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Introduction

1. Theoretical aspects of reverse logistics
2. Characteristics of the selected processes of reverse logistics
3. Analysis of the situation in the Czech Republic
4. Evaluation of the analysis and design measures

Conclusion

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ANNOTATION

The thesis deals with the analysing of reverse logistics in the Czech Republic. It looks at the theoretical aspects of this fascinating topic of reverse logistics. It later focuses on the processes that take place and how they function in the industry. Furthermore, the thesis evaluates and sheds light on the design measures in the situation in Czech Republic.

KEYWORDS

Reverse logistics, Supply chain loop, logistic processes, management, B2B, B2C.

TITLE

Analysis of reverse logistics in the Czech Republic

ANOTACE

Bakalářská práce se zabývá analýzou reverzní logistiky v České republice. Sleduje teoretické aspekty tohoto fascinujícího tématu. Dále se soustředí na probíhající procesy a na to, jak v tomto průmyslu fungují. Práce nadto hodnotí a osvětluje situaci v České republice.

KLÍČOVÁ SLOVA

Reverzní logistika, dodavatelské řetězce, logistické procesy, řízení, B2B, B2C.

NÁZEV

Analýza zpětné logistiky v České republice

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Introduction

Reverse logistics stands to solve most of our problems as we run out of space in this world. Environmental problems are occurring at an alarming rate in this day and time, there is never a day where we do not hear about global warming and see this as a headline : ‘tsunami is destroys a city’. Most of these come about due to pollution of the earth. While it might take decades to solve these issues, Reverse Logistics is in a good position to slow it down at least.

In this thesis an investigation shall be launched to find out what Reverse logistics really is. The theoretical aspects that apply to it and the definition will be tackled as we journey into the never ending world of reverse logistics

Its conception will prove to be a vital element when we research its importance in our communities and our place of work. Our everyday lives are filled with reverse logistics functions that we do not take the time to acknowledge, never mind admiring them. Our lack of time is a mere joke to the processes that take place in reverse logistics, but it too faces a lot of challenges and this will be touched upon in the 1st chapter of this thesis

There are many characteristics of reverse logistics, and yes they are congruent to those of logistics (forward logistics). They, unlike the ordinary logistics characteristics, take a different route in the supply chain as this simple definition gives light to this tale: Reverse logistics stands for all operations related to the reuse of products and materials. It is "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.ⁱ

The situation in the Czech Republic’s reverse logistics industry and its effects will be investigated, and in doing so an evaluation of the result shall be achieved. This thesis will try to simplify the complex theories that are mentioned in reverse logistics to the ordinary man or woman in the street.

The aim of this thesis is to analyse the reverse logistics process and its standing in the Czech Republic. It shall be used to make a decision on whether the Czech Republic has the capability to recognize these reverse logistics flows as a source of value and whether or not the design measures would hamper its growth.

ⁱ Wikipedia [ONLINE] [cit. 2012-05-05].accessible on http://en.wikipedia.org/wiki/Reverse_logistics

1 Theoretical aspects of reverse logistics

Though the concept of Reverse Logistics dates from a long time ago, the origin of the term is difficult to trace with precision. Terms like “Reverse Channels” or “Reverse Flow” already appeared in the scientific literature of the seventies, but were consistently related with recycling (Gultinan and Nwokoye, 1974; Ginter and Starling, 1978). The Council of Logistics Management (CLM) published the first known definition of Reverse Logistics in the early nineties (Stock, 1992), “...the term often used to refer to the role of logistics in recycling, waste disposal, and management of hazardous materials; a broader perspective includes all things relating to logistics activities carried out in source reduction, recycling, substitution, reuse of materials and disposal.”ⁱⁱ

1.1 Reverse logistics and how it came about

The previous definition is very common in this sphere, as it is evident from the views of these excerpts; “the role of logistics in “and” all related activities. In the same period Pohlen and Farris (1992) define Reverse Logistics, guided by marketing principles, as being “... the movement of goods from a consumer towards a producer in a channel of distribution.”ⁱⁱⁱ

Kopicky (1993) defines Reverse Logistics incongruent to Stock (1992) but keeps, as previously introduced ideology by Pohlen and Farris (1992), the sense of direction opposed to traditional distribution flows: “Reverse Logistics is a broad term referring to the logistics management and disposing of hazardous or non-hazardous waste from packaging and products. It includes reverse distribution which causes goods and information to flow in the opposite direction of normal logistics activities.”^{iv}

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 is known commonly as logistics but when we look at these processes backwards we find the pure definition of reverse logistics where the cycle carries on from the point of consumptions to the point of origin. Many experts stand firm by this theory and would support it until the end of time unless a better and precise process is established.

ⁱⁱ Ginter P.M. and J.M. Starling (1978), *Reverse distribution channels for recycling*, California Management Review, 20(3):72-81. and Stock J.R. (1992), *Reverse Logistics*, Council of Logistics Management, Oak Brook, IL.

ⁱⁱⁱ .Pohlen, T.L. & Farris II, M.T. (1992). Reverse logistics in plastics recycling. *International Journal of Physical Distribution & Logistics Management*, Vol. 22, No 7, pp. 35-47

^{iv} Kopicky R.J., M.J. Berg, L. Legg, V. Dasappa and C. Maggioni (1993), *Reuse and Recycling*:

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 origin to the point of consumption for the purpose of conforming to customer requirements.

Reverse logistics includes all of the activities that are mentioned in the definition above. The difference is that reverse logistics encompasses all of these activities as they operate in reverse. Therefore, reverse logistics is:

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.^v

This is how Logistics and reverse logistics are defined by The Council of Logistics Management.^{vi}

Logistics is defined by The Council of Logistics Management 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 origin to the point of consumption for the purpose of conforming to customer requirements. Reverse logistics includes all of the activities that are mentioned in the definition above. The difference is that reverse logistics encompasses all of these activities as they operate in reverse. Therefore, reverse logistics is: 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. More precisely, reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. Remanufacturing and refurbishing activities also may be included in the definition of reverse logistics. Reverse Logistics is more than reusing containers and recycling packaging materials. Redesigning packaging to use less material, or reducing the energy and pollution from transportation are important activities, but they might be secondary to the real importance of overall reverse logistics. (Reverse Logistics Magazine, 2006:12) Reverse logistics also includes processing returned merchandise due to damage, seasonal inventory, restock, salvage, recalls and hazardous material programs, obsolete equipment disposition and asset recovery.

^v Going Backwards Reverse Logistics Trends and Practices [online]. c. 2012 [cit. 2012-05-05].accessible on <http://www.rlec.org/reverse.pdf>

^{vi} Logistics world [online]. [cit. 2012-05-05].accessible on <http://www.logisticsworld.com/logistics.htm>

The reverse logistics process can be broken into two general areas, depending on whether the reverse flow consists primarily of products, or primarily of packaging. For product returns, a high percentage is represented by customer returns. Overall customer returns are estimated to be approximately 6% across all retailers. Return percentages for selected industries are shown in Table 1. In each case, return percentages were established by several different firms.^{vii}

Table no 1. Sample Return Percentages

Industry	Percentage
Magazine Publishing	50 %
Book Publishers	20-30 %
Book Distributors	10-20 %
Greeting Cards	20-30 %
Catalogue Retailers	18-35 %
Electronic Distributors	10-12 %
Computer Manufacturers	10-20 %
CD-ROMs	18-25 %
Printers	4-8 %
Mail Order Computer Manufacturers	2-5 %
Mass Merchandisers	4-15 %
Auto Industry (Parts)	4-6 %
Consumer Electronics	4-5 %
Household Chemicals	2-3 %

Source: [13]. Edited by Author

We can obviously see that the return rates vary significantly by industry. The same applies in different regions and countries therefore, would make the procurement of the management skills in reverse flow of prime importance.

Reverse logistics practices are broad and are based on industry and channel position. We find that industries where the returns of the products are a greater portion of operational cost tend or should maintain better reverse logistics systems and processes or rather have structures in place. Some of the characteristics of reverse logistics for the different industries are highlighted below as I define the different spheres of reverse logistics in the industries.

^{vii} International Journal Of Business And Management Studies Vol. 3, No 1, 2011 ISSN: 1309-8047 (Online)

Publishing Industry has the highest rate of unsold copies (28 % on average). An abundance of large chain stores: More square footage requires more books. To secure a prominent display in superstores, publishers must supply large quantities of books which also results in losses because we all know that Superstores sell less than 70 % of the books they order. Products may have a shorter shelf life.

Retail Industry has Profit margins that are so slim that good return management is critical. Returns reduce the profitability of retailers marginally more than manufacturers. Returns reduce the profitability of retailers by 4.30 %. The average amount that returns reduce profitability among manufacturers is 3.80 %.

The computer/electronics industry has a shorter life span; approximately 325 million PCs became obsolete from 1985 to 2005. Opportunities and created value from a ubiquitous asset are useful for industry and trade. How to recover and reuse materials contained in the E-waste? Aluminium, lead, copper, gold, plastics and glass, E-waste includes computers, televisions, mobile phones, audio equipment, and batteries. Remanufacturing of toner cartridge remanufacturers 12,000, 42 000 employees, were sold for nearly \$ 1 billion per year.

Automotive Industry has three primary areas: Components in working order sold as is, such as engines, alternators, starters, and transmissions are refurbished before they can be sold. Materials are reclaimed through crushing or shredding. Automotive recyclers handle more than 37 % of the nation's ferrous scrap. Remanufactured auto parts market is estimated at \$34 billion, annually.^{viii}

All these industries use reverse logistics to their advantage in the market but it is clear that the main activity in reverse logistics is the collection of the products to be recovered and the redistribution of the processed goods. Although this problem resembles the standard forward distribution problem, there are also some differences. There are usually many points from which goods need to be collected, the product packaging is generally problematic, cooperation of the sender is much more needed and the goods tend to have a low value. On the other hand, time is of less a problem. As reverse logistics is quite new, in many cases new networks need to be constructed. Major issues in this respect are the determination of the number of layers in the network, the number and location of depots or intermediary points, the use of drop points in the collection, the issue of integrating the reverse chain with the forward chain and finally the financing of the network

^{viii}International Journal Of Business And Management Studies Vol. 3, No 1, 2011 ISSN: 1309-8047 (Online)

1.2 The importance of reverse logistics

We can deduce that logistics and reverse logistics are and the same just vice visor. Reverse logistics has taken a form of its own over the years and has begun to catch the eyes of most proprietors and commercial moguls of our time. They have seen and carving a new routes to commerce. It is clear that millions can be saved by proper management of waste materials but these days we can enter a whole new market waste management through reverse logistics and actually generate millions through this process. Top businesses are investing a lot of money into the future of returned materials handling and storage, Facilities are being put into place and results are showing.

This just shows us that reverse logistics is important, but how important is it we wonder? Well, it is often referred to as green logistics, as it deals with the clean-up of unwanted items. It has a huge impact in the environment and it is growing from year to year while more and more people are being introduced to the topic of reverse logistics.

Reverse logistics (RL) is becoming an important aspect of supply chain management. Many companies that, previously, did not devote much time or energy to the management and understanding of reverse logistics have begun to pay attention. Firms have begun to benchmark return operations with the best in-class operators. Third parties specializing in returns have seen demand for their services greatly increased.^{ix}

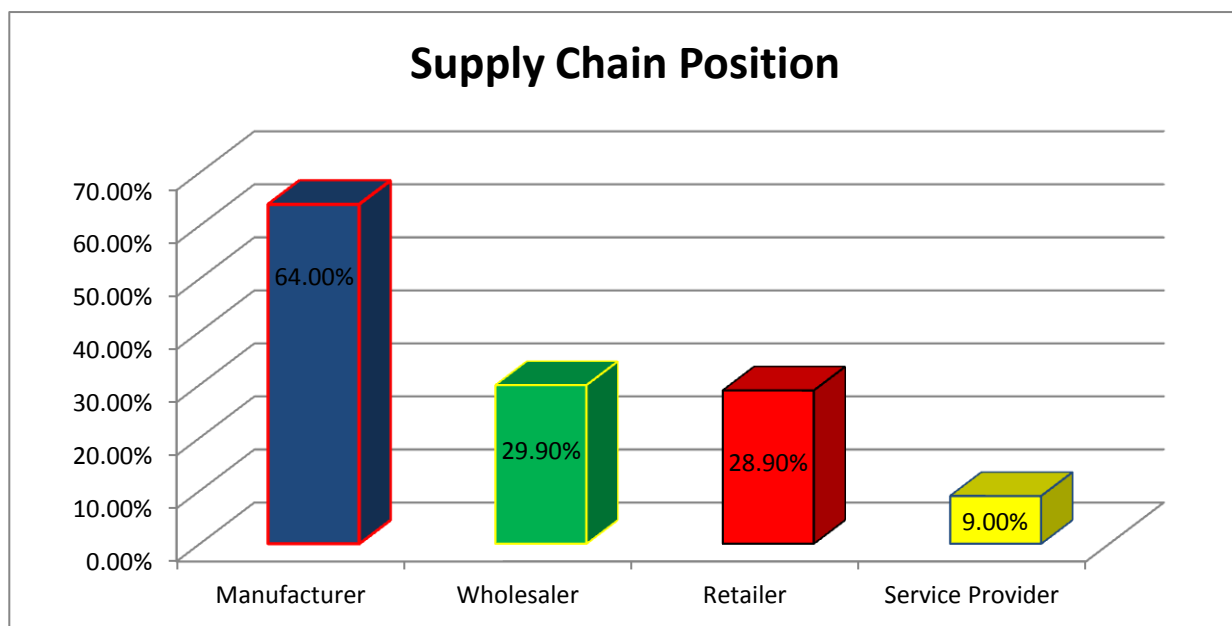
The growing environmental concern worldwide, forced companies to engage in reverse logistics, such as the re-use of products and materials and recycling. Practically, most of the companies deal with returns of some nature because of issues such as marketing returns, damage or quality problems, overstocks, refurbishing or remanufacturing. Handling returns presents a great challenge for companies, while in many cases it becomes a necessity for keeping customer satisfaction to a certain level.

