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# THE INFLUENCE OF A LOGISTICALLY EFFICIENT PRODUCT ON THE LOGISTICS OF A MANUFACTURING ENTERPRISE

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**ABSTRACT:** *Logistics, which is the platform covering all functional areas in a company has been more and more often turning into an area where enterprises gain competitive advantage. This involves continuous development of the current logistic processes where the product under logistic system has a remarkable meaning. The features of the product itself start to grow in importance in terms of its effective operation in the broadly understood logistics. The article presents results of research conducted to determine conditions of logistic management in manufacturing companies in Poland and concentrate on the one of the concept's aspects, namely a logistically efficient of product.*
**KEYWORDS:** *logistic, product, efficient, logistically efficient of product*

## LOGISTICS OF MANUFACTURING ENTERPRISES

*The concept of logistics of a manufacturing enterprise should include numerous factors typically related to the specific features of these companies. It should also generally refer to the knowledge included so far in the literature of the subject. The combination of logistics-related theory with practical solutions applied in economy should result in a utilitarian approach to the problem. This approach should involve not only the theories connected with the phase [8,9] and functional [8] division, but also the postulated actions that affect logistics efficiency.*

*The notion of manufacturing enterprise logistics makes us notice that creating the concept of its functioning needs to include the analysis of the conditions related to the phase and the functional approach to logistics, the postulated actions that enhance the effectiveness of logistics performance and the areas of manufacturing enterprise functioning from beyond the field of logistics, that have an impact on it alongside.*

*In the context of the phase approach, i.e. the division of the company logistics into the logistics of procurement, production and distribution (some authors also add the logistics of disposal and returns) [5], the basic challenge becomes - first and foremost - the assessment of the degree of integration, as regards:*

- *particular fields of logistics, integrated internally (within themselves) - functional logistics;*
- *particular fields of logistics with other areas of logistics within the same enterprise, along with the degree of integration of particular logistics fields with other areas of company functioning, from beyond logistics itself - internal logistics integration;*
- *particular fields of logistics with subjects from outside the enterprise - external logistics integration [4,7].*

*When analyzing the logistics of a manufacturing enterprise in the light of the functional approach, which distinguishes the logistics subsystems of: order handling, transportation, storage, packaging and inventory management, one should assess in what kind of interrelation the mentioned subsystems remain towards one another in particular areas of the phase approach. It also seems necessary to specify the issues connected e.g with the kind of infrastructure used in the mentioned areas, or outsourcing in these fields.*

*Referring to the postulated actions raising the performance effectiveness logistics itself, one may distinguish three basic action groups:*

- *enhancing the effectiveness of goods and information flow,*
- *minimizing the logistics operational costs,*
- *improving the quality of logistics in the context of internal and external customer service,*

*The last area, with a definite impact on the operation of logistics management in manufacturing enterprises is the inclusion of the non-logistics management areas of the company into logistics. They include, inter alia:*

- *the product itself and its logistics efficiency [1,2,3],*
- *the system of sales functioning in the company,*
- *the marketing system functioning in the company,*
- *the flow of goods system chosen by the company ("push" or "pull"),*
- *The information and decision-making system functioning within the enterprise,*
- *Information technologies supporting the enterprise, etc.*

*Each of these issues viewed in terms of logistics of a manufacturing enterprise should enable an analysis of logistics management condition in the company, in the context of its strategic and operational performance. In strategic terms, it is primarily about identification whether the logistics existing in the company is based on a solid and thought-out concept or is it only the effect of adjustment to the non-logistics needs of the enterprise. The operational aspect will refer to the possibility of changes in logistics and to the form of these changes, i.e. whether they will take the form of corrective or improvement actions.*

*The analysis of the logistics management condition provides grounds for the creation of logistics management models of manufacturing enterprises and enables to provide certain standard behavioral pattern for particular groups of companies. The presented conditions, allowing to build logistics management models of manufacturing enterprises become a starting point for determining the very concept and essence of conceptual, adaptive, corrective and improvement logistics, as well as, in the further course of this study, assessing the influence of a logistically efficient product on the logistics of manufacturing enterprises.*

