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Piotr BLAIK

LOGISTIC PROCESSES IN MANAGEMENT SYSTEMS AND VALUE CREATION

1. The essence and meaning of process orientation in integrated management

Useful practical experience in high-developed countries as well as current discussion concerning management seem to indicate the need for firms to concentrate, above all, on their aims and on process-orientated strategies. Firms are concentrating more and more on the creation of effective processes, on the management of these processes within the business as a whole, and on relations with other firms (customers and suppliers).

In the middle of the 1990s about 75% of firms in Germany used general process orientated methods of structuring a firm [1, p. 2]. The majority of these firms understood this as a new form of structuring the firm's processes. Only 12% of the firms constrained themselves to the optimisation of the existing process structure, putting emphasis on decentralisation and the integration of functions within the process framework. Approximately 38% of the firms undertook activities connected with new ways of structuring the processes. However, 50% of the firms decided on a new structuring of the firm, which expressed itself in the form of an increase in orientation towards clients, new process structures, structural changes, decentralisation, and flattening of the firm's hierarchy.

The necessity of a stronger orientation of a firm's activities at the process level is becoming more strongly emphasised and expounded in general management theory in the form of assumptions for process organisation, cost accounting of processes and process management, as well as in the interpretation (reinterpretation) of Porter's chain model of value.

Process orientation aims at overcoming the dichotomy between different spheres of a business, indirectly or directly creating value.

Some examples of the stimuli of development of process orientation towards processes are changes in the way of thinking and activities in the field of the structural form of creating and transforming value, product development, the relationship structure between suppliers and customers, the solving of clients' problems, the pursuit of comprehensive and synergetic solutions in the field of cost identification and rationalisation, and the pursuit of broader and more effective applications of modern methods and management tools. In general, it can be stated that process orientation is defined to a large degree by its integrating, co-ordinating, and creative character.

The integrating character of process orientation is highlighted, amongst other things, in the fact that the development strategy originates from the production tasks and not the present structure of the firm. All the activities involved in production and the intermediate processes mutually integrate into one whole process, which also takes into account the external spheres of co-operation of the company and in particular proper client-supplier relations.

The necessity of the co-ordinating character of process orientation is shown by experience, which leads to the conclusion that subsystems running optimally do not lead to an optimal system. This leads to a departure from systems based on a division according to function in favour of a division according to the individual processes and aims of the firm.

The creative character of process orientation involves the re-organisation and transformation of the firm. When re-organising within the framework of process orientation, the stress is put on divisions and an employment structure appropriate to the demands presented by the processes, and not on the existing organisational structure. This type of re-organisation is directed towards key processes (a clear chain of processes) as important starting points for the creation of added value and customer service. In this process, special importance is attributed to the interactions of all the functions of the firm in product development, proposing and optimising offers on the market (customer benefits) and the realisation of orders, as well as elasticity in the work timetable and the flow of information amongst others.

The introduction of process orientation demands and appears in a change in thinking in many important fields of activity within a firm, in particular at the level of the production process, product development, relations with market partners, achieving agreement and the creation of work teams, amongst others (see Table 1).

Table 1. Attributes of process orientation – Changes in thought patterns

Field	Attributes/Changes in Direction
Creation and transformation process	Connected as a dynamic and holistic process instead of the previous system of separately functioning fields (development, marketing, production, logistics, technology etc.).
Product development	Creation of a co-operative process across the functions of a firm, producing the appropriate product and taking into account the responsibilities of the functions of the firm in this process.
Internal and external relations	Including suppliers and intermediaries, as well as clients (the product users) in the process of product development.
Achieving consensus and finding optimal solutions	Making use of the negotiating process and skills, as well as solving conflicts within teams in order to make optimal decisions
Creation of management teams	The integration of work teams and increasing mutual trust and tolerance based on a process orientated way of organising work

Source: Author's own interpretation of: Muri, P., "Prozessorientierung- der Schlussel zum neuen Management", [in:] R. Muller, P. Rupper (eds.), *Process Reengineering*, Verlag Industrielle Organisation, Zurich, 1994, p. 143.

Process orientation in business management seems to gain particular meaning in the light of the possibility of achieving a higher level of activity and accountability, enabling co-ordination and integration of tasks, identification by employees of the relation between intermediate tasks and the aims of a firm, a long-term improvement in the recognition of client preferences and more effective ways of satisfying them, increase in growth of multidimensional strategic and synergetic effects, etc.

Table 2 presents examples of realisations of process orientation which represent models of the structure of basic processes (the process chain) in a firm.

The particularly important role of integrated processes of marketing and logistics, together with their structure of intermediate processes in the context of the structure of processes in a firm are presented in Figure 1. These are for example the process of identifying and forming a market and client preferences, the process of projecting and formulating a market strategy, the process of marketing and the logistics of customer service, the process of realising orders, the process of storing and efficient use of resources, the process of bringing a product onto the market, the process of achieving consensus, and the flow of information and work. These processes have a dynamic character and form parts of the

Table 2. Propositions for the structuring of basic processes in a firm

Author/Firm	Process Structure
T. Sommerlatte, E. Wedekind	The process of utility (benefit) optimisation for clients. The process of communication with the market. The process of preparing and realising a product as a market offer. The process of service (carrying out services). The process of realising orders. The process of ensuring profitability and financial liquidity. The process of ensuring the ability (potential) to create value. The process of planning and implementing strategies. The process of employee training and increasing motivation.
R. Manganelli, M. Klein	The process of recognising markets and client preferences. The process of formulating visions and strategies. The process of projecting products and services. The process of production and supply. The process of introducing a market offer and sales. The process of product guarantees and after-sales service. The process of personnel development and management. The process of information management. The process of managing financial and other assets. The process of managing change and improvement of the business. The process of managing relations with the environment.
ABC Toy Company	The process of product development. The production process. The process of realising orders. The process of information service to clients. The process of servicing client accounts. The process of developing human resources. The process of paying earnings. The process of insuring funds. The process of adapting to needs. The process of gaining orders.

Source: Author's own interpretation based upon: T. Sommerlatte, and E. Wedkind, "Leistungprozess und Organisationstruktur", [in:] Arthur D. Little (ed.), *Management der Hochleistungsorganisation*, Wiesbaden, 1990, p. 30; R. Manganelli, and M. Klein, *Reengineering. Metoda usprawniania organizacji*, PWE, 1998, pp. 35, 114-118, and 131.

system of marketing and logistics, based on activities which synchronise the various activities and undertakings and as such define the orientation in dealing with problems on the market and problems of the flow of information and work aimed at achieving the basic aims of the firm.

