The application of reverse logistics in a municipal enterprise through knowledge management

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Abstract:
Business processes determine how objectives should be achieved. They create the environment in which organizational communication passes through job positions and produces a business organizational structure. The experience of individuals based on historical development and the knowledge resources of a business contribute to the creation of knowledge-based processes. They are equally important for any business since competitive advantage can be built on knowledge. The efficient utilization of knowledge resources requires the harmonization of knowledge processes with business processes. Such knowledge management would lead to enhanced performance, which is based on the principles of sustainable development. A municipal enterprise is a specific example of such a business. It regulates the flow of waste. It determines its further processing or storage. The preparation of waste for processing requires the separation of recyclable waste in a particular quality. Otherwise, for economic reasons, it can end up non-ecologically on a dumping site after its reversion to a municipal enterprise. This paper aims to provide solutions to this problem and deals with the general application of reverse logistics in a municipal enterprise. It attempts to blend the improperly adjusted business processes of reverse logistics with knowledge processes, which are based on existing knowledge sources. It proposes a management approach to the regulation of important reverse processes.

Keywords:
Knowledge management, reverse logistics, business processes, knowledge processes, knowledge resources.

Introduction

The aim of the article is to draw attention to the importance of knowledge management in the application of reverse logistics of businesses through outsourcing by a municipal enterprise. A municipal enterprise has a special status in the application of reverse logistics. Despite the fact that it is an enterprise in which the private and public sectors are diffused, it plays an important role in the processing of used products and waste. The decision of whether used and waste material are destined for disposal or for further material recovery significantly affects the degree of negative impacts of industrial production on the environment. The environmental context is not the only reason why this decision is regarded as being crucially important. In a wider ecological context there is the effort to improve the performance of industrial enterprises on the principles of sustainable development. The recycling of used products, their parts, or packaging, on the one hand reduces the burden on the environment through the disposal of waste to the ground; on the other hand it utilizes the synergy of the process which is terminated in the re-processing of the already processed products.

There is a lack of economic efficiency in such a process. Mass production leads to economies of scale. Economies of scale reduce the unit price of products to the extent that the collection, sorting and recovery of recyclable products account for higher costs of reprocessing than mass production. A municipal enterprise, however, eliminates this cost disadvantage through the accumulation of used products and waste in one place and then it distributes it in bulk for further processing. Re-processors pay for recyclable products to the municipal enterprise. Producers pay for waste deposited in the ground. The most important producers of waste include businesses because, in addition to conventional waste, they generate manufacturing waste which significantly exceeds the normal volume of waste from households.

The logistics processes of businesses start with suppliers and end with customers. The flow of waste and used products is perceived as being reverse, i.e. going in opposite directions. The role of a municipal enterprise is to support this reverse flow. In principle it should encourage businesses to think both ecologically and economically. At first glance this task seems visionary because environmental protection is more associated with growth than cost savings. The principle "the more you separate, the less you pay" offers efficient and

environmentally friendly solutions to businesses and producers of waste in cooperation with a municipal enterprise. Knowledge management provides an effective tool for the efficient harmonization of organizational and knowledge processes in a business. Moreover, the reverse flow through environmental support would lead to additional cost savings. Reverse logistics thus contributes to higher profitability and increases the performance of a knowledge-driven enterprise.

1. Logistics in the reverse flow of goods and information

The business environment includes a network of business units which maintain trade relations. The diversity of relations refers to the diversity of the quality of inputs and outputs. The demands of any business can be satisfied within a certain limit, which determines the range of the input relations. A business determines the extent of the customer portfolio through the transformation of inputs into outputs. In this respect there is a material and information flow from input through process to the output. A business uses a logistics system for this purpose. “A system of logistics is built to support the comprehensive optimization of material and information flows within a business. Its role is to plan, organize, manage and control these flows from suppliers to customers. It acts as an interface with the external environment of business in supply, distribution and reverse flows "[9]. Input is associated with supply, whereas output is linked with distribution to customers. Reverse material flows at input can include qualitatively substandard spare parts returned to the supplier. Reverse material flows at output can include customer claims.