## MODEL APPROACH TO LOGISTICS IN THE STRATEGIC AND OPERATIONAL CONTEXT

*The presented definitions, in combination with the term logistics allow dividing the problem into two basic areas. The first one, classifies logistics in the context of a strategic approach to the actions in a manufacturing enterprise and divides it into conceptual and adjustment logistics. The other area, allowing assessing the nature of the actions in the operational context is adjustment and improvement logistics.*

*Table 1. Model approach to logistics in the strategic and operational context. Source: Own work*

| | | Operational approach | |
|---|---|---|---|
| | | Corrective logistics | Improvement logistics |
| Strategic approach | Conceptual logistics | CC model | CI model |
| | Adaptive logistics | IC model | II model |

*The combination of the areas under discussion makes it possible to notice that in the context of manufacturing management at least four basic models of logistics activities should be created. They would constitute the average or a blend of the strategic and operational approaches to logistics – Table 1. Each model should be primarily interpreted in terms of the strategic approach to logistics.*

*Conceptual logistics deals with the determining basic conditions of manufacturing enterprise logistics management performance and building its operational concept on this basis. Its aim should be to design an optimal logistics solution for the identified boundary conditions, so that they would fulfill the basic principles of logistics. It should also identify those areas of the company that for various reasons cannot be integrated with logistics.*

*Adaptive logistics deals with the sphere of activities where the primary objective will be adjusting logistics to the actions of the enterprise in a way that would be most efficient, at the same subjected to the functional, non-logistic spheres of the company's activity.*

*Regardless of the chosen type of strategic approach to logistics, the effects of the operational approach should not change. Viewing the corrective logistics as actions aiming at correcting errors, mistakes and irregularities in particular spheres of logistics and contrasting this definition with the concept of improvement logistics (understood as achieving excellence in the logistics spheres, making them increasingly better), one may notice that both the former and the latter concept will have a similar result in the strategic approach.*

*In the conceptual logistics approach, the task of corrective logistics (the CC model) will be to lead to the situation where the designed logistics concept would function according to its initial assumptions, via a range of corrective actions. In the same approach, also issues will appear related to improvement logistics (the CI model) which, by development of e.g. logistics technologies would identify the areas enabling its improvement.*

*The same is true for adaptive logistics, with this difference that corrective logistics (the IC model) would perform the corrective function for logistics actions, in the direction of the basic logistics principles that have been omitted at the previous stages of enterprise development, in the course of logistics customization. Improvement logistics (the II model) may temporarily improve adaptive actions without the need to account for the fact that these actions are carried out on insecure foundations, as is the case with conceptual logistics. The logistics models presented from the strategic and operational perspective are therefore an appropriate complement of the original division, which distinguishes only conceptual and corrective actions, and a convenient starting point to assess the impact of the product itself and its logistical efficiency on the debated issue.*

## A LOGISTICALLY EFFICIENT PRODUCT

*The concept of a logistically efficient product gives rise to a dichotomous division of the approach to logistics management. The first one will refer to accepting the product as it is (having an ultimately decided shape, weight, form, packaging flexibility and a whole range of many other features, resulting from many different management areas), and thus making the maximum possible use of all accessible concepts, methods, techniques and tools of logistics management, so as the product would reach the customer according to the 7Rs principle. The second approach dictates treating the product as a starting stage for actions related to its improvement as regards enhancing logistics efficiency, as well as the actions connected with the design process. Thus, a design of a product is a starting point not only for its improvement in the physical sphere (concerning its shape, size etc.), but also in the area of other conditions having impact on its logistics efficiency (range of assortment, marketing and ergonomic requirements, the need of order handling, using logistics services etc.). However, this does not exclude the possibility of the full use of concepts, techniques, methods and tools for logistics management. Moreover, synergy may make them more efficient and effective.*

*The assumptions adopted by the author in the above-mentioned way, provide grounds to undertake research on the issue in question. Should it prove possible to distinguish a certain group of features that would influence the logistics efficiency of a product, it will change the current pragmatic viewing of logistics in the context of constant ongoing efforts to optimize individual logistics areas for the simultaneous modification of a product itself.*

*Defining conditions for a logistically efficient product should be preceded by specifying a precise definition of product as such, the notion of a logistics product and the concept of efficiency. Since the latter, used in the context of a logistically efficient product, seems slightly problematic in the initial stage of research, it will be used only to indicate the idea behind the entire concept.*