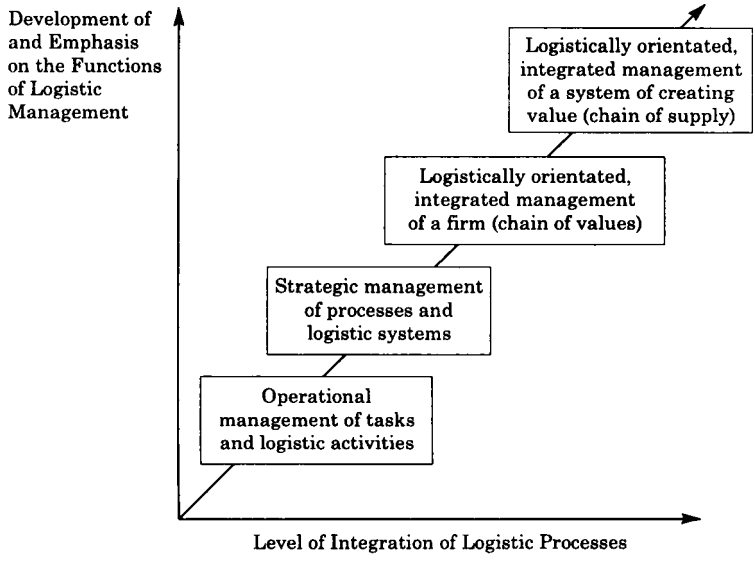

Fig. 1. The development of logistics in the direction of a concept of integrated management

The latest observations on a world scale indicate a growing need and an increasing number of occurrences of the treating and structuring of functions, together with logistic processes and instruments in the fields of co-ordination and integration at the system level, within the framework of a complete system of management and value creation at the level of the firm and a defined market structure. In the field of logistics, there is a change in emphasis from tasks and treating the areas of logistics as partial fields, to understanding logistics as a whole and concepts of strategic management and as a philosophy influencing almost every sphere of activity of a firm.

One can present the evolution of the concept of logistics in the direction of the increase in the importance of its integrating and strategic dimensions using two axes representing two tendencies, one characterising the development and scale of integration (from a concept at the level of functions to a concept at the level of processes and the system as a whole), and the other characterising the development of and the changing emphasis on the strategic functions of logistic management. The mutual links of the tendencies of logistic integration and the emphasis on the strategic functions of logistic management indicate various means of treating logistics and its development process in the direction of a concept of integrated management [2, pp. 100-133].

A combination of a holistic management approach appears in strategic logistic management, together with the integration and co-ordination benefits of logistics. These important attributes give rise to a new understanding of logistics in the sense of a process orientated concept of managing a business, whose aim is the efficient and effective structuring of all the processes connected with value creation [10, pp. 100-102].

In the struggle for their ever increasingly threatened existence, firms must undertake a logical sequence of actions connected with changing from an out-of-date, inflexible functional structure, to a dynamic and flexible structure ensuring efficient ways of planning and realising processes, more open to internal and external clients. From this point of view, one should treat a business as a network of dynamic processes creating a desired value system, and not as a conglomeration of static functions, whose aims are often conflicting. One should stress here the multi-dimensional character of the process network mentioned above and the cross-sectional concept of assisting the management of the firm, which determines the network of aims of the firm, the general planning system, steering of the firm, organisation and control, as well as defines the structure of human resources, etc.

The process dimension of a firm's situation was described by M. Hammer with the following bases of business process re-engineering [18, p. 36]:
- organisation of processes according to activities and tasks;
- introduction of the users of final product into the process;
- integration of information and transformational processes;
- treatment of dispersed resources in a centralised manner;
- parallel connection of activities rather than the integration of tasks;
- decision taking in the place where those decisions are put into action.

Such an approach contains new concepts of the effective functioning of a firm and significant potential of firm's efficient transformation. In general, this requires a thorough (in the innovational sense) transformation of the strategies, organisational and information systems, as well as the mentality and behaviour of the employees and the whole working environment in the firm. The transformation of a firm understood in this way embraces and is based upon changes in many strictly connected fields of tasks and activities coming under the influence of important structural determinants (see Figure 2).

Re-engineering key processes is thus an important factor in a holistic concept, which, together with the introduction of new businesses (processes) and systems aiding management (integrated marketing-logistic management, Lean Management (LM), Total Quality Management (TQM), Time Based Management (TBM), Efficient Consumer Response (ECR), Computer-Integrated Manufacturing (CIM). etc.), the remodelling of the production struc-

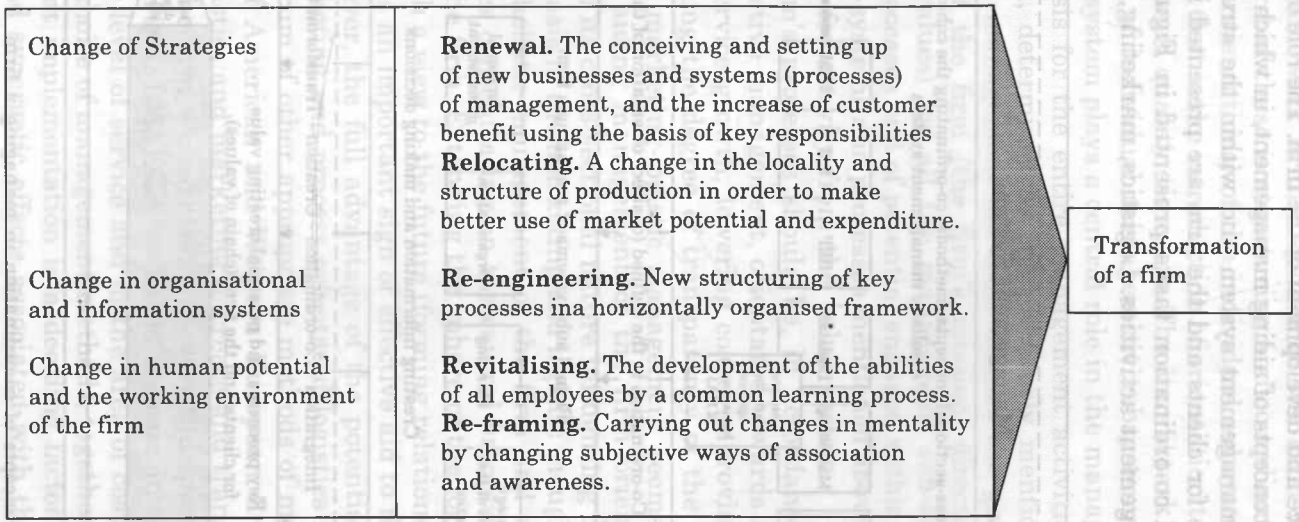

Fig. 2. Innovational determinants of the transformation of a firm

Source: Servatius, H.G., *Reengineering-Programme umsetzen*, Schaffer-Poeschel Verlag, Stuttgart, 1994, p. 42.

ture and the market offer, and changing the mentality of employees ensures the long-term existence and development of the firm. The role of logistics and other cross-sectional concepts of aiding management, in which we are interested, in a general management system and within the structure of processes creating value for clients and the firm are presented in Figure 3.