Information flow, including its reverse form, is realized through various information channels. The transmission of information via the Internet is one of the most advanced forms. It provides important information to a particular group of participants, based on which a business plans, organizes, directs and controls. "Through logistics a business can achieve significant cost savings, influence customer satisfaction and hence the volume of sales and gain significant competitive advantages" [12]. A business should optimize material and information flows through the alignment between organizational and knowledge processes to achieve cost savings, to maintain customer satisfaction, to increase sales volume, and to ensure a competitive advantage.

1.1 Reverse Logistics as an activity of business logistics

Logistics is the management of business activities which are somehow related to material and information flows. Management includes planning, organizing, leading, coordinating and monitoring. The flow of materials leads to information sharing which is assessed and transformed into the already existing knowledge. Ideally, knowledge is not only transmitted to the existing knowledge of employees, but also to organizational forms. This stabilizes the harmonization of organizational processes with the processes of knowledge. The management of business activities through the harmonization of these processes is called knowledge management. Business logistics activities are managed through knowledge management.

The main logistics activities include [7]:

- customer service,
- forecasting/demand planning,
- inventory management,
- logistical communication,
- material handling,
- taking orders,
- packaging
- support service and spare parts,
- determining the place of manufacture and storage,
- procurement/purchase,
- handling of returned goods,
- reverse logistics,

- transportation of goods,
- storage.

Handling returns, reverse logistics and logistical communication are activities of reverse logistics. Logistical communication is associated with all logistical activities, including reverse flows too. The principle "the more you separate, the less you pay" can be easily applied in reverse logistics. "Reverse logistics is defined as a process of recovering recyclable or reusable materials, waste and re-processed items from consumption, or from using for transport, reprocessing or disposal or storage. Reverse logistics incorporates activities which support material recycling and minimize waste production" [5]. The purpose of waste management in a municipal enterprise is to promote material recycling and minimize waste deposited on dumping sites. Figure 1 indicates that reverse logistics is not only a specific process, but also ability and a specified activity.

What is it?	Inputs	Activities	Outputs	From	To
process	Scrapped products	planning	Re-used products	Point of consumption	producers
task	Used products	implementation	recycling		Central collection points
abilities	Products or parts preferentially transported	control	reprocessing		Places of inception
activity	Packages or products with hazardous properties	collection	disposal		
	Information	transport	reduction		
	Raw material	storage	management		
	Work in progress	acceptance	Recovered products		
	Finished products	packaging			
	Related information	transport			
		reduction			
		management			
		disposition			

Figure 1 Basic components of reverse logistics [13]

Reverse logistics starts with consumption and ends with the producer, central collection points, or the places of inception through a reverse flow. Figure 1 indicates in detail the possible inputs, activities and outputs of a reverse process.

1.2 Reverse Logistics in a municipal enterprise

Every enterprise must have under the existing legislation a waste disposal system and should handle used products and waste in an environmentally and economically sound manner. Figure 2 shows the synthesized basic elements of reverse logistics in a municipal enterprise.