*The notion of a logistically efficient product stems from the combination of the definition of a product and a logistics product. A logistically efficient product will be understood as goods or service that provides benefits both to the manufacturer and the customer that has a number of features which facilitate or support logistics management of this product or service.*

*The above-quoted definition misses one crucial aspect regarding the relations between the customer and the manufacturer in terms of a logistically efficient product. An attempt to link benefits of a product logistically effective for the manufacturer and the customers is, in many cases connected with conflicts between the company that offers a product (adapting the product to flow and inventory streamlining) and the customer (who wishes to receive a product satisfactory for themselves). This often demands a compromise and creating an "imperfect" product which is friendly for logistic flows and processes and which simultaneously pleases the customer. Assuming that the problem of a product satisfactory for the customer fuses the issues of marketing, design, manufacturing, quality and many other management aspects, the author shall try to determine conditions which should allow to characterise a "logistically efficient" product as a set of interconnected features which allow to manage the product more effectively in terms of logistics.*

*Obviously, the overriding issue is to account for the fact that a product which is logistically efficient according to the concept of a manufacturing enterprise and the above-mentioned definition of a logistics product, needs to account for the flows and consistent with the system of information sand the decision-making processes.*

*The analysis of the logistically efficient product allows for some generalized assumptions which shall allow to properly interpreting the product conditioning in the context of its logistic efficiency:*

- *the concept of the product shall refer to both final product and all features assigned to it which directly or indirectly impact the issues of logistics – a widened structure of a logistic product,*
- *a product should be viewed from a dynamic perspective, i.e. involving both the product as such, related to the design and design process and the process of product improvement, which modifies the design in terms of logistic streamline,*
- *each of the conditions needs to be analyzed from the perspective of the customer, the manufacturer and common benefits,*
- *each of the conditions shall be analyzed in respect of optimizing one of the 7Rs.*

*However, commencing the determination of the conditions which define a logistically efficient product, one should also refer to some commonly accessible theoretical issues that would support the company's logistics actions. What need to be organized in the first place are the interrelations between elements of a logistics system, resulting from the functional division, namely: order handling, inventory management, warehousing, transport and packaging.*

*Analyzing the five aforementioned areas, one may come to a conclusion that particular subsystems need to be divided into those directly related to the product's features and those where this connection is indirect. The former include the subsystem of transportation, packaging and storage, while the latter consists of order and storage handling.*

## CHOSEN ASPECTS OF A LOGISTICALLY EFFICIENT PRODUCT – RESEARCH RESULTS

*In an attempt to provide the determinants of a logistically efficient product, it has been assumed that they might be sought in the following areas:*

- *transportation,*
- *storage,*
- *packaging,*
- *order handling,*
- *inventory management.*

*As it is not possible to discuss all logistics subsystems, the transport subsystem will be presented as an example of identification and analysis concerning the conditions for a logistically efficient product.*

*Dealing with the transport subsystem in the context of features influencing logistic efficiency of the entire system, one should remember that transport, operating as a binder between dispatch and delivery venues should draw plenty of information from order handling processes. Also inventory management shall be of significant meaning here. Transport is not only related to choosing the transport method, which for most small manufacturing companies is the road transport, but also to strategic choice related to the decision "Make or Buy" that is to arrange the transport with own resources or outsource transport with external carriers. These issues may be further developed, but in terms of a logistically efficient product they do not seem to be the crucial ones.*

*Analyzing transport and transport management in terms of a logistically efficient product, a general statement may be produced that a transported product should have:*

- *features which facilitate the transport itself (product sizes in relation to the available transport infrastructure),*
- *features which facilitate loading and unloading,*
- *no features which hinder transportation (external features such as sharp edges, internal features such as susceptibility to damage or to mechanical, chemical reactions, etc.) or features which enforce special transport conditions, e.g. appropriate temperature,*
- *a clear goods identification system,*
- *features which consider environmental issues.*

*Any features which facilitate the transport itself should include the ability to transport the product, already at the stage of the product design processes. Such issues as standard sizes of trailers, using Euro pallets or a possibility to transport in box vehicles, refrigerated lorries or other commonly used transport vehicles, the ability to employ rail transport by using particular cargo cars or finally issues related to containers and intermodal freight transport should determine actions related to designing new products and streamlining already existing products in terms of logistic management improvement. Also remarkable importance needs to be drawn to the part of issues related to loading and unloading of a given product.*