The concepts and co-ordination tasks presented in Figure 3 are put into action by management activities. Logistics, marketing, TQM, TBM,

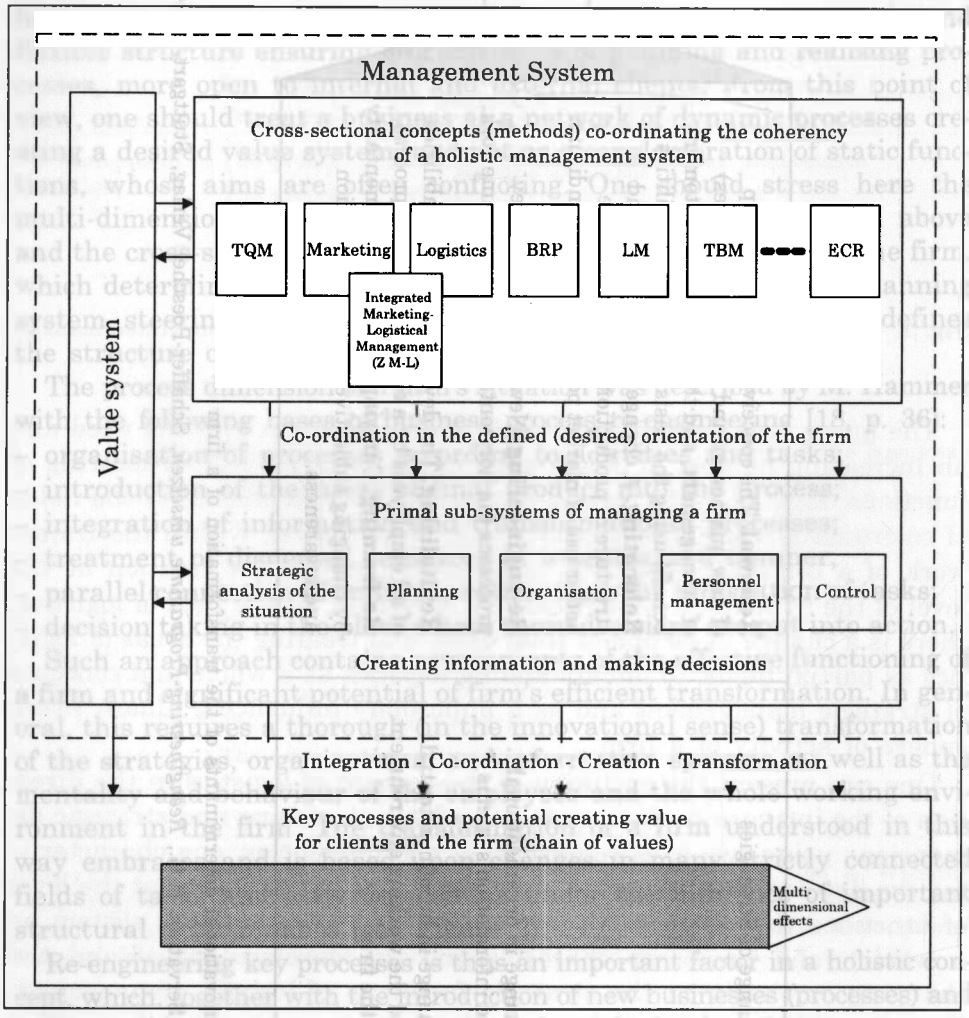

Fig. 3. Cross-sectional concepts of co-ordination in managing a firm

Source: Author's own interpretation based on: Weber, J., and Kummer, S., *Logistik-management*, Schaffer-Poeschel Verlag, Stuttgart, 1994, p. 16.

etc. are thus subject to a general management system and are realised within the framework of this system in the form of two co-ordination tasks. The first of these is structuring and co-ordinating the specific orientations (re-orientations) of the individual subsystems of the management system, that is the introduction of orientation towards information, clients, processes, quality, time, etc. The second task leads to the mutual co-ordination of individual management subsystems.

The value system plays a central role in the management system, creating the basis for the entire management activities of the firm. The value system, determined by the previously mentioned cross-sectional concepts and management aid tools defines the given orientation and philosophy of the firm (the firm's mission, directional aims, general norms and values) for all the management sub-systems and for the spheres of processes and of potential engaged within the firm. The management sub-systems and processes mentioned above draw the appropriate impulses for activity from the value system.

All the firm's processes should be, in accordance with the requirements of effective management, orientated towards achieving goal measures, like service growth, lowering costs, improving quality, reducing time, increasing the degree of transparency of the firm's actions, etc.

Integrated marketing-logistic management seems to play an important role in aiding management of the firm orientated towards processes, due to its cross-sectional nature influencing the whole firm. This shift of emphasis in the marketing and logistic thought processes and activities to a holistic management of the firm and structure of its processes ensures concentrating on the central processes involved in value creation by the firm. Extending the sphere of the logistic and marketing functions with a view to the future (forming relationships with suppliers and clients) is an important sign of effective aid to the managing of processes. However, the full advantage of the potential of integrated concepts of marketing and process orientated logistics is possible by using a wide spectrum of other appropriate methods of management aid. The experience of American and Western European firms shows that the ability of logistics and marketing to create and transform value for customers and the firm is clearly enhanced by the appropriate use of methods such as TQM, LM, ECR, etc. This appears in the simultaneous increase in the level of service and in the area of costs [1 pp. 12-29]. The appropriate choice of management methods, together with their effective and consistent implementation is a deciding factor in the obtaining of long-term and synergetic effects associated with these improvements.

The leading European firms in terms of the effective use of logistics (around 10% of all European industrial firms) pay particular attention to

the use of the concept of re-engineering, ECR, and work in teams (see Table 3). The expectations regarding the potential associated with the use of management methods are very high in the case of European firms. This is expressed in the predictions of its radical increase in strategic importance in the period 1996-2000. Firms expect, above all, an improvement in market effect (increase in service and client loyalty), together with rationalisation and reduction in costs from the more general use of these concepts of aiding the general management system. A sign of the spectacular achievements of these leading firms (so called 'leaders in the field of logistics') could be the noticeable rise in logistic services to the level of satisfying 98% of client demand, while logistic costs do not exceed 7% of the general costs of these firms [1, p. 14].