Reverse logistics operations in a supply chain may be considered as an introduction to innovative services of a company's portfolio. They may have an important impact on a firm's strategic performance in terms of market effectiveness, as well as, internal cost efficiency. Through reverse logistics innovation, it may be possible to expand revenue through market growth due to account customization, service augmentation, and improved customer satisfaction. Reverse logistics is becoming an area of competitive advantage.

^{ix} Arun, Kumar and Kwan, Tan, Albert (2003), *Improving the performance of a computer company in supporting its reverse logistics operations in the Asia-Pacific region*, International Journal of Physical Distribution & Logistics Management, Vol. 33, nr. 1, pp. 59-74.

One of the more interesting and significant trends in supply chain management is the recognition of the strategic importance of reverse logistics operations. (Retzlaf and others, 1997) These reverse logistics operations support a variety of activities ranging from what is termed “green logistics,” i.e., “efforts to reduce the environmental impact of the supply chain” to activities that encompass product returns, repairs, and refurbishment^x.

Figure 1.SCP



Source [11]: Author

In this very competitive market one has to use his strengths to the fullest and trade secrets at maximum capacity. Research respondents depicted in the table above indicated their position in the market. Companies included in this research are manufacturers, wholesalers, retailers, and service firms. In some cases, a firm may occupy more than one supply chain position. For example, many of the manufacturers are also retailers and wholesalers.

Most of the respondents are firms, also included in the research are very large companies generating billions in revenue and who have a strong hold on the market. They influence and sometimes determine its direction. By maintaining control and investing a lot into the reverse logistics industry, they are ensured greater profits and will receive first picks at the latest developments and most effective strategies.

^x Retzlaff-Roberts, D.L. and M.N. Frolick (1997), “Reducing cycle time in reverse logistics,” *Cycle time research*, 3(1), 69-78.

They have been exposed to the market the longest and continue to play a role in educating each other and controlling the field, thanks to the fact that early awareness of the art and science of logistics continues to increase, additionally, great interest in reverse logistics has been piqued. Many companies that previously did not devote much time or energy to the management and understanding of reverse logistics have begun to pay attention. These firms are benchmarking return operations with the best-in-class operators. Some firms are even becoming more involved with and actively transitioning into reverse logistics.

Reverse logistics has a lot of positive aspects to it that make it crucial to the industry as Kokkinaki concluded that reverse logistics is necessary for the following reasons:

- Positive environmental impact: legislative acts, also called “producer responsibility laws,” require manufacturers to develop a policy for the collection and reuse of products at the end of their life cycle.
- Competitiveness advancement: efficient handling of returns leads to reduced costs, increased profits and improved customer service.
- Regaining value: efficient reverse logistics can capture values from reusing products or parts or recycling materials^{xi}.

Basically what he means by this is that these factors are:

- Value can be extracted from used/returned goods by recycling, reusing, disassembling products. Often product returns have little to no damage.
- Improves customer satisfaction and loyalty.
- Reduces environmental impact by reusing and recycling return products

1.3 Challenges in Reverse Logistics

Retailer – Manufacturer Conflict

One of the difficulties in managing returns is the difference in the objectives of manufacturers and retailers. The distance between them on many issues can make the difference seem like a chasm. Whenever a retailer wants to return an item, the retailer and the manufacturer may disagree on any one of the following:

^{xi} Kokkinaki, A. I (2001), *Integrating a web-based system with business processes in closed loop supply chains*.

- Condition of the item
- Value of the item
- Timeliness of response

Often from the perspective of a trader each product was sent back in proper condition, and any damages in transit must be or must not be a manufacturing defect. The manufacturer may suspect abuse of vendor permission to return the item due to bad planning, or the return of the product damaged by sellers. As soon as the entry status is agreed, the value of the item must be determined; for this, you need to obtain a salesperson. A seller may claim all the credit, and the manufacturer may have a dozen reasons why they cannot receive all the credit. These problems can be difficult to sort out. After all is decided and the decision to grant the refund is taken, the refund may not satisfy the seller's expectations.

2 Characteristics of selected processes of reverse logistics

Products, components, materials, equipment and even complete technical systems may go backwards in the supply chain (for brevity we will use the term “products” to refer to all of them). For some time we have been familiar with products being reworked during manufacturing due to unsatisfactory quality, or with good materials or components being returned from the production floor because they were left over after production (manufacturing returns). Defective products may be detected after they have entered the supply chain resulting in a pullback of products through the chain (product recalls). From this stage there are more actors in the chain involved with the reverse flows on the basis of commercial agreements such as returning vs. taking back obsolete stocks of short-life products (B2B commercial returns). In addition, in the business-to-consumer scenery, products may be sent back due to mismatches in demand and supply in terms of timing or product quality (B2C commercial returns)^{xii}

A particular situation is e-commerce where high percentages of returned products are not a surprise. The average return rate has been estimated at some 36%.^{xiii} During use and in presence of warranty or service possibilities, products may also be returned to be substituted by others, or to be repaired (warranty and service returns). Ultimately, even after use or product life, products are collected to be e.g. remanufactured, recycled or incinerated (end-of-use and end-of-life returns). At this point both materials have a hazardous and environmental impact and these have to be taken into account (the latter especially in EU countries). Concluding, products may reverse direction in the supply chain for a variety of reasons.^{xiv}

- manufacturing returns
- commercial returns (B2B and B2C)
- product recalls
- warranty returns
- service returns
- end-of-use returns
- end-of-life returns

^{xii} Erasmus University of Rotterdam [online].c.2012 [cit. 2012-04-17].accessible on <http://repub.eur.nl/res/pub/561/fewec020020605160859.pdf>

^{xiii} Dekker R. and M.P. de Brito (2002), “A framework for Reverse Logistics” in R. Dekker, K. Inderfurth, L. van Wassenhove and M. Fleischmann (eds.), Quantitative approaches to reverse logistics (forthcoming).

^{xiv}] Dekker R. and E.A. van der Laan (2002), “Inventory control in Reverse Logistics” in V.D.R. Guide Jr. and L.N. van Wassenhove (eds.), *Closed-loop supply chains*, Pittsburgh (forthcoming).

These are just some of elements that make up the process of reverse logistics as they are the most common and can be solved or rather categorised by answering a few simple questions like what, why and how. The when is not really a factor as time is not really given any attention in the return of material unless you have perishables that you would like to utilize before they expire.

2.1 Management

Of course when dealing with system and processes that make the reverse logistics chain, we are going to need personnel that are going to take care and manage the processes according to the rules and regulations set on to govern the whole field. In the case of product returns and production we need an inventory manager, thus opening up a loop hole for the management of inventory.

2.1.1 Inventory Management

The returns of the products are often specific events that are left to the discussion of the inventory management menu. Guarantee of income, have similar characteristics as the correction. They differ mainly in a Contracting Party and therefore it cannot be expected that they have many publications on its inventory management. Below we deal with cases found in detail together with the mathematical models used. Production returns, such as specifying is often in contexts of production planning.

2.1.2 Commercial returns cases

Commercial returns occur in a wholesaler - retailer or in a retailer - customer setting, where the buyer has a right to return the product, usually within a certain period. The reason behind the return option differs between the cases. In the first setting, the retailer faces the problem of how much he might sell and giving him a buy-back option lowers this risk for him. The returns are likely to be in bulk at the end of the season. In the second case the reason for the return option is that the buyer might not be sure whether the product (or the amount of products) really meets his/her requirements. Sanders et al. (2000) describe how the inventories of products are controlled within Wehkamp, a Dutch mail order company, selling all kinds of consumer goods to the Dutch and Belgian market. Two types of products are distinguished: products which are asked for during a very short period of time only; which are controlled by using an amended version of the newsboy models taking into account returns, and products that can be sold during a long period of time; which are controlled via a return policy.^{xv}

xv Sanders H., A. van Harten and M.C. van der Heijden (2000), “*Logistiek en retourlogistiek bij Wehkamp*” in A.R. van Goor, S.D.P. Flapper and C. Clement (eds.), *Handboek Reverse Logistics*, Kluwer B.V., Deventer, The Netherlands (in Dutch).

2.1.3 Service return cases

In the framework of services systems, revenue may come from one of three ways. First of all, the products themselves may be brought or sent to the Centre for correction. If the repair is successful, they are brought back, otherwise a new system or product to be bought and completely preserved will be ignored. Secondly, if one needs a continuous operation of a product or system, one can directly replace the system or part of mercy. Failure of the system or its part is then corrected later, after which they enter inventory replacement systems or parts.

Finally, for such a replacement scheme to be successful, Service Engineers need to have spare parts to repair them. This requires sophisticated Logistics systems for the order and delivery of parts (often used in night services). In Advance however, it is not always clear which new parts are needed and as a result more parts than necessary are ordered. The remains of the part are then to be returned to the warehouse. It is the third stream of revenue. Cases found only cover the first two return journeys;

Díaz and Fu (1997) study a 2-echelon repairable item inventory model with limited repair capacity. For several classes of arrival processes, they develop an analytic expression for the number of items in the queue at the different stages of the system. They analyse the impact of the capacity limitations and compare the performance of their approach with an incapacitated METRIC type of model.^{xvi}

Both models are applied to the case of spare parts management at the Caracas subway system. Donker and Van der Ploeg describe how the optimal stock of repairable service parts of telephone exchanges is determined within Lucent Technologies Netherlands. They use an amended METRIC model, where the service measure is fill rate (i.e. the percentage of demand that can be immediately fulfilled from stock) and there is no budget restriction for service parts^{xvii}.

Van der Laan (1999) describes the remanufacturing chain of engines and automotive parts for Volkswagen. It is very similar to the engine remanufacturing case with Mercedes Benz in the previous section.^{xviii}

Cases that have the following characteristics: repair chain consists of several floors. It is important to determine how many parts of it should be on any place of storage. Another crucial question is how much correction capacity should there be to ensure the throughput times

^{xvi} Diaz A. and M.C. Fu (1997), *Models for multi-echelon repairable item inventory systems with limited repair capacity*, European Journal of Operational Research 97(3):480-492.

^{xvii} Donker S. and T. van der Ploeg (2001), “*Multi-echelon voorraadbeheersing voor repareerbare reserveonderdelen bij Lucent Technologies Nederland*” in A.R. van Goor, S.D.P. Flapper and C. Clement (eds.), *Handboek Reverse Logistics*, Kluwer B.V., Deventer, The Netherlands (in Dutch).

^{xviii} Van der Laan E.A. (1997), *The effects of remanufacturing on inventory control*, PhD thesis, Erasmus University Rotterdam, the Netherlands.