*Another product feature which impacts the transport process is the issue of external and internal features of a product. Golembska notices that these include all physiochemical properties but also the biological ones [6]. She also stresses that "the manager's knowledge of external (exogenous) and internal (endogenous) impact resulting from the construction of a logistic product is a condition precedent to handle such a product in the entire logistic system" [6]. It is hard to disagree with the author, but it should be noted that having a broader look at logistics, and therefore considering and anticipating some actions for product's specific features during its design phase, may remarkably simplify further transport processes. The manager's knowledge of the aforementioned features should also be determined by all actions aiming at improvement, which include either minimizing the impact of specific features upon transport processes or their elimination as far as it is possible.*

*Another, not less important aspect is related to a clear and well-thought-out goods identification system. It should facilitate the transport process itself and, which seems even more important, counteract and eliminate all mistakes which may occur in transport processes. This factor directly relates to the last factor, namely proper integration of the goods identification system into transport processes and entire logistics in a company.*

*Still growing importance is assigned to including the environmental aspects in most company processes. This also refers to the transport issue. It should relate not only to streamlining of transport processes in terms of selecting optimum transport routes and thus reducing fuel consumption, but also to "empty runs" (often unavoidable) or other manifestations of "transport waste". Moreover, options to use various and pro-environmental transport solutions should be considered here, such as water or railroad transport. However, to provide the possibility of verification for the presented assumptions in reality, the further part of this article will present fragments of research results concerning the issues in question.*

*In order to test small manufacturing companies in the aspect of the aforementioned concept of logistics and its conditions of performance, a survey questionnaire was developed which was divided*

*into: a part referring to the company manager, a part referring to operating conditions of small production enterprises and a part concerning logistics, divided into specific logistic subsystems and processes occurring therein.*

*It should be noticed that, as the problem of conditions of logistic management in small production enterprises is very extensive, and the scale of similarity of certain logistic processes resulting from specific features of given enterprises may differ considerably, research was decided to be carried out upon a certain heterogenic group of manufacturing companies which share a common characteristic of operating within a common branch – in this case the textile branch. The research started in November 2009 and concluded in March 2010.*

*Additionally, the research was intended to survey only those companies that are managed solely by native entrepreneurs and those not exceeding a certain turnover limit. Hence certain additional assumptions were made referring to: company size, ownership structure and income level.*

*Thus formulated research method makes it possible to relate the study to the issue of logistics concept in small manufacturing enterprises, but as the research results are extensive, the further part of the article shall be present research results concerning a logistically efficient product in respect of transport.*

*The presented research results concerning the issue of a logistically efficient product as regards transportation have been divided into four main areas regarding:*

- *transport conditions in the group of companies under research,*
- *assessment of the product's features which facilitate transport that are taken into consideration by the analyzed group of companies,*
- *determination of how product identification works in transport processes in the analyzed group of companies,*
- *determination of the extent to which environmental issues are considered in transportation.*

*While examining conditions of transportation in the studied group of companies, it should be pointed out that in case of supply, the entrepreneurs mostly use their own transport and for delivery processes own transport is prevailing. About 40% of the enterprises use their own transport only for supply needs, and ca. 30% of the researched companies use mixed transport for supply (their own and their supplier's). For distribution processes, the situation looks different, as in this case ca. 70% of companies deliver own products with own transport and only in 13% of cases transport is provided by purchasers of company's products.*

*Another question regarded the specialization level of transport vehicles possessed by the studied companies. In 70% plus of the researched companies, cars are used for transport and only 14% of the group is vehicles equipped with additional elements to facilitate transport, e.g. hangers.*

*The presented research results clearly show that transport means used by the researched companies are not, in most cases, specialized vehicles.*

*Further, as regards another group of conditions related to transport supporting product features, it is worth seeing that only 24% of the analyzed enterprises consider an option to pack products in collective packaging while almost 50% of the companies try to adapt individual products to transport needs – Figure 1.*

