Out of a U.S. survey, Blumberg (1999) reported: "71 % of reverse logistics and repair services are currently done in-house … over 55 % of the firms … would prefer to outsource this function." This preference has been put into practice, at least in the U.S., with third party logistics providers playing a key-role in reverse logistics handling (Vaidyanathan, 2005), such as GENCO that serves leading customers like Sears or Wal-Mart (www.genco.com).

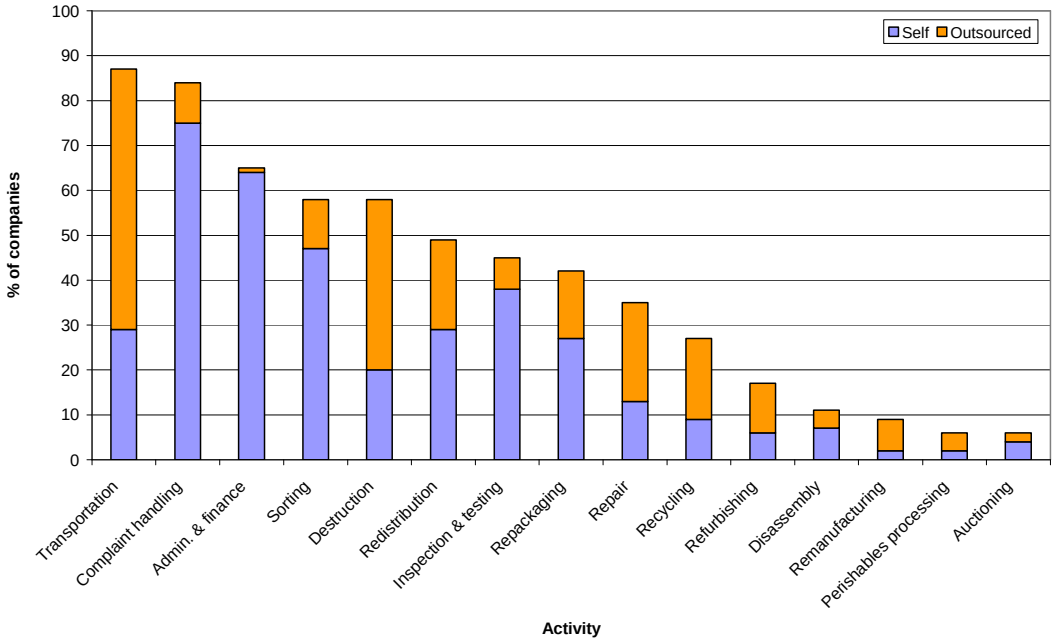

Figure 5. Level of outsourcing for reverse logistics activities

6. Analysis of process performance

Respondents were asked to assess the quality of their organization's current business processes for physical and administrative handling of products and packaging returns on a three point scale:

1. processes are *poorly under control* and are performing in an irregular way
2. processes are *partially under control* but could be performing in a better way

3. processes are *well under control* and are performed efficiently

The survey indicates that only 37% of the respondents consider the physical handling of packaging & support materials to be *well under control* and performing efficiently. The administrative handling of packaging and support materials receives positive grading from 54% of the respondents. For returns of products, the figures are better, 71% of the respondents consider the physical management of product returns to be well under control, while 25% of the respondents express concerns about the administrative handling of product returns (partially or poorly under control). Regarding information management, there is a lack of integration of data with ICT especially the management of packaging and support materials appears to be an information blind spot. This is a serious gap as monitoring is one of the necessary steps for a successful reverse logistics program (Ellis, 2006).

Furthermore, 40% of the respondents indicate that there has been little or no management attention towards reverse logistics in the recent past. Within the respondents, 24% had no policy on product returns and 44% had no return policy for packaging and support materials. The ownership of the reverse logistics process is often entrusted to managers in charge of other main processes such as sales and customer service. The responsibility for reverse logistics is also often shared with these colleagues: in 46% of the cases, the logistics manager is not the single owner of the reverse logistics process. Overall, the job title of "reverse logistics manager" exists in only 13% of the companies in the sample. In 11% of the cases, no clear owner of the physical reverse logistics process can be identified, a figure that is even slightly higher for the administrative aspects of the reverse logistics process (13%).

Thus, the outcome is little management commitment, lack of return policies and unclear assignment of human resources to reverse logistics resulting in dispersed ownership of reverse logistics issues. However, it is known that without a clear focus and commitment from the organization's top management, it is impossible to give reverse logistics the necessary attention, to obtain the budget for the necessary ICT investments and to overcome the resistance to reengineer reverse logistics processes and create awareness for reverse logistics with suppliers and customers. The lack of commitment from top management is an important barrier to successful reverse logistics management. Other main barriers to reverse logistics are caused by the variable quality of returned products, the lack of appropriate performance metrics, financial constraints and lack of staff training and education (Ravi and Shankar, 2005). Nonetheless, almost all respondents (94%) expect to see an increase in management attention towards reverse logistics in the next 3 years. More than 25% of the respondents state that their organization will start a reverse logistics optimization project within the next 3 years.

7. Summary and conclusions

This paper empirically investigates reverse logistics in Flanders, reporting the results of across-sector survey of 250 Flemish LSPs and shippers with a response rate of 22.5%.

Practically all the respondents have to deal either with short-life cycle or low-value products, or both, stressing the importance of efficient reverse logistics handling. However, current reverse logistics processes are not considered to be a priority by the respondents as far as returned product flows are concerned, but especially the management of packaging and support materials appears to be an information blind spot. The limited value recovery of products and packaging materials and the slow cycle time of packaging materials and

returnable transport items represent an important 'invisible value loss' in the supply chain and may offer a substantial untapped source of efficiency gains.
These gains, however, will not be achieved with the current levels of management attention. Yet, almost all respondents (94%) expect an increase of management attention for reverse logistics and 25% of the respondents claim they will start optimization efforts in the next 3 years. Thus, companies seem to be looking for both information and practical tools to support them in this process. Best practices, clear-cut information on upcoming legislation (such as RoHS, WEEE,) and guidelines for evaluation and benchmarking are needed to unlock the hidden value in the reverse supply chain (see also Fleischmann et al., 2004).
Only 37% of the respondents consider the physical handling of packaging & support materials to be well under control and 25% expressed concerns with respect to the administrative handling of product returns. Potential causes of inefficiencies are lack of (i) ownership and targets, (ii) insight, measurement and reporting, (iii) process vision and (iv) systems integration (ICT and data).
This paper offers an exploratory analysis of reverse logistics practices for products and packaging materials and company performance. Further formal research is needed to examine the observations made in this paper, especially on management drivers and process performance of reverse logistics processes. It can be expected that the development of a formal model, e.g. along the lines of Wisner (2003) will offer objective arguments to overcome resistance to implementing reverse logistics processes in the extended company by creating awareness on reverse logistics and by encouraging academic research in this field.

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