Table 3. The degree of implementation of modern methods in firms in western Europe

Management method (instrument)	Year		Year	
	1996	2000	1996	2000
	All the firms investigated		Leaders in the field of logistics	
	Application in percentage of firms			
Total Quality Management	44	75	50	71
Re-engineering	48	66	59	82
Concentration on key competencies	32	56	29	53
Strategic alliances	17	50	17	40
Efficient consumer response	20	45	27	73
Work teams	25	42	35	65

Source: Baumgarten, H., Wiegand, A., "Managementtrends und -entwicklungen in der Logistik", *Ergebnisse der Untersuchung Trends und Strategien in der Logistik 2000*, Technische Universitat Berlin, Bundersvereinigung Logistik, Berlin, 1997, p. 14.

Comparative tests show that, in general, European firms still show a high need and a certain lag in terms of the implementation of modern management methods in relation to firms from North America or Asia. The average European industrial firm makes use of only 4 or 5 different management aids simultaneously. The lag of European firms in relation to north American or Asian firms in the field of using modern concepts of management aids is smallest with regard to TQM and re-engineering and greatest in the case of the concentration of activities on their core abilities and the creation of strategic alliances. European firms could

discover further opportunities for the use of modern management aids by benchmarking (observation and copying) American firms.

With this as a background, the results of a pilot survey carried out in 1999 among 103 Polish businesses [5, pp. 10-14] seem to be particularly relevant. Various facts indicate lack of appreciation of the role of logistics within the activities of a firm and a low degree of awareness of the advantages accrued by using modern management aids. One is that above 50% of the respondents to a question about the use of logistic management methods stated that such methods have not been implemented. Furthermore, amongst the other management methods, the most commonly used were TQM (15.5% of firms), TBM (4.9%), and BRP (4.8%). In the light of the above comments, one can formulate conclusions regarding the strategic importance of process orientation in the integrated management of a firm and market structures in the form of the following hypotheses:

- discussions regarding modern logistics (marketing-logistical management) TQM, LM, TBM, ECR and other modern concepts and management tools should concentrate on the requirements of the development and use of process orientation and the management of key processes and potential;
- the concepts mentioned above, symbolising present-day changes in the process and system of management have a common denominator in the form of process orientation, which is the key to making use of all these concepts of management aids in aiming to achieve multi-dimensional strategic and synergetic effects;
- even by using the concepts (methods) previously mentioned one cannot produce the desired significant changes in a firm's structure (in the system of its behaviour) or the expected degree of long-term benefit without understanding the essence and role of a process based approach;
- the concept of integrated marketing-logistic management, along with the increasingly important concept of re-engineering, best illustrates integrating properties and attributes, as well as stimulating possibilities for the effective use of a wide range of means for modernising management and transforming the firm.

2. The idea of a process and its basic elements

The idea of a 'process' belongs to the set of ideas commonly known and used (especially in recent literature on management). However, it is not always correctly understood or interpreted. In this situation, namely

consideration of the problem of process orientation in management, the business of defining, or at least explaining, the essence of a process and its properties independently of specific applications and goals plays an important role.

M. Christopher defines a process in the context of a firm as activities of all kinds or the set of activities which, when carried out, add value to initial resources and pass on the product to an internal or external client [7, p. 163]. R. Manganelli and M. Klein treat a process as a sequence of related activities (creating added value), which lead to the transformation of inputs into the product of the process [16, p. 27]. H. Striening [23, p.17] presents a somewhat different definition of a process. He concisely defines a process as a series of actions with definite inputs and a measurable added value. On the other hand, according to J. Dangel [8, p. 15], a process embraces a chain of activities, directed at creating value (products or a service) satisfying the demand of clients. In turn, U. Wegner [26, p. 50] defines a process as a system of activities, which results in the transformation of goods from an initial state to a final state. Finally, according to H. Hinterhuber [12, p. 66], a process is an entire set of integrated and related actions, by whose aid a product and/or service (value) is created according to the demands of internal and external clients.

An important relation, from the point of view of the structure of the management system and cost accounting for the process appears here between activities and processes. One may notice in the literature a relatively large degree of freedom in the use of these ideas. They are often treated with less precision than is required, often being used as synonyms. These categories are directly connected with each other, which is clear from closer inspection of the definitions of a process in the context of the structure of a management system presented above. In the light of this, it is possible to conclude that a process is an integrated, purposeful arrangement or chain of actions, being on one hand the result of integration and structuring of actions and on the other hand an object of integrated management. Apart from the integrating aspect, the above definitions indicate that processes have a creative character. The definitions formulated by these well-known authors do, in fact, differ from the point of view of the nature and range of the ideas of the basic goal (tasks) of a process. However, they do all repeatedly indicate a general agreement as to the essence of a process and to its creative role in management, aimed at an increase in the effectiveness of a system of creating and transforming value. The task of a process is a defined transformation of inputs and materials into finished outputs and products of higher added value to clients. This means that during such a transformation process, each object involved in it exhibits an increase in value, which also de-

fines the transfer costs of transferring particular objects within a given structure and steering mechanism.

Within this context, it is worthwhile investigating a little more deeply the morphology and structure of the categories of process, in order to identify more accurately their universal properties and structural elements. Better knowledge of the morphology of a process and the means to structure it are necessary in order to carry out a complex assessment (quantification) and modelling of that process.

P. Schuderer [21, pp. 59-60] categorises the following properties as being significant elements of the idea of a process ('a process tree'):
- the results of actions (activities);
- measurable inputs and effects;
- transformation;
- subject (factors carrying out the work);
- the object of activities;
- planning;
- internal suppliers and clients;
- external suppliers and clients.

In the case of properties indicating results of the activities, the important thing is to underline the fact that a process is basically composed of many activities, one after the other, which create a logical sequence of elementary actions and results (states), that is to say the tree of all possible and rational interactions: an 'action-event'. Elementary actions and results are understood, in the sense of identification and value creation, to define individual actions and results, which appear in the logical context of cause-effect and which make up a process and determine the subsequent phases and desired states of the process realisation. For example, the process of serving a client may be carried out as a result of such an event as a 'receipt of a client's order'. This event gives rise to a set of defined responses (actions in the form: 'check the state of produced goods', 'check that the order can be realised', 'draw a timetable to realise the order', 'take the product out of storage', 'carry out the service', 'present the bill for the service carried out', etc.), which are carried out by the appropriate units in the firm [6, p. 11]. These events and activities are, in this sense, the basic elements of the activities of a firm and their most important attribute is creating a basis for purposefully orientated activities of the firm and calculating unit costs. These actions (activities) can be divided into activities directly connected with the product (primary activities) and administration activities (secondary activities).