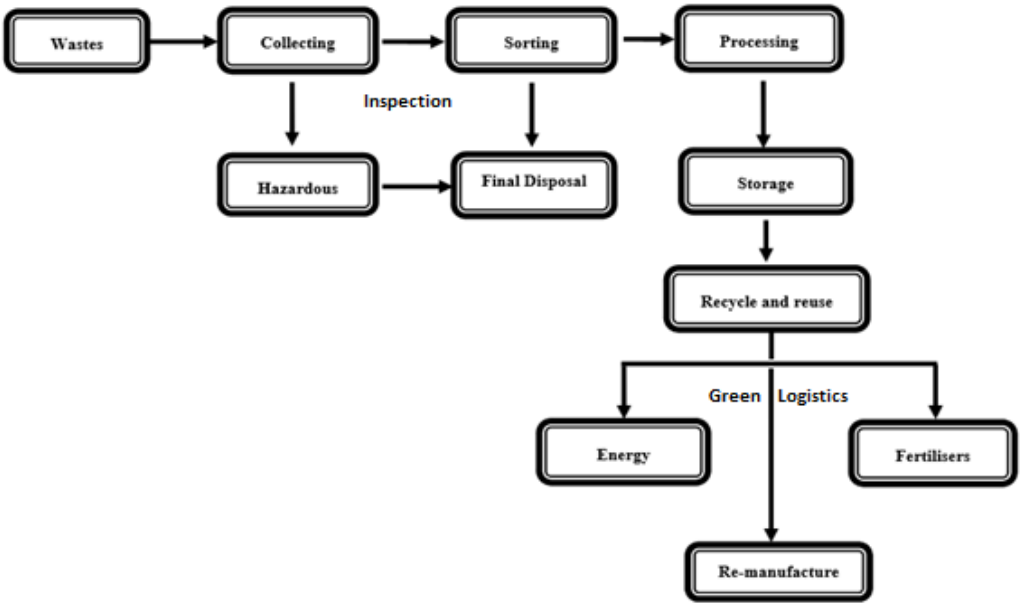

Figure 2 Basic components of waste management & reverse logistics [1], [6]

A municipal enterprise through an integrated waste management system collects used products and waste at predetermined collection points by garbage trucks. The initial inspection refers to qualitative and quantitative assessment of whether the reverse flow of business before collection produces the desired input to a municipal enterprise. A municipal enterprise is regarded here as the implementer of reverse logistics outsourcing of an ordinary business. A municipal enterprise under a contract implements a reverse material and information flow. This is followed by collection and separation, which is considered as being the second inspection.

The second inspection refers to secondary assessment; it determines whether the material flow will be destined for disposal, or for reprocessing. The output of reprocessing is redistribution, reallocation, or repeated separation for recycling. This aspect of reverse logistics is considered important in this article.

1.3 The difference between reverse and green logistics

Figure 3 shows the difference between reverse and green logistics. Reverse material flow in a municipal enterprise is also based on the principles of green logistics. This statement is proven in the analysis of Section 1.2 and Figure 3. Complaints, returns of products, seasonal goods and green logistics are not discussed in this paper.

"The primary task of reverse logistics is the collection, separation, dismantling and processing of used products, components and by-products, excessive inventories and packaging materials, where the main objective is to ensure utilization and material recovery in a manner that is environmentally friendly and economically interesting "[11]. The environmental context is a desirable side effect of reverse logistics through a municipal enterprise, whereas a reverse material flow in terms of long-term sustainability should also be economically interesting. This would motivate the management of a business to apply environmentally friendly principles that are applied at the expense of increasing costs.

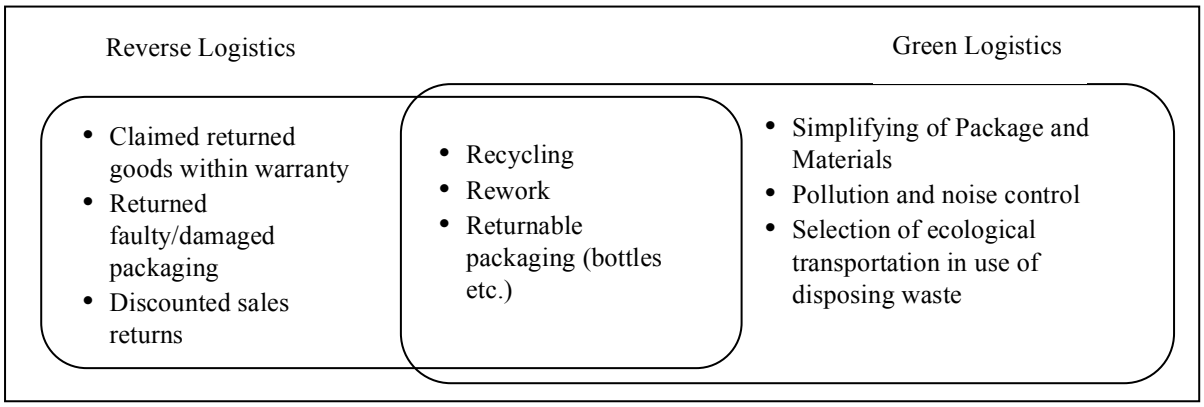

Figure 3 Relationship between reverse and green logistics in examples [11]

The offer to collect separated waste free of charge for all businesses is a motivational tool for the implementation of reverse logistics in a logistics system of a business. In addition to the environmental benefits of such managerial decisions it represents cost savings for the company. The more a business separates, the less used products and waste are destined for disposal. The offer of a municipal enterprise contains charges only for disposal. An ideal business, separating 100% of waste, does not pay for the reverse material flow to a municipal enterprise. "Reverse logistics guarantees an adequate output only if it leads to logical implementation in compliance with the inputs, outputs, components and tools of reverse logistics for specific problem areas and conditions" [4].