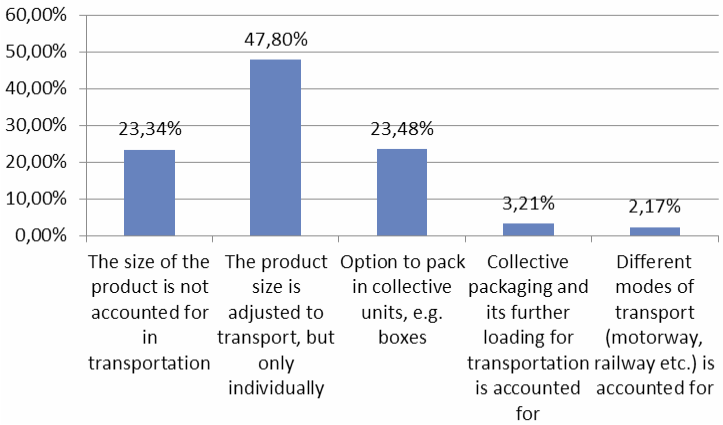


*Figure 1 - Adaptation of product features to transportation*
*Source: Own study, based on own research*

*As regards goods identification in transport processes, it can be clearly seen that most companies under research use simple actions for this purpose. A bothering fact is that ca. 15% of the surveyed enterprises do not use any visible system of goods identification (often an identification system is based on putting layers of given number of items of a product or a visual inspection and thus products are identified). Almost 50% of the questioned companies use small size IDs (size stickers or other hardly visible solutions, e.g. tags). Only 8% of enterprises use barcodes to mark their products.*

*The last analyzed issue relates to environmental issues. A quite representative outcome has been achieved in this respect, which logically comes from the previous research results presented, where the entire studied group considers no environmental issues whatsoever, be it when choosing a transport method or planning further delivery routes. The only dominating factor is the economic one which sometimes translates into the environment (e.g. using LPG propelled vehicles, optimizing routes using software of GPS equipment) but as the research shows this is merely a coincidental relation.*

*The presented research results show some specific conditions concerning logistics management in small manufacturing companies and in particular allow creating an opinion on the concept of a logistically efficient product in the light of transport in the researched companies.*

## THE IMPACT OF A LOGISTICALLY EFFICIENT PRODUCT ON THE LOGISTICS OF A SMALL MANUFACTURING ENTERPRISE – A SUMMARY

*The presented research results and the concept of the logistics efficiency of a product, as well as the model approach to logistics, allow an attempt to assess the scale of influence of a logistically efficient product on the logistics of manufacturing enterprises.*

*The determinants of the product in terms of its logistics efficiency, as the idea itself indicates, create a purposefully designed and organized layout of interrelated elements, providing, in the ultimate result, a given efficiency of logistics.*

*The analyzed research results directly indicate that enterprises do not show particular interest in identifying and supporting specific features of the product in the context of its logistics efficiency. Thus, the model, strategic approach to logistics (understood as a choice between conceptual and adjustment logistics), in the surveyed companies clearly indicates the need to decide on adaptive logistics. This stems from the fact that in most cases the surveyed enterprises do not perceive logistics and logistics management as a significant management area that might enhance their competitiveness. This in turn results in visible neglect in the area of strengthening the logistics features of the product.*

*The above-mentioned choice, when confronted with the research results, has its further consequences regarding the selection of one of the operational approaches to logistics. It becomes apparent that in terms of operational logistics these enterprises require corrective rather than improvement actions. Thus, an especially dedicated adaptive-corrective model will provide the possibility for the enterprises to correct their product. The correction process should be done in a way that would facilitate the fulfillment of basic logistics principles, previously neglected by the entrepreneur in the earlier stages of enterprise development.*

*Proper organization and implementation of the basic logistics principles will allow to gradually changing the operational actions of logistics from corrective to improvement-related one. Thus, space will emerge for the implementation of some particular processes that would improve the selected features of the product in terms of its logistics efficiency.*

*Unfortunately, adaptive logistics also has its limitations; it may turn out that the range of improvement and corrective actions is not sufficient to increase the logistics efficiency of the product as such, due to its very design and construction. Then, it becomes necessary to carry out logistics reengineering, meaning crucial and radical changes in the product construction, being at the same tame preparation to implement conceptual logistics, which, unfortunately, might not always be possible.*

*Further development of scientific research aims to identify the specific features of the product that influence the logistics efficiency of the enterprise, and to assess the strength of this impact. These actions will provide means to create a simple model, allowing not only to analyze and assess particular aspects of logistics in the strategic and operational sphere, but also identify specific patterns of behavior that enhance the efficiency of logistics within an enterprise.*

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