2.1.4 End- of-use returns cases

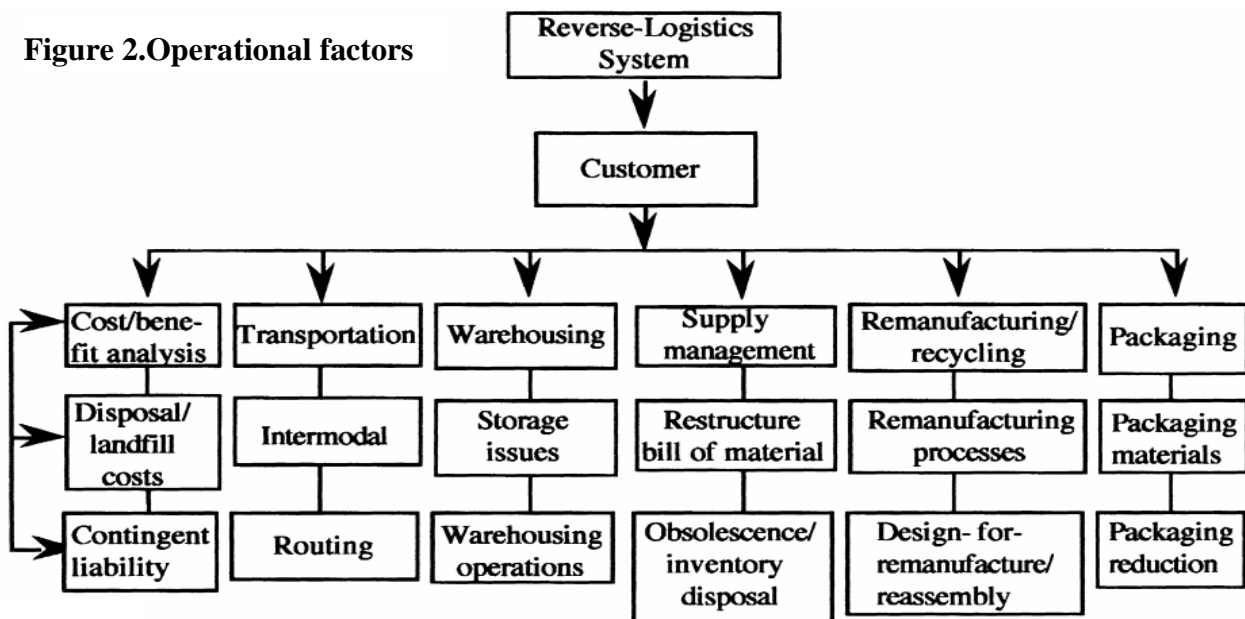
This return reason pertains to items that are only temporary to the needs of the user. The product can be leased, rented or rented temporarily, given the competence of the recipient. This is for distribution, that is, products such as bottles, railcars, containers, and crates, which are used for the purposes of distribution

Del Castillo and Cochran (1996) study production and distribution planning for products delivered in reusable containers. Their model includes transportation of empty containers back to the plants. Availability of empty containers is modelled as a resource constraint for the production of the original product. The model is applied to a case study of a soft drink company using returnable bottles^{xix}.

2.2 Operational Factors in Reverse-Logistics Systems

Figure 1 shows the operational factors of reverse-logistics systems: cost-benefit analysis, transportation, warehousing, supply management, remanufacturing and recycling, and packaging. Although the operational factors are not of equal importance in all organizations, firms should consider all seven operational factors, weighing them according to their importance. Customers, the external force, drive the reverse-logistics system depending on which they are, their needs, and their willingness to support reverse logistics. Firms must consider two issues: the specific features (quality, reliability, delivery) customers want or expect from remanufactured or recycled products, and customer education regarding the potential economic and noneconomic benefits of reverse logistics.

Figure 2.Operational factors



Source: [12]

^{xix} [1]. DelCastillo E. and J.K. Cochran (1996) *Optimal short horizon distribution operations in reusable container systems*, Journal of the Operational Research Society 47(1):48-60.

Through its costing system, the firm should establish the cost-and-benefits structure for its reverse-logistics system so that it can appraise the value of returned materials, the costs of remanufacturing processes, and the overall costs and benefits of remanufactured or recycled products. It should consider operational costs and landfill and contingent liability costs^{xx}

Reverse Logistics: why, what and how?

After having briefly introduced the topic of Reverse Logistics, we now go into more detail by analysing the topic from three main viewpoints: why, how and what. In previous literature, tiny excerpts of these viewpoints have been explored. In this paper we gather them together and in this way the fundamentals of Reverse Logistics are analysed on a basic level.

In layman's term, the complex processes in reverse logistics will be scrutinised and documented.

- Why are things returned: we go over the driving forces behind companies and institutions to become active in Reverse Logistics (at a high level and the reasons for reverse flows (return reasons))
- What is being returned: we describe product characteristics which makes recovery attractive or compulsory and give examples based on real cases;
- How Reverse Logistics works in practice: we list the actors and processes involved (how is value recovered from products)

2.2.1 Why (this is major drive behind reverse logistics)

Reverse logistics starts with the products in the supply chain or soliciting you to use or value the goods. In principle, the returning party, who possesses the product, and the receiving party who is trying to sell, distribute, or restore the value of the product. In this section, we will why illustrate reverse logistics will be geared to the first high level above the receiver perspective, i.e. the driving force for the companies and other organizations have become active in the adoption of the proceeds or recovery. Later, we will treat the returning party. We categorize the driving forces of under three headings, as an investigator.

- Economics (direct and indirect)
- Legal provisions and expanded responsibility

^{xx}Developing A Theory Of Reverse Logistics [online]. c.2012 [cit. 2012-05-05]. Accessible on <http://www.feg.unesp.br/~fmarins/IPOG/Material%20Complementar/Textos%20gerais/Teoria%20para%20LR%20-%20Shad%20Dowlatshahi.pdf>

Economics as a driving force covers all recovery actions where the company has direct or indirect economic benefits. Rather than to profit from operations of the recovery, due to the reduction of costs, to the use of the materials or the acquisition of valuable spare parts. Even with a clear or immediate expected profit, an organization may encounter economic challenges with reverse logistics, due to marketing, competition and strategy of drivers.

Companies can get involved with the use of a strategic step to prepare for future legislation. On the other hand, the company may edit some of the conditions in the long term, such as the impending legislation.

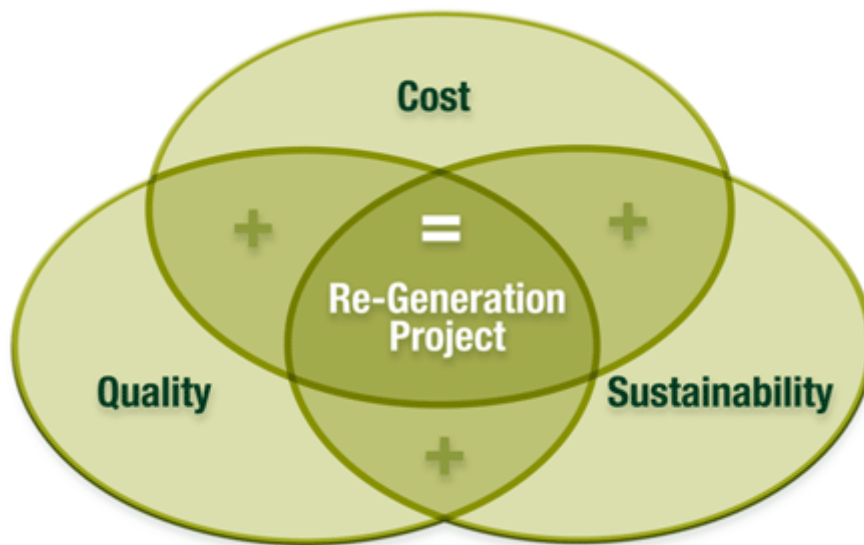
In response to the competition, the company may recover to prevent other companies from getting their technology, or prevent their entry into the market. A company may get a good recovery (environment), a picture with the client or get a better relationship with the customer. An example is the tyres manufactured by a company that also offers customers rethreading options, to reduce the cost to the customer. Green line of products may also be part of the strategy of the customer relationship, in particular in view of the increasing environmental awareness of society as a whole.

Legislations

Legislation refers here to any jurisdiction indicating that a company should recover its products or accept them back, e.g. packaging recycling quotas in Europe (see EUROPA, online) and home shopping right to return in some countries as UK (see Office for Fair Trading, online).

One should note that Reverse Logistics is often done for a mixture of reasons: what may seem ethical in the short run is hopefully economical in the long run. Figure 1 depicts the driving triangle for Reverse Logistics

Figure 3 Economic Factor



Source: [27]

2.2.2 Why (reasons why things are returned.)

In the previous section we focused on the driving force for reverse logistics from the perspective of the recipient. In this second part of Why reverse logistics, we reflect on a lower level of the returner/initiator perspective. Roughly speaking, the products are returned or scrapped; because they are not working properly or because they are just old or their functions are no longer needed. this will elaborate on these reasons and classify them into three main headings according to the phase of supply chain in which they occur. In this respect, a little more specification than most of the other authors will take place.

This is justified because all these currents to Logistical aspects Deals with returns. Return reasons are listed according to the usual hierarchy of the supply chain, from production, another wholesaler/retailers and end customers/consumers, which in principle is to use the products. Therefore returns the production, distribution and returns customers and users returns. One should keep in mind; however, manufacturers are also part of the supply chain. With the "production returns" we return during the manufacturing process, while income including the manufacturer as an actor chain is part of the distribution of returns. The exact delimitation between these phases, however, is not as straight forward as the final production may be in the distribution chain decision making technique.

Manufacturing returns

We define manufacturing returns as all those cases where components or products have to be recovered in the production phase. This occurs for a variety of reasons. Raw materials may be left over, intermediate or final products may fail quality checks and have to be reworked and products may

be left over during production. The first and the last represent the “product not-needed” category, the latter the “faulty” category. In sum, manufacturing returns include.^{xxi}

Figure 4 Raw materials assortment



Source: [28]

- raw material surplus
- quality-control returns
- production leftovers

Distribution Returns

Distribution returns refer to all those returns that are initiated by a supply chain actor during distribution after the product has been made (including the manufacturer). It refers to product recalls, commercial returns, stock adjustments and functional returns. Product recalls are products recollected because of safety or health problems with the products, and the manufacturer or a supplier usually initiates them. Commercial returns are all those returns where a buyer has a contractual option to return products to the seller.

^{xxi} Erasmus University Of Rotterdam [online]. c.2012 [cit. 2012-05-14]. Accessible on <http://repub.eur.nl/res/pub/561/feweco20020605160859.pdf>

This can refer to wrong/damaged deliveries or to unsold products that retailers or distributors return to e.g. the wholesaler or manufacturer. The latter include outdated products, i.e. those products whose shelf life has been too long (e.g. pharmaceuticals and food) and may no longer be sold. Stock adjustments go on when an actor in the chain re-distributes stocks, for instance among warehouses or shops.

Finally, functional returns concern all the products that their inherent function makes them go back and forward in the chain. An obvious example is the one of distribution carriers as pallets: their function is to carry other products and they can serve this purpose several times. Summarizing, distribution returns comprehend^{xxii}

- product recalls;
- commercial returns (e.g. unsold products, wrong/damaged deliveries)
- stock adjustments
- functional returns;

Material input (Old chair)

Table no 2. Recalled stock decider

	Repair	Destroy	Store
Costs (high/,moderate/low)	Moderate(2)	Low(1)	Moderate(2)
Convenience(1-3)	(2)	(2)	(1)
Necessity	(1)	(1)	(2)
Total	(5)	(4)	(5)
Decision making		Best option	

Source: Author

^{xxii}Erasmus University Of Rotterdam [online]. c.2012 [cit. 2012-05-14]. Accessible on http://repub.eur.nl/res/pub/561/fe_weco20020605160859.pdf

Functional returns

The third group consists of customer returns, those returns initiated by a customer or user and/or as a result of consumption/use, in the large extent). Again there is a variety of reasons to return the products.