The abolition of charges for separated waste is not an uneconomical idea. The increase in separated waste leads to heightened bargaining power vis-à-vis the processor. In addition, this activity is financially supported by additional resources under the environmental policy of the government.

2. Reverse logistics through knowledge management

Logistics, based on section 1.1, is defined as the management of business activities which are related to material and information flows. Material flow is bound to information flow, which is evaluated and transformed into the existing knowledge of knowledge resources in a business. Figure 4 shows that knowledge resources of a business can be classified as schematic and contextual.

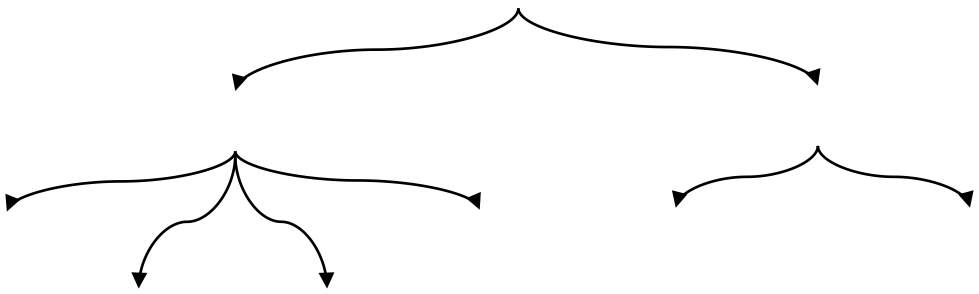

Figure 4 Knowledge according to C. W. Holsapple a K. D. Johsi [3]

This classification of knowledge resources is seen as a suitable approach for highlighting the importance of knowledge management in any business. The schematic sources include objectives, strategies, cultural values and organizational structure. This explicit manifestation of schematic knowledge resources shows which schemes may be affected by a new piece of information.

In terms of content knowledge, resources are divided into participants and artifacts. Schematic distribution only refers to information which is evaluated and transformed in an explicit form; content division refers both to explicit and tacit forms. Tacit knowledge [2] is linked to living entities, or groups. These entities are called agents. Explicit knowledge is stored in various inanimate forms, called artifacts. Agents refer to people, experts, researchers, employees; artifacts are documents, drawings, procedures, videos. Agents not only act as independent sources of knowledge, but also in combination with artifacts. Participants and agents are regarded here as synonyms. Explicitly expressed schematic resources can be found in documents or procedures, and thus become the property of a business. Conversely, tacit knowledge is bound to living entities. "The importance of tacit knowledge is immense for any business. As practice shows, the greatest wealth of knowledge is in the heads of employees in a tacit form, bound to the characteristics of individuals or groups. The process of acquiring and utilizing this potential is not easy "[8]. The evaluation and transformation of information logistics is regarded as a proactive creation of knowledge, which is an integral part of knowledge process. After the generation of knowledge, a business should begin to work with knowledge; this means that knowledge should be managed similarly to the organizational processes of a business.

The process of knowledge application has an impact on material flow, which belongs to the management of business processes. Since information flow does not correspond with material flow, there is a dissonance between the application of organizational processes and information-affected knowledge processes. The harmonization of these processes is realized through knowledge management, which should optimize the logistical flows. This is, however, subject to compliance with other knowledge resources of a business, which makes matters more complex. These problems generate higher requirements for management. Solutions should lead to the harmonization of logistical processes and comply with other schematic resources in a business.

2.1 Explicit knowledge

Schematic resources explicitly systematize business processes and create solid management. Explicit knowledge has become "increasingly emphasized in practice as a managerial tool used by businesses in knowledge management. The Internet, intranet, various databases, knowledge networks are considered significant knowledge management systems which enable sharing and transfer of knowledge in businesses "[10]. Explicit knowledge must be expressed in particular ways to become noticeable. Explicit knowledge is expressed in reverse logistics as follows:

- waste management programmes,
- internal regulations on waste management,
- rules for the separation of materials,
- logistical processes of central collection of recyclable products and returnable packaging,
- contractual relationships with municipal enterprises,
- video instructions on best practice from other companies,
- information leaflets.