Each particular activity is connected with a measurable input, which 'enables' that activity, together with a measurable effect, which is a result of that activity. Moreover, this result of the activity is the basis of

the realisation of the next activity. Within this framework of actions (activities), a transformation of inputs into an effect is carried out in a structural sense.

The actions of a process are realised by the appropriate people, that is to say work groups and/or means of carrying out work defined as 'factors carrying out work'. The next structural element of a process is the appropriate object on which work (of a physical or information-regulatory nature) is carried out. Defined transfer and transformation actions are carried out with regard to this object.

In order to ensure the desired, controlled flow of the realisation of a process, it is necessary to appropriately describe the process. That means that a process should have a uniquely defined start and finish. This is important for the goal-based orientation of any given process.

The last two elements of a process, that is to say internal suppliers and clients, as well as external suppliers and clients, should underline the importance of the existence of proper client-supplier relations in the action and process structure by agreeing on the level of service. These relations may appear as the relations between departments of a single company engaged in the same process or between a given firm and suppliers or clients. Due to the fundamental importance of this element in the understanding of the essence of a process as a chain of clients and suppliers, one should include this idea in the definition itself.

Finally, to complete these comments it is worth noting, that a correct definition of a process and its holistic interpretation also leads to the formulation of expected (planned) and obtainable final effects and their appropriate structure, the defining and structuring of appropriate organisational units and the means of the appropriate carrying out of the process and its realisation, the defining and identification of fundamental constraints, the defining and allocation of competency in the field of steering and controlling the flow of the process, the determination of the information structure required to realise the activities, which in turn generate the appropriate information, etc.

To recap, it is possible, in the light of the above comments to state that independently of whether the subject of analysis is development, production, marketing, logistic or administrative processes, any of these processes may be treated as a repeated and well-defined sequence of actions, orientated towards clients, defined by the flow of materials and information within the boundaries of the individual spheres of activities of a firm, and embracing primary and secondary activities, which create value.

A set (synthesis) of processes, connected by flows within a business present, in the form of a chain of processes, the next higher phase of aggregation in the hierarchy of processes. A chain of processes understood

in this way may be treated as an ordering of individual partial processes (elements of a chain of processes), orientated towards a defined flow of actions. One example of a chain of processes might be a client service process as an expression of the integration of marketing, logistic, technological and financial processes (sub-processes) of customer service. Above all, strict orientation of all the processes involved in these chains of processes towards the realisation of the idea of the prime role of the interests of clients and suppliers, together with their common membership in the same flow of actions is a deciding criterion for the creation of a chain of processes. The degree of certainty that no faulty outcome of the work from a process previously carried out will not affect or determine the flow of the next process may be increased by a coherent implementation of the rule mentioned above.

The structure of a process changes in the light of changes in the flow of actions within a firm. One may thus treat a firm as a complex, open system (network) of dynamic processes, orientated towards a multitude of mutual relations with internal and external suppliers and clients.

3. Classification and identification of logistic processes in the aspect of management and the market

3.1. Criteria and cross-sections of process classification – a general interpretation

When attempting to classify processes, one should first of all take into account the problem of determining the criteria differentiating and indicating different types of processes, their character and importance. The determination and classification of the properties of various types of activities (actions) and processes, and also a further structuring of the categories of process and a qualitative assessment of a given process (action) is possible when based upon appropriate classification criteria. This is particularly important for the carrying out of analysis of structure and the weak points of a system orientated towards goals and effectiveness.

Table 4 [21, pp. 64-65] presents the general systematics of these criteria and the resulting specification of the attributes of a process resulting from these criteria. These criteria can be differentiated into two cross-sections according to whether they regard the whole process as a series of activities or only individual activities in the process.

The following criteria are the most commonly used in the literature: the criterion of a hierarchy of processes, the criterion of form of the structure of the process, the criterion of the type and object of the flow of actions, and the criterion of relation to the creation of added value.

Table 4. A general classification of criteria and processes together with their attributes

Criteria	Attributes of the process/activities	
Level of aggregation (structuring)	The firm as a structure of key processes (chain of processes) General (holistic) processes Sub-processes at various levels (in various fields) Actions/activities	
Added Value	Processes/activities directly creating added value Processes/activities indirectly creating value Processes/activities related to value Processes/activities not creating added value	
Means of structuring the flow	Sequential processes Alternative processes	Parallel processes Cyclical processes
Sphere of activity	Production processes Realisation processes	
Frequency of activity	Repeated processes Innovative processes (one-off)	
Role	Primary (fundamental) processes Secondary (auxiliary) processes	
Functions	Production processes Purchasing processes	Construction processes Development processes
The object of the flow	Processes/activities connected with the flow of ideas Processes/activities connected with the flow of information/documents Processes/activities connected with the flow of goods	
Impact	Functional processes	Multi-functional processes
Character of activity (decision)	Operational processes Processes connected with the transmission of instructions	
Character and object of an action	Unit (elementary) actions/activities Complex actions/activities Actions/activities connected with the product Constantly repeated actions	
The nature of an action (event)	Transformation Transport	Assembly Preparatory actions

Source: Author's own interpretation based on: Schudere, P., *Prozessorientierte Analyse und Rekonstruktion Logistischer Systeme. Konzeption-Methoden-Werkzeuge*, Gabler Verlag, Deutscher Universitats Verlag, Wiesbaden, 1996, pp. 64-65.

The first case, that is the criterion of the level of aggregation or segregation, often also defined as the basis of vertical classification and the hierarchy of processes is used to present the structure of a firm and its

processes at various levels of generalisation and detail. A system diagram illustrates the model hierarchy of processes: the level of the firm (the integration of primary and secondary processes at the scale of the firm); the level of defined, fundamental holistic processes; the level of sub-processes, the level of sub-sub-processes, the level of sub-sub-sub--processes, etc; the level of actions; and the level of activities and elementary events. The flexibility of a given combination of attributes of the structure of processes results rather from the differing demands of practice, depending on the nature and goals of a firm, than from the fact that a variable number of levels of a hierarchy are available to a firm.

The form of the structure of activities and processes and the nature of the relations between them are used as another important classification criterion. This criterion determines the complexity of the network of logistic processes of the flow system and has a deciding influence on the structuring of appropriate methods for the description of processes. Four different means and relations of flow are categorised, namely: sequential flow, parallel flow, alternative flow, and circulatory flow.