- Reimbursement guarantees;

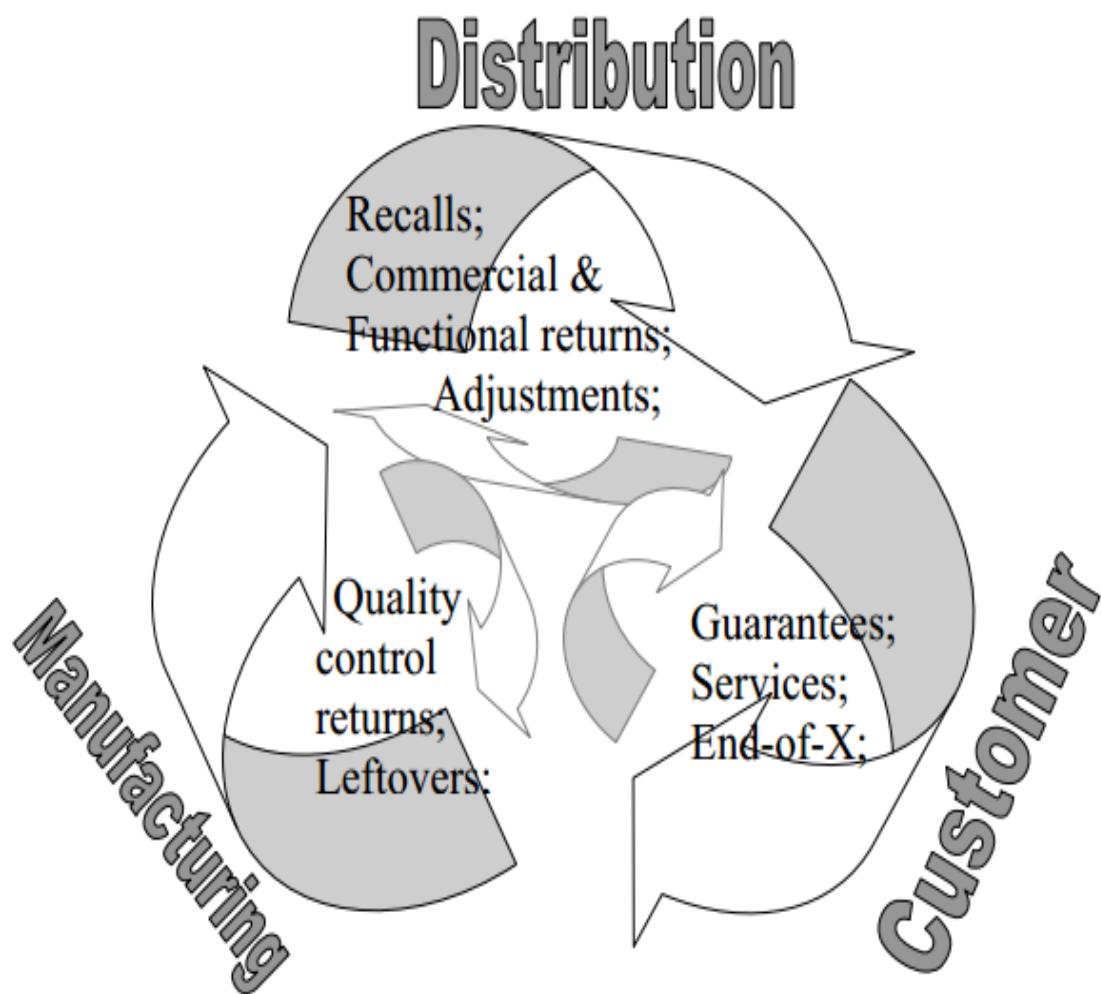
2 We introduce the term “functional returns” while many authors refer simply to “distribution items” or “distribution carriers” as a type of return. In the why-what context of the framework, “functional returns” befalls in the why while “distribution items” is then a category of the what

- warranty returns
- service returns (repairs and spare-parts)
- end-of-use
- end-of-life

The reasons have been listed more or less according to the lifecycle of a product. Reimbursement guarantees give customers the opportunity to change their minds about purchasing (commonly shortly after having received/acquired the product) when their needs or expectations are not met.

The list of motives is long, e.g. with respect to clothes; dissatisfaction may be due to size, colour, fabric’s properties and so forth. Independent of the motive, when a customer returns a new product benefiting from a money-back-guarantee or an equivalent, we are in the presence of reimbursement guarantees returns. The next two reasons refer to an incorrect, functioning of the product (in a broad sense) during use. We like to remark that the word “use” should be interpreted broadly, e.g. an untouched spare part has served a function (potential back-up) while being there.

Figure 5. Supply chain loop



Source: [2].

End-of-use returns refer to those situations where the user has a return opportunity at a certain life stage of the product. This refers to leasing cases and returnable containers like bottles, or returns to second-hand markets as the one of Bibliofind, a division of amazon.com for used books. Although end-of-use products are not really new, they are often in a good or reasonable state.

2.2.3 What: Types and characteristics of returned products

The theory of what is discarded or returned is basically a second opinion on the reverse logistics. In this respect, it is not the product itself that is important, but its properties. It seems that the three features of the relevant, i.e. the composition of the product, and the product use pattern and degradation because it affects the recovery. Below is the talk in detail. Composition of the product will be in four aspects, namely.

- Ease of disassembly (whether it's easy to delete a certain part or not, such as the removal of chips from old computers that can be reused).
- The homogeneity of the constituting elements (product from one or multiple components consisting of: this plays a role in recycling, where one wants to obtain a homogeneous component, which is used as a raw material for new materials. Plastics are notoriously difficult to separate, which limits their recycling)
- The presence of dangerous materials (batteries with toxic materials in the monitor or the PC needs to be deleted before they can be recycled)
- Facilitation of transport: whether the product needs specific transportation or not. Collection of old and the distribution of new items can sometimes be combined (e.g., fulfilment of the cylinder) which reduces transportation costs, but also gives you problems in the case of dirt from the collection of items (e.g. refrigerators). Empty bottles are expensive to transport, so then local solutions are preferred. These aspects are usually related to the economics of the reverse logistics activities. Determination of whether it will be profitable to dismantle and destroy the part or the recovery and recycling of the product structure is followed by the material.

All of these characteristics are the product of internal processing and are determined during the product design. This is also why it is so important for the recovery of the product taken into account in the design of the product (design for disassembly)

Product use pattern affects the collection of items and is associated with the above; the deterioration of the national product can be divided into two aspects

- The place of use: the use of more jobs is more plausible for the collection. Many of the packages of food and drink may expire at the place of use and expensive collections must do. Another example is the diaper collection from Knowaste in the Netherlands: the findings of mail users and individual households as a collection, of which otherwise would have been too expensive. So the location determines the cost of collection.
- The intensity and duration of use: this is the difference, if it is constant for a long time or short/occasionally, it occurs with the lease. Distribution of items such as containers, bottles, crates and pallets, and are only used for a short period of time, during which the recipient must not be altered. Therefore, they can often be re-used, but first they need to be collected before further use.

Finally, deterioration of the characteristics, which determine whether there is enough of the product left to function, and further use of the product, either as a whole or as a part thereof. It strongly affects the recovery options. These aspects play a role.

- Intensity of the deterioration: how fast is it aging during use of the product? If a product that is totally consumed during use, such as gasoline, or if it is ageing rapidly, such as batteries, there are limited options of reuse and recycling may be the only option.
- FIX: Can the product be easily returned to its original state? Is it easy to mistake the diagnosis? Rotating items, such as a rechargeable battery can be easily reset to their original state. This aspect of rotating cycle is pretty much guaranteed, therefore the guidelines can be stated and passed on to operational managers and should be accomplished as they are given. Method of restoration does tend to be manually intensive, tends to be more expensive and often one has to resort to recycling.
- Homogeneity of deterioration: in have all parts deteriorated the same or not? The priority is for the former case, but it is not always possible. In the latter, the product may be a candidate for remanufacturing or part of recovery.
- Economic decline (due to new products on the market): products may be out of date, because their function is becoming obsolete, such as a computer. It offers the potential for reuse in the secondary market or part of recovery. On the basis of these characteristics we then decide where the product lies, while we also evaluate the importance of the medium, either from the production or recovery. For products there are several categories from the UNITED NATIONS for trade, etc.

Figure 6. Economic Decline



Source: [29]

Unfortunately, these are not always useful for reverse logistics. That is why we will distinguish the following product types

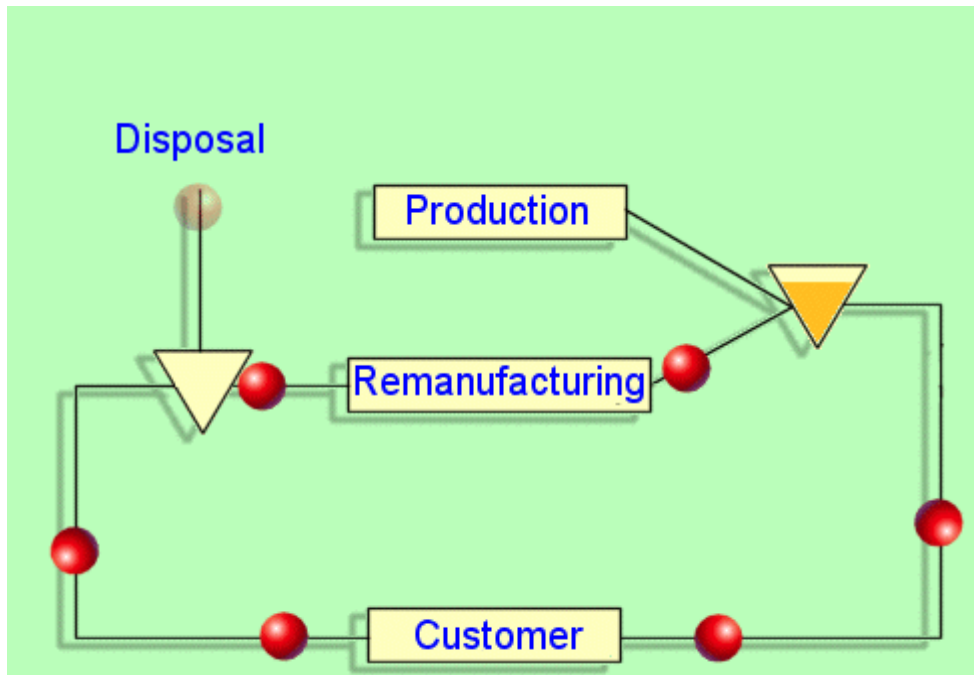
All these products have different characteristics and for all these recovery take place, although each time differently and with different terminology and processes. Below we will motivate each category shortly.

- Food which is left over in the food chain is often reprocessed and used as animal feed (a kind of recycling). As there have been many scandals concerning contaminated ingredients, quality issues and tracking and tracing through the chain have become very important.
- Civil objects, like buildings, bridges, dikes and roads are often renovated during their long useful life, which can be seen as a kind of remanufacturing or refurbishing. When they are really obsolete, they are demolished and their waste is crushed, separated and recycled. There has been some occasions of re-using of bridges, but civil objects are usually non transportable.
- Mineral oils, oil products and chemicals (all fluids). They are either consumed during use (e.g. gasoline) or are processed in a complex way. This makes their remanufacturing difficult, but it is done if a large volume can be collected (e.g. gasoline vapours recovery) or if recovery is mandatory or environmentally important.
- Industrial goods tend to be more expensive than consumer goods. Moreover, firms often take a more rational view than individual customers. Remanufacturing is therefore much more popular, especially in leasing cases such as aircraft engines, photocopiers and tires.
- Transport equipment, a specific subcategory of industrial goods, has a long tradition of remanufacturing, parts recovery and recycling. For cars, there are extensive recycling schemes in Europe and extensive remanufacturing takes place in the US. The standardization and multitude make recovery attractive. Quite often they are complex assemblies with a reasonable life time, with a lot of metal; hence they have a high material value.
- Pharmaceuticals are characterized by small amounts and stringent regulations. Most returns occur when they pass their shelf time.
- Consumer goods today are produced in millions with increasingly shorter product life cycles. This has raised many environmental concerns with the result that within Europe there has been much attention to recycling. Remanufacturing occurs occasionally, as consumers have a preference for new products. Although repairs have a long tradition, the increasing labour wages make them unattractive and often disposal takes place for failed products.

Military equipment is a special case of industrial goods, where the processing has to occur in a controlled way. Specific cases are the destruction of nuclear weapons and other dangerous weaponry. During their life there is a lot of remanufacturing and parts recovery. Recycling is applied only in a limited way.

Finally, the intermediate streams worth mentioning are metal scrap, paper pulp, wood pallets, etc. They are the result of recycling.

Figure 7. PLC (Product life cycle)



Source: [30]

Some products go through this whole process to be re-entered into the cycle again

2.2.4 How: Reverse logistics actors and processes

The third and last part is to see how reverse logistics works in practice: the actors and processes (how the value is recovered from the products). Actors can be distinguished by the returners, receivers and collectors/processors. Each party may be a returner, including customers. The receiver can be found in the entire supply chain, suppliers, manufacturers, wholesalers, retailers. Next, there is a group of entities involved in the reverse logistics activities, such as collection and processing. They are independent providers, specific recovery companies (e.g. brokers), reverse logistics services providers, municipalities care for the collection of waste, the foundations of the public private created to take care of the recovery.