Without mutually sharing knowledge within a business, for example through the intranet, there would only be isolated explicit knowledge of low value. Knowledge sharing within a business provides a platform for employees, through which they have access to explicit knowledge. Their value increases as a result of sharing, but the real value is only attached to knowledge that is actually utilized for the purposes of a business. All regulations, orders, and information expressed in them need a recipient, but they should also influence the organizational processes in a business. For example, regulation on administrative waste management and information in it help us harmonize the organizational processes. Explicit knowledge is the cause and effect. It occurs as a result of information flow, which accompanies the material flow, and leads, through knowledge management, to the effective attainment of goals.

2.2 Tacit knowledge

Tacit knowledge is difficult to express explicitly. As they are bound to human beings, they are considered to be highly individual. Unlike explicit knowledge, tacit knowledge does not refer to arranged words in some regulation or stored information in business databases. They are part of an employee with tacit knowledge.

Despite the complexity of explicit representation, several examples of tacit knowledge in reverse logistics are shown here:

- professional competence to ensure the operation of waste management in a business,
- knowledge of an employee about the nature of reverse logistics,
- know-how of the head of logistics about efficient and environmentally balanced flow of materials,
- the ability of an employer to reconcile knowledge and organizational processes,
- knowledge of an employee about effective and efficient achievement of business objectives,
- skills to correctly identify whether it is a commodity of reverse logistics, or a normal commodity.

The most significant tacit knowledge is perceived as a sound business judgment on business opportunities in a business sector and in a particular legal form, with a number of employees, which are associated with long-term sustainable development. Tacit knowledge inherently determines the success of any business which cannot be explicitly expressed by successful entrepreneurs. That is why they tell stories, or they teach their followers how to do business.

The sharing of tacit knowledge is linked to a number of factors that affect successful transmission among human beings. Business success is associated with time which passes and changes its surroundings. Business units, which emerge, or cease to exist, or change in different stages of their life cycle, affect the quality of the business environment. An entrepreneur does not need to know the real causes of success; or he may not be willing to hand over the vital essence of his success; or employees may not be able to absorb tacit knowledge under the given circumstances. The absorption capacity of an employee acts as a decisive factor, which cannot be affected by the disseminator of tacit knowledge.

3. Transforming knowledge into organizational forms

Whereas explicit knowledge is seen as an easily graspable knowledge resource, tacit knowledge is seen as a hardly graspable knowledge resource. However, explicit or tacit knowledge are co-formulators of knowledge assets of any business. Their transformation into an organizational form corresponds with their comprehension. Easily graspable explicit knowledge can be easily transformed into a logical organizational form because it binds to the schematic sources and creates artifacts. Hardly graspable tacit knowledge cannot be easily transformed into an organizational form. However, tacit knowledge, which is bound to human beings, means the ability to process knowledge to a higher level of artifacts.

Transforming knowledge into an organizational form is a key competency for any business. A business that provides conditions for the implementation of knowledge management eliminates the negative impact of key employees' departure on the actual business operations. It is capable of creating a proactive organizational environment based on knowledge and key competencies through the alignment of knowledge and organizational processes. It does not create an environment of ignorance, random selection from a variety of options and inconsiderate business coordination.

Knowledge management enriches the field of reverse material logistics and information flows. It is enriching since it extends planning, organizing, leading with a unique managerial approach by emphasizing those capital values which should be transformed into organizational forms.

Conclusion

The destruction or remanufacturing of used products, packaging and waste is a key issue in reverse and green logistics. A municipal enterprise, as an outsourcing unit in reverse logistics, accumulates reverse material and information flows, and offers economies of scale. Furthermore, it creates efficient and environmentally balanced solutions in compliance with the principle "the more you separate, the less you pay".

The application of knowledge management as a specific managerial approach is crucially important for the management of reverse processes. Knowledge management enriches the classically understood management by values of knowledge capital, transforms knowledge into organizational forms, and makes a business adaptable to conditions, which are based on the principles of sustainable development.

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