The criterion of the object and type of flow differentiates and determines the object and the character of actions, defining at the same time the specifics and the structure of actions and processes. One may define all the possible phases of the transformation of a particular object and the realisation of tasks connected with the object within the framework of a given process and with the aid of given factors (goods, ideas, information, documents, etc.), together with the nature of the activity (transformation, transportation, assembly, preparatory work, etc.)

From the point of view of process management in a firm within market structures and assessment of the effectiveness of these processes, the role of the classification criterion and the analysis of processes according to their effect on the growth of added value (an increase in quality and the utility of the supply offer, an increase in the speed of realising orders and supplies, cost reduction, etc.) is being more and more emphasised.

One may differentiate between three categories of process influencing the growth of added value within the framework of logistic management of a flow system. These are processes and activities directly increasing added value (e.g. the process of realising orders, the process of client service), processes and activities indirectly increasing added value (e.g. processes ensuring the quality of purchases and the acceptation of products, processes predicting the logistic situation of markets), and processes and activities related to added value being a condition for its growth (e.g. the research and development process, process of creating relationships with the surrounding environment).

3.2. Primary and secondary logistic processes

As underlined previously, the structure of creating value and services in a firm cannot be treated as a conglomeration of static functions, but should be understood as a structured network of dynamic processes. The central task within this network is more and more often attributed to logistics, which should overcome temporal and spatial problems, simplify the crossing of borders in the hierarchical and functional structure, as well as co-ordinate internal and external processes. How the basis of logistic orientation results from the rules of the systematic approach, as well as from the rules of the optimisation of flows, may be observed in practice as a tendency to institutionalise logistic activities in a firm, in order to optimise functions. By connecting the logistic activities in a firm and their full inclusion in the value chain, one can treat them as equally valid activities from the point of view of value creation, enabling original input to the growth of consumer utility, as well as decreasing costs.

Within the framework of logistic processes, one may categorise, as does M. Hadamitzky, key primary processes and secondary processes. In turn, within both the first and the second group of processes, one can categorise partial processes and activities (see Table 5).

Table 5. Primary and secondary logistic processes

Primary processes		Secondary processes
Processes of the flow of goods	Processes of the flow of information	
Storage Transport Receipt of goods Product distribution Management of side products/waste Servicing, logistic service	Planning, distribution, production, storage Giving orders with respect to distribution and realising orders Steering the flow of production Processing orders	Logistic management (creating goals, strategies, personnel management) Logistic control (planning and control of costs and services) Logistic research and development (projecting logistics, technological and personnel development, Cross-functional co-ordination (regarding new products, information technology)

Source: Author's own interpretation based on: Hadamitzky, M., *Analyse and Erfolgsbeurteilung logistischer Reorginasationen*, Gabler Verlag, DUV, Wiesbaden, 1995, p. 70.

Key logistic processes bring together purchase, production and distribution processes, changing the temporal, spatial, quantitative, qualitative, and categorical properties (attributes) of goods and information. These pro-

cesses consist of chains of processes of the flow of materials and goods, as well as the accompanying information flows. The processes of storage, transport, accepting goods, supply to customers, and management of side products/waste and service are partial processes of the flow of materials and goods, as is their connection with the transformation process and with suppliers and clients. The obtaining, use, selection, and transfer of information, generating the origin of the flow of materials and goods and regulating and documenting this flow is an object of the chain of processes. One can categorise a set of activities connected with the realisation of an order, as well as every information, communication, or co-ordination process, which is necessary for planning, use, and steering of logistic objects and resources.

Unlike key, primary logistic processes, which in general must be realised in all production firms, secondary logistic processes depend on the concept of logistics and the management model implemented in a given firm. Secondary logistic processes relate to management and the further development of base processes. They embrace strategic, administrative and operational processes of planning and decision making in the structuring, co-ordination, and optimisation of logistic systems. The following, in particular, belong to such activities: planning and control of logistic costs and services, the development of logistic strategies, ensuring effectiveness and reliability of logistic systems, the implementation of logistic projects, the development and implementation of logistic technology, personnel training and the enhancement of management using knowledge and innovations, as well as the use of logistics in the introduction of new products, etc. [11, p. 70].

Logistic activities and processes create dynamic ties (interactions), which affect every sphere of the firm's system, from client orders, through acquiring raw materials, to the distribution of products. These activities equally apply to transformation of the objects of actions, as to their transport, assembly, and transfer.

H. Wegner [27, pp. 23-24] presents a somewhat different structure of logistic processes, categorising two main groups of logistic processes, namely major strategic processes and major operational processes. The following belong to the major strategic processes: the planning of goals and major strategies, the controlling of logistics, and the structuring of a logistic system. On the other hand, the process of realising orders, logistic processes in purchasing, sales and distribution, the process of planning and steering production, as well as after-sales service create the structure of the major operational processes. Here, the quality and reliability of operational processes are determined by the range of strategic processes in the firm. According to H. Wegner, the effectiveness of structural and organisational system-wide solutions in the sphere of lo-

gistics depends on such factors as the process of creating goals and strategies, as well as the structure of the logistic system.

Operational processes should be differentiated according to the connections with the market and type of activity. These processes are orientated towards external clients, creating value for them. They are structured as well-defined, integrated fields (systems) of a sequence of activities extending beyond a functional and hierarchical structure and the competencies of organisational units.

With regard to the number of possible activities in a sequence within a firm, one may define and form (organise) logistic processes specific to a firm of varying degrees of concretisation. The starting point for a system-wide structuring of the organisation of tasks is a division of logistic tasks within the framework of strategic and operational processes.

When assessing activities from the point of view of creating value, one should be aware that logistic tasks themselves are important sources of process orientation in satisfying the principle of circulation. Thus within the firm, in a process based approach the organisation of logistic tasks is a central basis of a system-wide structuring of activities orientated towards processes.

Aiming to carry out logistic processes involving the whole structure of an organisation, in the opinion of M. Dinges [9, p. 185] one should first define (create) holistic logistic processes and their structure in the form of general processes and partial processes (sub-processes) of providing a service (see Table 6).

It should be noted that up to now the spectrum of the supply of logistic services was to a large extent realised by partial processes. However, from the point of view of customers great benefits result mainly, when the supplier (service provider) takes the responsibility for the realisation of a whole process, which provides complete logistic services.

3.3. Processes and the change in added value

Returning to the structure of processes based on Porter's chain of values, one may see that the categorisation of processes according to input into creating value seems inadequate from the point of view of a logistic orientation. In particular the following problems are apparent.