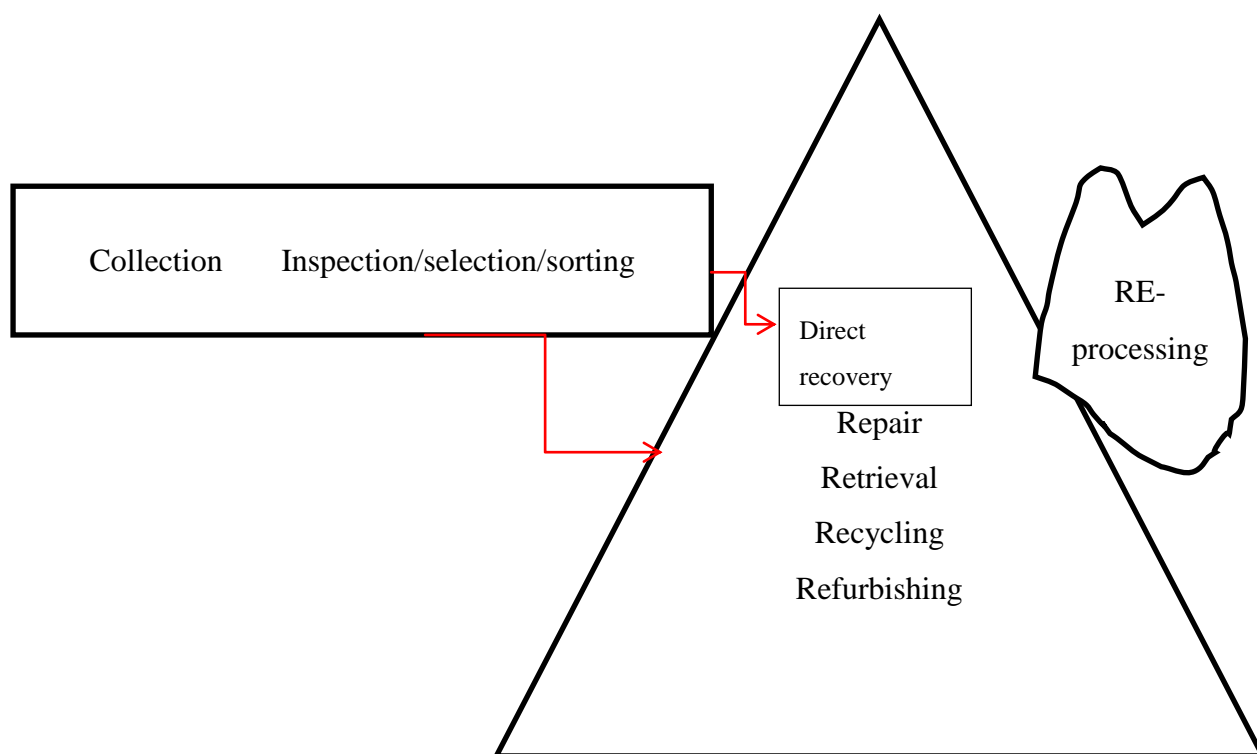
Each actor has different objectives, such as: the manufacturer can recycle to prevent brokers selling its products at a lower price. The various parties may compete with each other. In general, we can see the

different structures for the different uses of options: the company does sell new products typically recurrence, if this is not for re-use on the secondary market. You can use the OEM Remanufacturing (photocopiers) or independent companies (e.g. motor renovation) and recycling is often enough in the public and private sector partnership with the foundation leads the organization. Public bodies are usually related to the first phase of the collection, in combination with the collection of waste. It will be clear that for private companies, economic and legal are the main drivers, while for public bodies it is mainly professional ethics and legal.

You can distinguish several types of recovery; we divided between recovery of the product, part of the recovery, the use of material and energy recovery. In the recovery of the product, it can be re-used in the original market (as containers) or on the secondary market. In the case of remuneration components, products are dismantled and their modules or their parts may be used either in the production of the same product (remanufacturing) or different products.

Another possibility is that a product, that is just a big installation, building or other object, civil, gets reconstructed, after which, again, it is in better condition. In the case of recycling, products are cut and their materials are sorted and processed in order to obtain the required quality, after which the materials, paper and glass. Finally, the recovery in the energy products and energy released by burning is captured, reused, remanufactured, recycled, or disposed of (incineration or land filling).

Figure 8 Reverse Logistics Processes.



Source [7]: Author

There are four main reverse logistics processes. The first collection, the other is a combined inspection/selection/screening process, for the third there is used, or directly for the recovery, and finally there is the redistribution (see Figure 8). Collection refers to the placing of the products from the customer to the point of renewal. At this point the product is controlled, i.e. the assessment of their quality, and it is decided on the kind of recovery. Direct recovery entails the following: to re-use, re-sell and re-distribution. Reprocessing includes the following options: repair, refurbishing, remanufacturing, retrieval, recycling and incineration.

Finally, redistribution is the process of giving the recovered goods to new users

In the inspection / selection and sorting phase products are being sorted according to the planned recovery option and within each option, products are sorted according to their quality state and recovery route. As a last phase in the recovery, products undergo some kind of processing. This can consist of dismantling and/or grinding, again sorting, testing and possibly (re)manufacturing. In dismantling, the product is split up into parts or components, which may undergo a separate recovery. In grinding, the product structure is destroyed and its materials may be recycled after sorting. These actions may be combined, e.g. one may first remove batteries from a monitor and then grind it.

The condition of returned products may be derived from the return reason. They determine very much whether the product can be re-used or remanufactured. If that is not the case then only recycling or disposal are left over as recovery options. For example, supply chain returns normally refer to products in good condition (unless damaged in transport and or if they are recalls). They can often be re-used, but not always be sold as new. Yet they may be sold at a discount or at a secondary market. Warranty returns may often be repaired, but sometimes the needed effort for testing and repair does not pay (economically) off. End-of-use returns are often deteriorated, but they may contain valuable components that can be re-used. This is e.g. the case with photocopiers

2.3 Integration of reverse logistics into the supply chain market

2.3.1 Creating an effective and efficient supply loop/sustainable development

Integration of the reverse logistics activities into the regular supply chain will result in a new logistics system, which we can call the supply loop. Such an approach will fit the concept of sustainable development. In short, with this concept, firms seek strategies for economic development under environmental and social constraints. Their aim is to meet the present needs without compromising the needs of future generations. The reintroductions of the renewed products into the market, in their

original form or the following evaluation activities reflect this approach by reducing the consumption of non-renewable resources. So that it creates less waste, which will reduce the negative impact these materials had on natural resources.

Until recently, the concept of sustainable development was used mainly in the design phase to reduce the environmental impact of a product in its production and distribution process as well as in its use. However, the responsibilities of organizations with regards to their products are constantly expanding. Organizations must satisfy customer needs not only by the quality of their products, but also by supporting them with various after-sales services, such as maintenance, some may refer to it as “dematerialization” of products and activities within an organization. Some organizations see themselves forced to recover unused products from their customers. They must then not only deal with environmental concerns in terms of the production, distribution and utilisation stages for their products, but also in terms of their return and processing. Two concepts of sustainable development can then be noted:

Sustainable development – product perspective: Concept applied at the design stage of the product.

Sustainable development – organizational perspective: Concept applied to ensure effective and efficient activities related to the recovery and processing of recovered products.

Sustainable development – product perspective

In the design stage of products, Czech organizations will seek to reduce negative environmental impacts of their products by meeting some of the following challenges:

- Reduce the consumption of non-renewable resources.
- Favour recyclable materials.
- Opt for standardized materials.
- Integrate valorised components.
- Reduce manual adjustments in order to decrease risk of error.
- Reduce the variety of components.
- Adopt a modular design.

In addition, to ensure the cost-effective after-sales service, including maintenance and activities related to the recovery and processing of recovered products, the Organization will have to pay greater attention to the reliability of its products, both new and valorised. Therefore, must be able to estimate the reliability of their products at any time in their life cycle. If you want to keep this reliability at the required level, the Organization will also have an interest in designing products which can be easily fixed, and therefore recyclable products. The costs incurred by the maintenance activities may be

reduced by the use of valorised materials, always in good quality and at lower costs. This approach will allow more of what should be optimizing the process of degradation of the renewed products, so as to restore the maximum value, and reduce processing costs.

It is also known as the “disassemble ability” of a product.

By approaching these various aspects at the design stage, the aim is to simplify and add value to activities related to production, after-sales service, and recovery and processing, in an economic and environmental perspective, all the while meeting the quality standards of the organization.

2.3.2 Sustainable development – organizational perspective

The organizational perspective of sustainable development in the Czech Republic aims at supporting the memory of an organization to ensure a certain level of planning for the recovery and processing of recovered products. This is done to reduce the impact of uncertainties generally met with reverse logistics. By insuring an adequate integration of reverse logistics activities with primary activities, organizations will be motivated to structure and organize them. This will lead organizations to the following challenges^{xxiii}

Analyse possible markets for recovered products:

- Return policies to control the reverse flows of material.
- Closed and/or open loop.
- Processing alternatives for the recovered products.

Examine the requirements for the reverse logistics network by outsourcing or not additional activities.

- Define the performance criteria of the network.
- Determine the degree of integration of reverse logistics with the regular supply chain:
- Dedicated or integrated reverse logistics network.
- Centralized or decentralized network.
- Number of levels of the network.
- Dedicated resources or common resources with the regular supply chain.
- Define operational processes.
- Define required information.
- Establish and continuously improve the supply loop.

^{xxiii} Developing A Theory Of Reverse Logistics[online] c2012 [cit. 2012-05-28] accesssable on <<http://www.feg.unesp.br/~fmarins/IPOG/Material%20Complementar/Textos%20gerais/Teoria%20para%20LR%20-%20Shad%20Dowlatshahi.pdf>>

In their approach, organizations could be confronted with various key goals:

- Increase possibilities for reuse of recovered materials by establishing new business relationships.
- Standardize procedures, more particularly those connected to reverse logistics.
- Provide adequate support for employees' tasks.
- Ensure collection, exchange and processing of the generated data by each actor in the supply loop.
- Manage activities by considering the coordination of recovered, valorised and new products.
- Follow and control products in all operational processes that they require through their life cycle.
- Maintain a certain level of quality to products through their life cycle.
- Establish return strategies to improve the possibilities and policies for recovery of products.
- Plan, to a certain extent, activities related to the processing of recovered products.^{xxiv}

All these factors relate to the uncertainties regarding the return of products. In order to better support the conditional nature of the procedures associated with reverse logistics activities, i.e. to more adequately consider the various factors that influence the course of the operational processes, it is necessary to establish decision-making criteria. These criteria can be grouped under two categories; circumstances associated to the product and those associated to the organization. The circumstances associated to the product refer more specifically to the:

- Technical specifications of the returned product.
- Reason for the return.
- Condition of the returned product.
- Failure law of the product.
- Disassembly sequence.
- Impacts of the reintegration of the recovered materials in the market.
- The circumstances of concern for the organization refer to the following points:
- Characteristics of the installations (equipment, labour, etc.).
- Possible markets for the recovered materials in the supply loop.
- Legislative constraints.
- Clean disposal of the recovered materials.
- Rate of return.
- Demand for valorised materials.
- Policies for the return and processing of recovered products.
- Stock level.

^{xxiv} Developing A Theory Of Reverse Logistics[online] c2012 [cit. 2012-05-28] accessable on <http://www.feg.unesp.br/~fmarins/IPOG/Material%20Complementar/Textos%20gerais/Teoria%20para%20LR%20-%20Shad%20Dowlathahi.pdf>

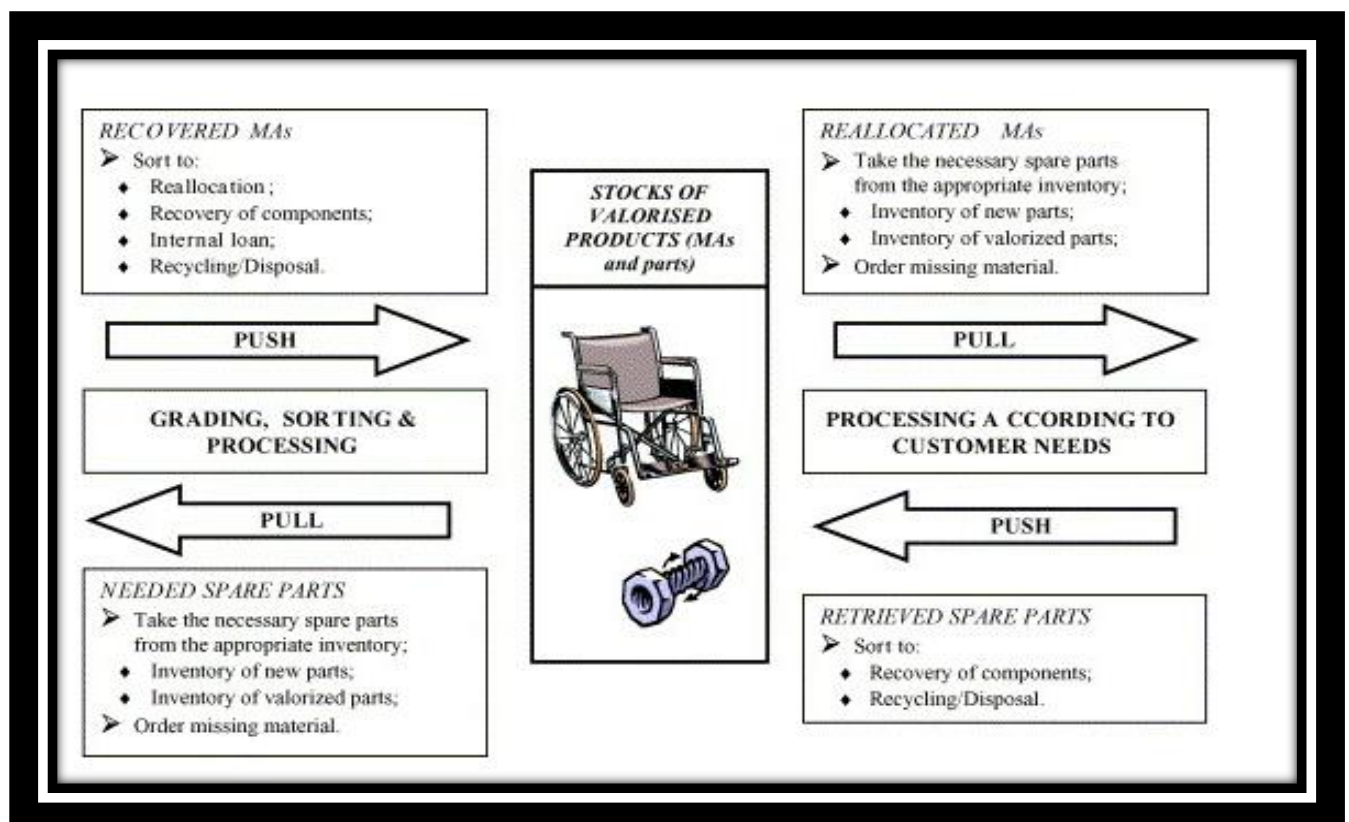
These criteria will have a significant influence on the efficiency and effectiveness of the network configuration. By taking these criteria into account in order to structure, organize and plan reverse logistics activities, the aim is to correctly match supply (returns) with the demand for valorised materials. This will allow a better control of costs in addition to the economic and environmental gain generated by the reintroduction of recovered materials in the market.

“Push – pull”

This approach is for the recovery and processing of recovered products

- To better match supply and demand for valorised products, it is more appropriate to manage activities with a “push–pull” approach. This is a hybrid concept which is based on long-term planning for certain stages of the operational processes (push) but which also allows the launching of other activities in reply to an order (pull). A decoupling point coordinates the two portions of the system. This comes from the desire to benefit as much as possible from the advantages of these two modes of management:
 - Push: prevents demand variability in the system.
 - Pull: decreases inventory levels.

Figure 9. System push and pull



Source: Management of the recovery and the processing of the QRI activities by a push–pull approach

Pull portion

In the QRI context, it is sometimes necessary for recovered materials to be processed twice, in particular for those dedicated for reallocation. Wheelchairs are highly personalized equipment, i.e. specifically adjusted for the customer. Minimal adjustments must therefore be made to the materials before putting it in inventory, in order to avoid unnecessary work. Moreover, the quantity and the composition of inventories must be adequately maintained and controlled in order to meet the various needs of customers, without keeping too great a range of relatively bulk materials. The suggested approach (Fig. 9) for the coordination of all activities of the QRI is detailed in the present section^{xxv}

Push portion

First, in order to decrease the workload for the valorisation shop and as the decision for the processing of some material models is known immediately, it is suggested that a list of predetermined alternatives be elaborated and regularly revised. Certain obsolete generations of materials would then be directed towards recycling or wheelchair models of a supplier in bankruptcy, for example, could be systematically disassembled for parts to repair those in circulation. In this way, the mechanic will not be required to grade and sort all recovered materials. The employee in charge of the recovery of the wheelchair will know, by means of this list of guidelines for the processing of a particular model, where to direct it and the appropriate warehousing space.

In short

This approach is well adapted to the context of reverse logistics where the variability of activities is considerable and for which it can be desirable to profit from economies of scale. The activities of an organization must be adequately defined so as to carry out the processing of recovered products with effectiveness and efficiency, all the while taking demand into account and the capacities and constraints of the facilities. With this goal, two approaches can be considered.

^{xxv} QRI= Quebec Rehabilitation Institute

3 Analysis of the situation in the Czech Republic

The analysis is a bit tricky to undertake due to the fact that most data that is published is a bit old and not specific enough to be acknowledged in practice.

3.1 Legislative

In the Czech Republic, EKO-KOM, Inc., plays a major role when it comes to decision making that may affect the environment and has been doing so efficiently over the years.

EKO-KOM, Inc. is an authorized packaging company that provides syndicated performance take-back and recovery of packaging waste, resulting from the Packaging Act No. 477/2001 Coll, as amended. Duties of return and recovery of packaging waste have by law, persons who place packaging or packaged products on the market or into circulation, i.e. perform, import or sell to the ČR. These persons could meet these obligations in conclude Agreement on Comprehensive Fulfilment with the EKO-KOM, Inc.^{xxvi}

Figure 10. EKO-KOM, Inc., System Operations



Source [31]

^{xxvi} EKO-KOM.Inc[online] c. 2012[cit. 2012-05-31] accessible at <http://www.ekokom.cz>

What they strive to achieve is illustrated in the figure below:

Figure 11. Evolution

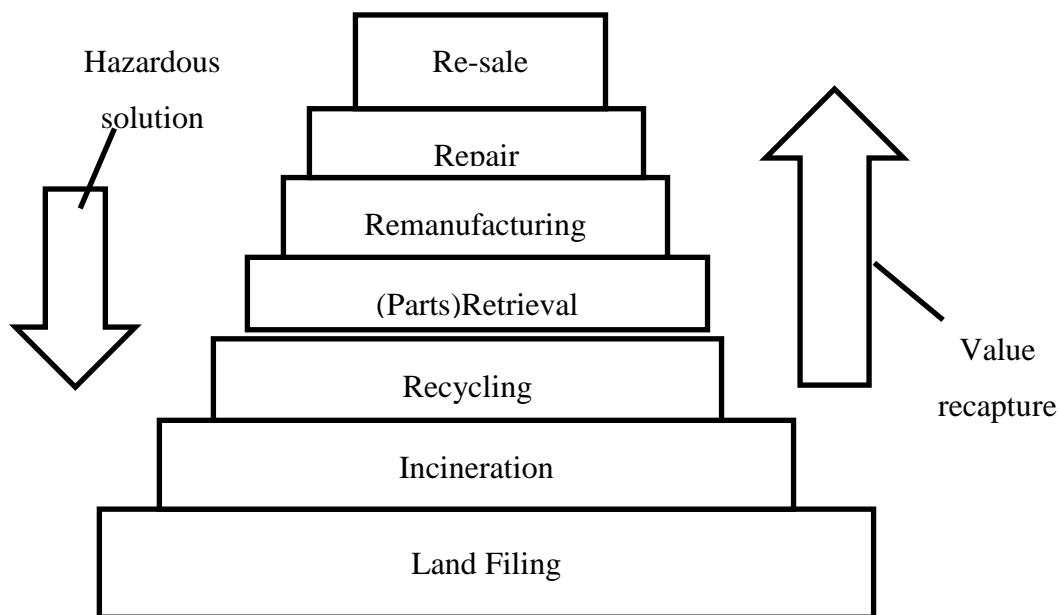


Source: [32]

3.2 Reverse logistics in the Czech Republic

Recoveries are a natural part of the trade, and it is impossible to completely avoid them. On the contrary, we can see several reasons for strengthening the impact of reverse logistics in the business environment at the time, which increases the attention on recoveries. Withdrawal from efforts to give the full factors, we can see the following facts with the activation of this process.

Figure 12. Recovery point pyramid



Source [22]; Edited by Author

Beside the legislative requirements, the motivation of practitioners in the Czech Republic dealing with the reverse flows was due to the lack of resources. The motive reappeared more distinctively in connection with constantly increasing stress on efficiency and effectiveness in the 80ies of the 20th century. Nevertheless, it was already a decade earlier when the experts called attention to forthcoming scarcity of raw materials (not only) on account of wasteful approach to the living environment.

NET4GAS has completed its three years lasting gas reverse flow project which is a fundamental contribution not only to the energy security of the Czech Republic but also to that of the Central European countries. “In case natural gas supplies coming from the usual, eastern direction are held, the Reverse Flow project will allow changing the direction speedily to send gas from west to east, thus providing sufficient capacity for countries like Slovakia or Austria^{xxvii}

In Europe, specifically in the European Community (European Union finally) aid has been granted to the environmental aspects of the management of reverse flows in the form of legislative requirements (undo obligation¹ for certain categories of products). The 90ies reawakened interest in the reduction or the possibility to retrieve the value of the reverse flows connected to sustainable growth as one of the fundamental pillars of the current reverse logistics. Thus the reverse logistics can be considered part of the sustainable development.

^{xxvii} [DOC] press release - NET4GAS www.net4gas.cz

Jayaraman and Luo (2007)^{xxviii} add that the popularity of reverse logistics is linked with the concept of corporate citizenship supporting the companies to behave as “good” citizens in the society as a whole in the Czech Republic. Such behaviour should be positively reflected by publics who should appraise measure like protecting the environment, or philanthropy. (Providing un-soled or returned products to charity, which is a common reverse logistics task or “reprocessing” option, is classified as philanthropy).

It is worth to mention a note by Boks and Komoto (2007) made at the beginning of the nineties. That time there were very optimistic expectations about opportunities and competitive advantage, which can be achieved by pro-active measures like eco-design. Actually, the whole thing turned out to develop in a different way. Speaking generally, companies didn’t focus on prevention, on activities that should have limited environmental harmfulness of products and production process by applying new concepts in products design and production itself. The companies concentrated on fulfilling the legislative requirements, namely on reprocessing of reverse flows and take-back obligation set by the governments. Because of that we can see the popularity of reverse logistics as the defensive measure applied by companies to grab the low-hanging fruit.^{xxix}

Another group of incentives for reverse logistics programs is connected to customers; more precisely, to change their buying behaviour and expectations. As the customer its more demanding, many companies have introduced a so-called “repayment of a security”. This is the right to return goods within a certain period of time for the retailer and get the money back. Typically, customers need not give reasons for the return. Liberal return policy should promote the satisfaction and loyalty of customers and increase competitive advantage. Let's add to the Internet and catalogue retailers, it is legislatively imposed practice. We must point out that this positive approach (in the perspective of customers) increases the reverse flows and operational costs for the retail trade.

This can be quite crucial in remote retail (i.e. Internet and catalogue retailers), because the proceeds are greater than 20% (in some product categories), as opposed to about 6% in bricks and mortar stores. This means that the development of e-commerce is another impetus for optimizing reverse logistics, because remote retail face extensive cost (associated with reverse flows), which may eventually be lower.

^{xxviii} Reverse Logistics In The Czech Republic outcomes Of The Preliminary Research [online] c2012 [cit. 2012-05-27] accessible on <http://www.icabr.com/fullpapers/Skapa%20Radoslav,%20Alena%20Klapalova.pdf>

^{xxix} Boks, C. B., Komoto, H. (2007). *An overview of academic developments in green value chain management*. In S Takata & Y Umeda (Eds.), *Advances in life cycle engineering for sustainable manufacturing businesses - Proceedings of the 14th CIRP International Conference on Life Cycle Engineering* (pp. 433-437) Tokyo: Springer.

The survey mapping the situation in the year 2004 showed a very limited interest in reverse logistics (Škapa, 2004). In the majority of Czech companies the reverse flows stood for supplementary cost and therefore their goal was to minimize the reverse flows. Companies didn't see value, which could be retrieved to improve corporate productivity and effectiveness. Speaking about the future expectations, it was the retail companies that awaited the increase of reverse logistics impact in the near future. Based on this we can assume that retail put more stress on effective reverse logistics nowadays than industry does. The need for effective reverse flow management (including value retrieval) is more present in retail companies.