Firstly – the lack of a means of selectively placing the previously mentioned processes into one of the categories of value creation. The example of the construction process, considered by Porter is treated as a secondary process and thus does not directly create value. This process might be variously interpreted according to whether it relates to mass production of a product sold entirely in an anonymous market, or as part of

Table 6. General and partial logistic processes

General Processes	Partial Processes
Management processes in the sphere of purchasing	Determining the needs for materials Choice of suppliers Realisation of orders Receipt of materials Payment of bills
Preparing a product	Ensuring quality Technical specification from the point of view of the client Internal transport
Analysis of market supply	Analysis of the logistic situation in the market Forming the logistic factors favouring sales
The realisation of orders	Taking orders Supply Billing Dealing with complaints Organising and carrying out storage Loading and packing Organising and carrying out transportation Accepting return of goods, recycling
After-sales service	Customer services Repairs

Source: Dinges, M., Buttner, M., "Effiziente Logistik durch Integration von Dienstleinstern", [in:] A.D. Little (ed.), *Management im vernetzten Unternehmen*, Betriebswirschaftlicher Verlag Dr. Th. Gabler, GmbH, Wiesbaden, 1996, p. 185.

a commission orientated towards a client. In the second case, the producer makes his offer in relation to the commission, the client, and his specifications. This type of construction process may be regarded as a primary process and thus as one directly creating value.

Secondly – the low degree of categorisation. Two categories for the categorisation of activities and processes regarding the input and level of added value might not fully reflect the procedural variety. In Porter's categorisation there is a lack of differentiation between processes with regard to customer interaction. In this scenario, a question might appear as to whether the function and activities of purchasing are not much more related to the customer than, for example, strategic planning or security of the firm (place of work). Also, there is a lack of clear differentiation between activities and processes, which might be a cause of waste, as for example: the doubling of roles, halts

in work (waiting time), assembling and transporting goods several times, numerous customer claims, quality control at too many stages, etc.

It should be stressed here that the exact categorisation, resulting from the assumption of creating added value of the activities and processes carried out in a firm in the field of client orientation is difficult and requires refining in the light of the problems mentioned above.

Table 7 presents a proposition for a refined categorisation of value creation in the framework of the logistic management of a system of flows.

Table 7. Structure of the categories of creating value in the management of a system of flows

Processes and change of added value	Differentiation between the processes according to the character and degree of interaction with clients and orientation towards their market demands
Processes directly creating value	Processes characterised by a direct and close interaction with clients – primary (major) processes
Processes indirectly creating value	Processes characterised by an indirect interaction with clients – secondary (second level) processes from the point of view of creating value (auxiliary processes)
Processes related to creating value	Processes characterised by a relative (conditional) interaction with clients – tertiary processes from the point of view of creating value
Processes not creating value	Processes unrelated to interactions with the client – a potential area for waste

Source: Schuderer, P., *Prozessorientierte Analyse und Rekonstruktion logistischer Systeme*, Gabler Verlag, DUV, Wiesbaden, 1996, p. 51.

P. Schuderer differentiates the following four types of processes with regard to the relation to the categories of creating added value:

- primary processes, directly involved with the client and directly creating (increasing) added value;
- secondary processes, indirectly involved with the client and indirectly increasing added value;
- tertiary processes, with a general and relative interaction with the client and with the creation of added value;
- processes unrelated to the client and not having any positive influence on the increase in added value.

Within the framework of primary processes, one may in turn differentiate between major processes and auxiliary processes. The characteristic attribute of major processes is that they start and end with contact with clients in the market. These are, in particular, processes which create and

supply appropriate value and benefits to a customer, in the form of products and services useful to the customer, for which the customer is prepared to pay the firm an appropriate price. In this way, these processes directly create and increase value for the customer, most often showing a strong temporal relation with the wishes and preferences of the client. Examples of such processes are the projecting and creation of new products, the process of customer service, the process of realising orders, the process of minimising costs in the chain of supply leading to a decrease in the price of the offer satisfying the demands of the client, the process of distributing goods, etc. Auxiliary processes form a second group of primary processes. These are called into being by the major processes. Examples of such processes are processes of obtaining materials, adapting and preparing materials within specific fields of the flow of materials, pre-production processes, and the assembly process. Auxiliary processes are necessary for the existence of major processes and are somewhat less related temporally with customer demands than major processes.

Secondary processes fulfil auxiliary functions with regard to primary processes and are characterised by only indirect interaction with clients. With auxiliary processes, which directly create added value, secondary processes lead indirectly to an increase in this value. As examples of auxiliary processes one might mention the process of ensuring the quality of purchases, the process of analysing and predicting the logistic situation of the market, the process of ensuring and developing the qualifications of personnel, etc.

In the case of processes defined as tertiary, the emphasis is on processes which are at a large distance, hierarchically and temporally, from the processes of creating added value. Such processes are 'distant' to primary processes in a temporal sense and in their nature. However, even in this category there may be relative interaction with clients. Thus, these processes are conditionally connected with the creation of added value. Belong here the process of fundamental research and development, the process of developing relations with the environment, the process of improving work safety, etc.

With regard to processes which do not create value, the emphasis lies on activities and process which in general do not show any interaction with clients. These are most commonly such processes as dealing with complaints, repeating work, carrying out corrections, intervals in work and waiting time, etc. These fall into the category of 'waste' and as such do not in general make any positive impact on the increase in value of a product. Identification and diagnosis of these activities and processes may form, in consequence, the primary source and incentives for an improvement in the whole flow system.

The above attempt to categorise of creating value should be treated simply as a symptom of the tendency towards a deeper structuring of logistic processes. Thus, it cannot be treated in a completely unambiguous manner. This means, among other things, that major processes, which are defined as those showing direct interaction with clients and, according to this definition, influence the increase in added value to a high degree may contain activities not creating value within their own structure. This also may apply to all the later categories and processes leading to an increase in value.

3.4. Processes of logistic transformation with regard to creating value

One should understand creation of value basically as a process of transformation, needed in order to achieve added market value. A generalised, model formulation and mechanism of logistic transformation is presented in Figure 4.