3.3 Economic perspective of reverse flows

In respects of reverse logistics we pointed out the task to recapture the remaining value hidden in reverse flows. But before the companies started to optimize reverse flows in terms of value recapturing, they focused on cost reduction and the cost-cutting was the priority. The value retrieval task was overseen. As a result of this, logistic systems for processing the reverse flows were neglected. The underinvested reverse logistic systems were inflexible and slow, which led to a vicious cycle: Due to slow reprocessing of reverse flows their remaining value diminished on the way and the chance of retrieving the value was less and less (Jayaraman, Luo 2007).

It's a surprisingly easy answer to the question how expensive reverse flow are and how much money they are able to generate. The economic consequences of a reverse flow can be measured on a national as well as at the level of firms. National data on recycling activities and As regards investment in new gas infrastructure, there was no major capital investment project in 2009. Preparations for the construction of two planned gas pipelines in the Czech Republic continued. One of these pipelines is to be a continuation of the newly built northern route for natural gas transport from Russia to Europe through Nord Stream and the connected Opal pipeline in Germany. In the Czech Republic, this route is to continue by the Gazelle pipeline connecting the border points at Hora sv. Kateřiny and Waidhaus. The volume of gas to be transported through this pipeline is expected to amount to 30 - 33 bcm/year.

However, the Opal pipeline is not primarily intended for the needs of customers in the Czech Republic. The other project being considered is a pipeline connecting the Czech and Polish transmission systems near Český Těšín. The new pipeline is to mainly serve for supplying Polish customers, but in extreme situations it will also support a reverse flow of gas into the Czech Republic. For this project, RWE Transgas Net, s.r.o. has received EUR 3.5 million under the European Energy Programme for Recovery (EEPR)

Major investments in Czech underground gas storage facilities are also being planned. RWE Gas Storage, s.r.o. intends to extend the storage capacity in its underground gas storage facilities by up to 675 mcm in the coming years; the projects for the expansion of storage capacities in the Třanovice and Tvrdonice gas storage facilities are among the 43 selected electricity and gas projects that will receive a subsidy under the EEPR. The European Commission launched this programme in March 2009 to mitigate the impacts of the financial crisis and reinforce the European energy infrastructure. A subsidy of EUR 35 million (approximately CZK 910 million) will be used by RWE Gas Storage, s.r.o. for financing the expansion of its underground gas storage facilities; as a result, by 2012 a new storage capacity of 450 mcm is to be developed under this project. The other storage system operator in the Czech Republic, MND Gas Storage, a.s., is also planning to expand its storage capacity by up to 500 mcm.

The last project for which RWE Transgas Net, s.r.o. has obtained a subsidy under the EEPR is the reverse flow of gas from the west to the east; this flow was used, on a makeshift basis, to tackle the January 2009 gas crisis. EUR 3.675 million will be drawn on the funds available to the programme to provide for a permanent reversibility of the gas transmission system.^{xxx}

Despite the fact that recoveries are often seen as a necessary evil, it's wise to take advantage of their side effects. When we talk about the positive effects of the reverse logistics, we can distinguish between direct and indirect. Direct effects of revenue from sales of recycled materials, the money saved on the spare parts replaced by remanufactured modules, for example. Such direct effects on the company level are fairly easily identifiable^{xxxii}.

The indirect effects are related to the company's image mainly and therefore they can be measured by marketing tools. We mentioned non-financial effect of reverse logistics above (environmental and social effects like philanthropy can improve the corporate image, for instance). If a customer's loyalty would be higher in companies treating reverse flows carefully (like attempting to repair or recycle reverse flows, bringing the old products to charity etc.), this could be classified as secondary effects of reverse logistics. Thorough literature review on shopping behaviour in B2C and B2B^{xxxiii} done by Karpissová (2008)^{xxxiii} suggest that there is enough empirical evidence supporting the existence of

^{xxx} The Czech Republic's National Report on the Electricity and Gas Industries for 2009 [online]c.2012[cit 2012-06-05]accessible on http://www.energy-regulators.eu/portal/page/portal/NATIONAL_REPORTS

^{xxxii} ^{xxxii} Reverse Logistics in the Czech Republic: Outcomes of the Preliminary Research[online]c. 2012[cit. 2012-05-02] accessible on <http://www.icabr.com/fullpapers/Skapa%20Radoslav,%20Alena%20Klapalova.pdf>

^{xxxiii} B2B,B2C=Business to business, business to customer

^{xxxiii}ING. EVA Karpissová[online]]c 2012 [cit. .2012-04-26accessible on <http://www.icabr.com/fullpapers/Skapa%20Radoslav,%20Alena%20Klapalova.pdf>

positive effects of reverse flow programs on customers purchasing decision and loyalty generally. The quantification of such a factors is however speculative.

3.4 Barriers (Challenges) to development

Compared to the cited foreign surveys, the Czech results represent no major surprise. The low RL priority is the main barrier in the researched Czech companies. Even studies from USA (Rogers, Tibben–Lembke, 1999) come up with the same conclusion. The second barrier is the lack of systematic management.^{xxxiv}

On the basis of a survey of literature we explore eight obstacles associated with the internal activities of the company and six external barriers. Their overview and the target frequencies are listed in the tabs. I and II (column "experts" and "other" are explained in the following text).

It suggests that reverse flows are probably managed by ad hoc mechanisms, which is not a good approach, as pointed out e.g. by Meyer (1999). The third barrier (unskilled personnel) is logically connected with the first two barriers as well as with the last one, i.e. the lack of know-how. It is thus unclear why companies fail to perceive know-how as a significant barrier (Klapalová, Škapa, 2010). A barrier concerning a product typically rests in demand seasonality as well as low-quality materials and components Barriers.^{xxxv}

Karpissová, E. (2008). *Environmentální přívětivost jako faktor tvorby hodnoty na trzích B2C a B2B*. In *Vývojové tendence podniků IV* (pp. 383-407). Brno : ESF MU Brno

^{xxxiv} ROGERS, D. S., TIBBEN–LEMBKE R., 1999: *Going backwards: Reverse Logistics Trends and Practices*. Pittsburgh: Reverse Logistics Executive Council, 275 p. ISBN 0-9674619-0-1

^{xxxv} MEYER, H., 1999: Many happy returns. *Journal of Business Strategy*. 30, 3: 27–33. ISSN 0275-6668.

Figure 13 Barriers in Commerce

I: *Internal barriers RL (n = 102)*

Internal barriers	Frequencies (Percent)	Experts	Others
failing to see a reason in reverse flows compared to other activities	43 (42%)	30%	50%
lack of systematic management	36 (35%)	36%	37%
staff resources (unskilled personnel)	31 (30%)	27%	32%
product nature	19 (19%)	27%	16%
missing consultancy for the field of reverse flows	18 (18%)	15%	19%
internal financial resources	16 (16%)	16%	17%
conflict with strategy / corporate policy	12 (12%)	6%	15%
lack of know-how	9 (9%)	0%	13%

Source: Klapalová, Škapa (2010), modified

II: *External barriers RL (n = 45)*

External barriers	Frequencies (Percent)	Experts	Others
customers	45 (44%)	46%	44%
suppliers	29 (28%)	23%	31%
financial resources	29 (28%)	23%	31%
legislation	23 (23%)	15%	29%
intermediaries of various services concerning reverse flows	20 (20%)	15%	21%
government's interest – politics	14 (14%)	15%	13%

Source: Klapalová, Škapa (2010), modified

Source: [21]

The figure above shows us that the biggest downfall to the Czech reverse logistics is the fact the businesses fail to see a reason to it. They have a lack of proper management; to make that worse is the huge number of unskilled employees. This, together with the debatable corporate policies cause division and conflicts among all the levels of operations.

External factors can be dealt with differently and systematically. Solving such factor the firms need strong hold on their strategies and beliefs. Customers are the hardest to deal with as they feel the need to be satisfied thus putting the Industry under great stress as they must in reverse try to meet the needs of the both the customers and the providers at one.

Satisfaction usually comes in the form of returns (turnover). It is the driving force behind any strategy or plan of an undertaking. But it is all governed by rules and legislation in order for it to be fair in the market or place of commerce.

Based on specifically open questions, we can say that customers are perceived as the main external barrier because of their careless and unqualified handling of products and packaging, and the in pressure on the sale price. Similarly, irresponsible handling with packaging and its low quality is the main problem on the suppliers' side (Klapalová, Škapa, 2010). The impossibility to obtain further financial sources for RL from external subjects is the third most important external barrier. Interestingly, it did not appear in such front positions in foreign surveys. The obtained (relative) frequencies of answers do not suggest that companies see RL barriers in the internal rather than external environment.^{xxxvi}

Table no 3. Respondent percentage

Criteria	Number of respondents	percentage
cost reduction – 79	respondents – 88	8 %
customer satisfaction – 75	respondents – 84	3 %
services to customer – 67	respondents – 82	7 %
customer interest/press –	respondents – 74	7 %
competitive reasons – 60	respondents – 66	7 %
productivity increase – 46	respondents – 64	8 %
value capturing/recapturing – 45	respondents – 54	9 %
environment concern - 38	respondents – 49	4 %
assets recovery – 33	respondents – 46	5 %
margin protection – 30	respondents – 42	9 %
speeding up the flow in distribution channel – 23	respondents – 31	1 %
compliance with government requirements – 21	respondents – 28	4 %

Source[16].: Author

^{xxxvi} KLAPALOVÁ, A., ŠKAPA, R., 2010: *Managing reverse flows in the Czech Republic*. In: *An Enterprise Odyssey: From Crisis to Prosperity – Challenges for Government and Business*. 1-st ed. Opatija: University of Zagreb, 1111–1123. ISBN 953-6025-33-7

In addition, to further implement the analysis, we provide statistically reliable evidence to suggest differences in perception barriers to companies. It is therefore impossible to claim, for example, the companies regarding their RL as profit making or, conversely, loss-making activities define differently barriers. Furthermore, no difference was found in the framework of a firm of a different size. Given the high diversity of the affiliation industry in combination with the small sample, it was not reasonable to identify barriers in industry-specific.^{xxxvii}

3.5 Reverse logistics as a source of value in Czech companies

Since the end of the 20th century reverse flows are still more intensively considered by the experts as an important source of value for companies. The concept of reverse flows is familiar to managers in western countries; however there is some gap in knowledge and skills of managing reverse flows among managers in the Czech Republic given by the very low level of recognition of this concept. Notwithstanding this fact, the situation is changing especially due to foreign enterprises active in the Czech market and the macroeconomic and microeconomic influences which are the same or very similar to those in more developed economies. However, the real status of management perception of reverse flows as the source of value is unknown regarding the lack of field research.

^{xxxvii} Reverse Logistics In The Czech Republic: Barriers To Development[online] c. 2012[2012-04-28]accessible at http://www.mendelu.cz/dok_server/slozka.pl?id=51329;download=79973

Table no 4 Financial savings

Rough financial savings		Expenses for electricity during operation of distillation device	
Diluents saving	5201	Duration of 12l diluents distillation	4 hours
Financial saving	CZK10155	Total duration of 800 l of diluents distillation	268 h/year
Resulted waste saving	344Kg	Electric input of distillation device	1,04 KW
Waste extermination saving	4094	Power drain	279 kWh/year
Total rough financial saving	CZK 14294	Electricity expenses	3 CZK/kWh
		Total expenses	837 CZK
Total financial savings			
Rough financial savings		14 249 CZK	
Total electricity expense		837 CZK	
Total financial expense		13 412 CZK	

Source: [25].

In other field research such as shown in the above table, we can predict the future curve by just referring to already obtained data. This table shows us we can save from following proper procedures that are deduced from research data.

Contained in the paper are some preliminary results of empirical investigation aimed at certain aspects of the reverse flow in companies that operate a business in the Czech Republic, in particular the ability to recognize these flows as a source of value. The aim is also to offer a picture of the management of participation in this field, reflecting the various barriers and drivers or interests to get the value of these flows. The value resulting from the reverse flow can be understood as a very broad concept which will be of hard economic data through physical attributes, such as spare parts to the intangible benefits, such as an image of good citizenship, or information or know-how.^{xxxviii}

^{xxxviii} Reverse Flows As The Source Of Value In Czech Companies[online] c2012 [cit. 2012-05-06] accesible on <http://www.airl-logistique.org/fr/files/?view=430>

Another suggestion of alternative waste processing solution focuses mainly on dissolution reagents, whose are being used for spray guns maintenance. Total expenses connected with gaining and extermination of dissolution reagents are around 24 000 CZK per year. Detailed specifications of these expenses are covered with table. This show us that the ability to recognize these flows as a source of value is present.

Table no 5 Calculation of expenses for dissolution reagents (DR)

Sort of activity	Yearly Income/expense
DR washing consumption	8001
Expenses for 11 DR	CZK 20.31
Expense for purchase of DR	CZK 16 248.00
Waste production/polluted diluents	500kg
Dumping expenses per kilo	CZK 13.00
Dumping expenses	CZK 6 545.00
Total emissions	250
Emission tax per Kg	CZK 2.00
Air pollution tax	CZK 500.00
Total expenses	CZK 23 293.00

Source [25]

This clearly indicates a safer and more effective way to deal with waste internally. At root level it is much easier way to handle these materials and therefore sum-up the cost beforehand. The total expenses could therefore be added to the business monthly or rather in this case yearly costs. This would surely result in profit over a period of time.

4 Evaluation of the analysis and design measures

These evaluations are drawn from a number of different authors, mainly the ones that have really done research on the Czech Republic and have published their work. This paper should be able to evaluate and shed light on some of the barriers or flaws in the system.

4.1 Profit of reverse logistics

In the case of question surveying the impact of reverse logistics on profit compared to the categories of value (positive or negative) gained from reverse flows respondents were allowed to introduce free answer. Answers were categorised into 14 categories and the analysis of frequencies was counted from three given answers to every category. 73 companies are sure that reverse flows decrease the profit; only 26 companies know that reverse flows increase the profit and 40 companies do not know – they do not measure this impact.

Table no 6. Main reverse flows

share in%	Resold		Remanufactured		Recycled		Land-filling		Repaired	
	freq	%	freq	%	freq	%	freq	%	freq	%
0	16	22.20	12	24.00	25	33.30	20	30.30	19	27.10
1-30	34	47.20	24	48.00	33	44.00	39	59.10	32	45.70
31-50	6	8.30	1	2.00	6	8.00	1	1.50	4	5.70
50-80	9	12.50	6	12.00	6	8.00	6	9.10	5	7.10
81-100	7	9.70	7	14.00	5	6.70	0	0.00	10	14.30
Total	72	99.90	50	100.00	75	100.00	66	100.00	70	99.90

Source [16].: Author

In this main reverse flow table, an indication of how many companies have proper reverse logistics structures in place is evident as we can see in the 1-30 % activities are very high. This could be very good for the industry as managers seem to have placed proper structures and using them effectively but on the other hand the question still stands, why are they so many return though. The higher the returns, the better the reverse logistics has to be. Regular stock inventory taking has to be utilized to fullest to make sure that there is some sort of balance in the ins and outs.

If we compare answers to the questions concerning the relation between impact of reverse logistics on profit and value gained from reverse flows, we can see following results (see Table 6). Managers who assigned positive impact of reverse flows on profit see value “revenues” and “cost reduction” more often compared to those who feel negative impact. Nobody from the group of “positive thinkers” introduced “cost increase” as the category of value. Respondents who believe that reverse flows influence negatively profit more often presented value of “good customer relationship”, “information – know-how” and “quality improvement” comparing both two other groups^{xxxix}.

4.2 Strengths and weaknesses of Reverse flow in CZ

There are many other factors that influence the reverse supply chain in the Czech Republic just like many other countries in the world but there are some factors set it apart from the others. These qualities should be explored and be taken full command of. If not rectifying them.

Difficulties forecasting demand in high-volume repair environment caused inventory costs to skyrocket. A proper forecast plan must be put in place before time. This is where reverse logistics should mend its ways and evolves from a timeless process into one that has volume per time period. This will give it more purpose and a sense of proper direction. It could lead to more people in the Czech Republic taking it seriously and actually using it to benefit them. If the legislation state a time period in the process of reverse logistics, then it will gain a more rigid structure that would be able to keep details of the routines that take place.

Inadequate planning and execution resulted in excess and obsolete inventory and poor Utilization of warehouse space are major factors that most businesses here in the Czech Republic are failing to achieve where they should be the world leaders in this process I feel. The main logistics centres are not being used to optimum usage capacity, meaning that they should be running the reverse logistics circle due to the fact that they carry most of the transport systems. All modes transportation can be linked to one logistics centre. This could make the system run smoothly and much faster. The planning should have some sort of proper structure and order to it. Management should take control of their co-operation and lead them into a more disciplined approach to business in order for them to achieve their goals and function as a team.

The production efficiency is affected by availability of waste and component sourcing. It causes delays and lowers customer satisfaction. This is not a good property to inherit in commerce as we are all aware of the fact that the fulfilment of customer needs leads to a well-run business. The happier the

^{xxxix} Reverse Flows As The Source Of Value In Czech COMPANIES [online]c 2012[cit. 2012-05-06]Accesible on <http://www.airl-logistique.org/fr/files/?view=430>

consumer is the greater the growth of the business. Production is fully depended on the activities of the firm and the staffs in it, well treated employees usually have higher production rate efficiency but without a good reverse logistics process in place the worker can't really get to work as they won't have anything to do or work with. It is best to keep the cycle moving for the sake of harmony in the firm that will later lead to success in the industry and a higher turnover.

Things to do to make sure that the Czech business is able to functions well with the reverse logistics flow.

Some Czech Republic major businesses have implemented world-class forecasting model to improve inventory management and asset utilization while reducing costs on the over all. The EU and the government are working together to maintain the standard and trying to make sure that they spread the news.

Utilized advanced sourcing and materials planning to speed fulfilment cycles and improve service levels for increased customer satisfaction has been working efficiently for years and its seems the people really enjoy the benefits of it, of course there could be improvements but at the moment things seem to be running smoothly. An example of this would be the beer recycling system where when people purchase alcohol they can return the bottles and receive a small amount for their service. Most people use it to buy the alcohol again, its keeps the cycle moving forward

The Czech Republic has also configured a highly structured and efficient reverse logistics program to supplement demand inventory and reduce sourcing costs. A simple example of this would be the trash can pick up system. The bin have been colour coded to make things easier to recycle the materials accordingly to their kinds, I think it is a super program, not much needs to be done.

Lack of interest is a major problem and it should be eliminated from the system, even though it is in the people themselves, Czech people tend to keep to what they know and aren't accepting of change for example, Czech people would rather play hockey than try out for a new sport, so just like in the sports and other traditions, they are not as interested in the idea of reverse logistics as a revenue making enterprise. But this can be introduced by continuous adverting and winning over the most influential minds.

Lack of research facilities and data in the reverse logistics field as a whole is causing a slowdown in the industry. People are not being educated enough about this subject. I browsed around the town of Pardubice to find some people that could assist in explaining the term 'reverse logistics' and found that most people didn't even know what I was referring to even when they were part of the reverse flow cycle. More studies need to be published by the Czech companies to educate the people.

The government needs to play a bigger role in this as reverse logistics is helping to build the economy and save land we live in.

Reverse logistics could do with better infrastructure (transport system integration). They have seen the Czech national transport systems boom over the years at an amazing rate, but now it is about time it helps other weaker fields such as the industry of reverse logistics. More reverse logistics storage centres can be planted to the main railway routes and airports. This could help with the accessibility of major routes at lower costs

4.3 Cost reduction

Cost reduction and care of customer are the biggest drivers of reverse flows in surveyed Companies. Customer satisfaction and service to customer were indicated by about 80 % of respondents as playing the role in strategy management and when exploring the reason of interest in reverse flows, where cost reduction was mentioned by 90% of respondents, all three surveyed factors related to customer were introduced by most companies (from 83 to 74 %). Competitive reasons are also very important driver with the frequency of about 65 % of answers in both questions. Also value capturing reached relatively and unexpected high rate of response. The lowest percentages were found with compliance with government requirements as playing the role in strategy as well as being the reason of interest. The second least denoted answers were “necessity” with the strategy and “speeding up the flow in the distribution channel”. Two the most often given factors when asking for the growth of the factors importance in the last five years, were customer interest and cost reduction.^{x1}

The findings are intriguing but rather bit too complex to comprehend on a basic level. Knowing that Cost reduction is a major driver in the field of reverse logics I feel the best workable solution would come from the deductions of doc. Ing. Rudolf Kampf, Ph.D., as he basically explains how to go about this more clearly in his Alternative waste processing suggestion.

Currently there are many devices, able to recycle or in other manner of speaking able to process produced waste. One of them is distillation devices, whose are providing recycling and repeatedly use of dissolvent reagents used for cleaning and degreasing. Using basic principle of distillation, polluted reagent is cleaned of resin, pigments, varnish, oil etc. Residue of distillation are lodging on the bottom of special tank and after ending the distillation they can be removed without any obstructions. Effectiveness of these devices is high. Based on amount of pollution it is possible to get back almost 65% of total amount of used reagents. Acquisition of such device would be advantage from long-term aspect,

^{x1} Reverse Flows As The Source Of Value In Czech Companies [online] c 2012 [cit. 2012-05-06] accessible on <http://www.airl-logistique.org/fr/files/?view=430>

because it would mean saving money spent on extermination of polluted diluents and buying a new one. The total financial saving (table) is based on rough financial saving, from which expenses for electricity and functions are subtracted.^{xli}

The results show that, despite the various obstacles to the management of reflows, the Czech firms are able to articulate what categories or types of values are able to create or obtain reverse flows. However, this ability varies, depending on the perception of the industry and the management and recovery capabilities, as well as for access, access or the perception of managers, in particular top managers. The exploration of the nature of the preliminary survey of the problem was through standardized interviews on a sample of respondents 102, representatives of the Central (in some cases), corporate governance from several sectors. RIRL 2010-Bordeaux, 30. September, October 1. 2010

From above tables, we can deduce from this hypothesis that buying a distillation device would result in a possible saving of 57% from the spent expenses in this case. It is also important to collate or rather consider the return of investment period with lifetime of distillation device which must be higher.

Czech Republic companies and the industry as a whole will need to immediately tackle the forecasting and demand challenges by implementing its proven demand planning methodology if not create new ones, though they are still ahead of many countries in the world. This solution should use sophisticated rules and procedures to create a feasible demand-driven execution plan that reduces inventory risk by minimizing the amount of time, product and cash a company has tied up in inventory. The plan has to consider the variability of demand while allowing for rapid changes in the characteristic of the service repair environment. The new model should yield a dramatic improvement in forecast accuracy, because the infrastructure is mostly in place as it stands. All that is needed is to quickly integrate the reverse logistics systems to the already well developed broad transport systems

Additionally, the client's inventory levels should reduce once a forecasting model is implemented, Czech industry needs to round out the solution with more efficient and cost effective sourcing for the products and waste elements. Reverse logistics' primary source for raw materials must be the returns management program, 'where unused returns are just sitting, which will require them to undergo or conduct rigorous testing to identify units that could be put back into forward logistics inventory. This will provide the industry and businesses with significant cost savings, given the exorbitant price tag for brand new goods that go through the normal distribution channels. When supply levels are low, big corporations should tap into the open market to purchase reused or reusable materials; it can leverage its local market expertise worldwide to obtain the right product, at the right price, at the right time. In

^{xli} Reverse Logistics In Connection With Waste Management [online] c2012 [cit. 2012-02-24] accessible at http://pnerscontacts.upce.cz/20_2010/Kampf2.pdf

the Reverse flows they should also handle shipments of spare unused goods, (which they can process in-house) and product documentation. The reverse flow must continuously monitor the supply levels of all the elements at the manufacturer's centrals and other European hubs and replenish their stock on a weekly to monthly basis to ensure that consistent inventory levels are always on hand to meet the forecasted demand. This efficiency has to improve the on-time, same-time transport rates

A forecast plan would be able to reduce product excess and obsolescence which would result in significant cost savings and improved asset utilization for the manufacturer. In addition, overall efficiency for supply chain related processes will improved thus making everything flow smooth in reverse as in logistics

Conclusion

The findings of this bachelor thesis were helpful towards the understanding of the reverse logistics industry thus making it possible for one to make up their mind about the state that Czech Republic's reverse logistics cycle is in. Now going back to my question

At the beginning of this dissertation I posed the question "does the Czech Republic have the capability to recognize these reverse logistics cycles as a source of value and the design whether measures would hamper its growth"

The results show there is some gap in the knowledge and skills of managing reverse logistics among managers in the Czech Republic given by the very low level of recognition of this concept, and that despite various barriers of managing reverse flows, Czech companies are able to articulate which categories or types of value they are able to create and/or gain from reverse flows. Nevertheless, this ability is different depending on the industry and management perception of reverse logistics potential as well as on the approach of managers, especially top managers.

It appears the industrial structure needs to expand and allow more foreign investors as well as new (smaller) investors to experiment with and to explore the market. Not only will they bring more capital, they might widen the thought process and introduce fresh methods of operation.

From the review of the data, it is apparent, that the level of commitment is fairly impressive. Though there is a lot of room for improvement, the drive is positive and heading in the right direction. All that is needed is now diversity and the will to accommodate change.

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