According to the concept presented in Figure 4, the objects of an activity mentioned, i.e. material goods, energy, information, financial sources, etc. undergo change within the transformation process. Here, changes in these objects may basically relate to the parameters of time, space, amount, quality, form, etc. The transition from State 1 to State 2 follows from the logistic process of transformation. This transition is defined by the change of at least one parameter. The goal of the transformation process is to increase the value of specified objects of the activities, which takes place by the realisation of fundamental logistic processes (overcoming spatial and temporal differences, improvements in the quantity-quality structure of the offer, increasing the degree of logistic determination of supply etc.) This value is defined by client orientated attributes of the achieved state of transformation of the object of activity, which represent specific benefits to the customer. The appropriate transformation commission (client order) describes the planned change of the state of the object of activity with respect to parameters of time, place, quantity, quality, and form. This also allows a clear definition of the desired attributes of the object being transformed. Attributes, defined in the transformation commission, present desired factors, which should be attained in the process of creation and transformation. Technical means related to the flow of materials, means of information flow, infrastructure, personnel, and energy fulfil the role of operators (elements of the logistic chain) required in order to realise this transformation process.

The system-wide nature of the transformation process and creation of added value may be more strictly defined by using the ideas, used in the

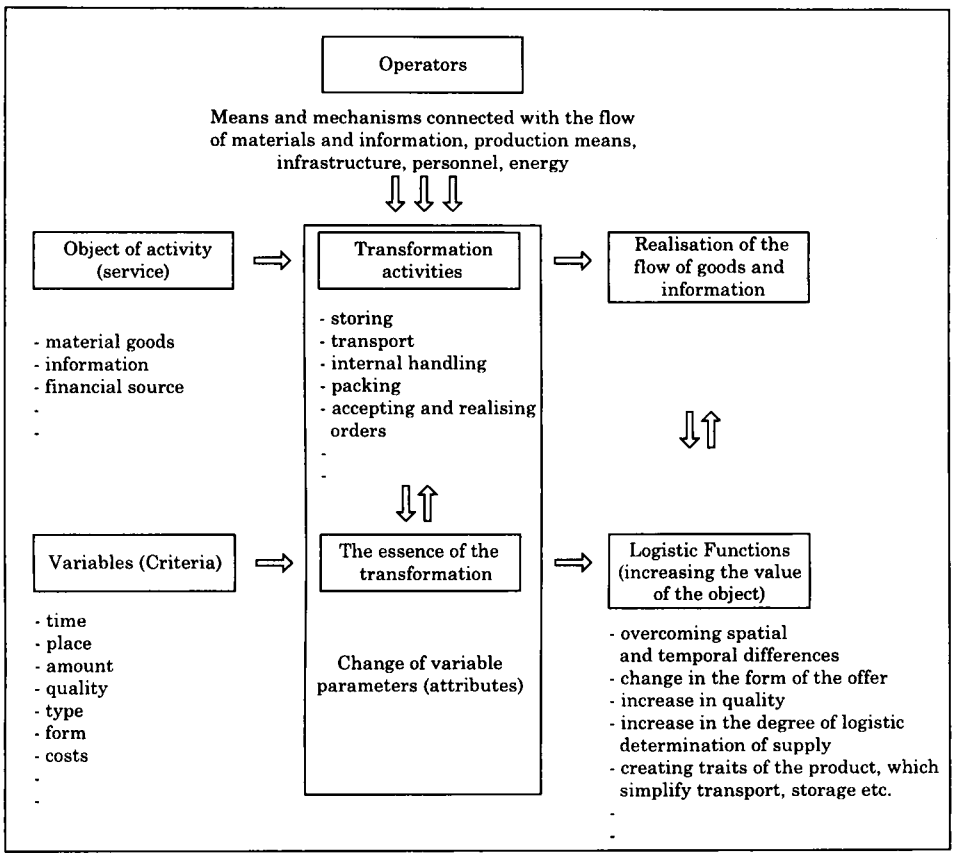

Fig 4. A general formulation of logistic transformation

Source: Author's own interpretation based on: Koch, U., op. cit., p. 79; Schuderer, P., op. cit., p. 49.

literature of: added value, chain and system of creating value for a client, and the logistic chain of value.

The transformation process is characterised by two states of the system, namely the initial and the final state. The initial state denotes the situation at the beginning, defined according to the recognised preferences of customers and criteria of expected benefits, which define the readiness of clients to buy. The realisation of these customer preferences and the conditions defining the willingness to purchase defined benefits are fulfilled in the final state of the transformation process by the achieved value to the client. A comparison of the realised transformed profile of objects in question (the exit state) with defined requirements in the transformation commission (the desired state) indicates the level of

satisfaction of the required demands (the level of service) and the quality of the transformation process (see Figure 5).

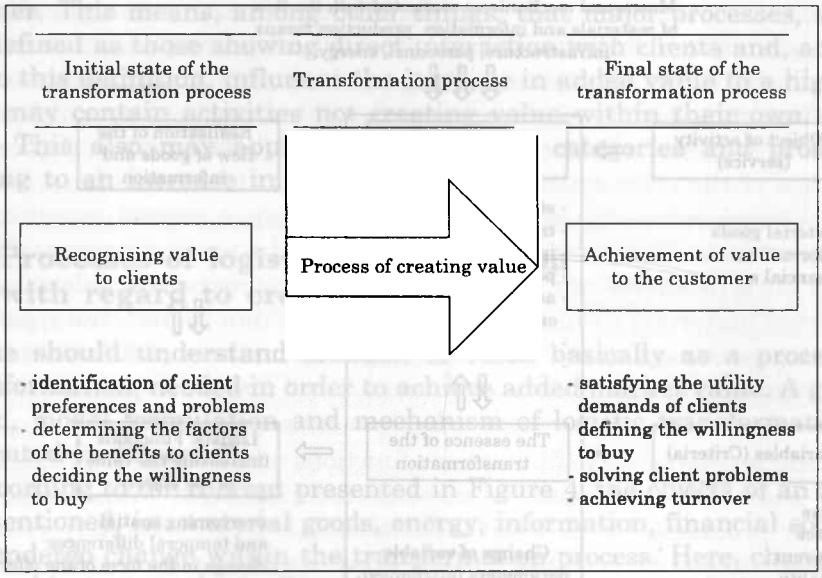

Fig. 5. A client orientated process of creating value
Source: Klopper, H., op. cit., p. 119.

The major, system-wide basis for a client orientated process of creating value, introduced here as a transformation process, from recognising to realising value to clients is based on the assumptions of the concept of marketing. According to this concept, it is assumed that the key to the success of a firm is the recognition and realisation of client needs and demands. The concept of marketing differs from a concept of a production orientated strategy of activity precisely in this external, client orientated approach. A trend towards client orientation, and the increasing importance of the concept of marketing and concentration on client benefit associated with it should in practice be indicated by a change in the strategic behaviour and activities of a firm with regard to the market. Significant incentives for restructuring and a new orientation of the value creation system in a firm, taking into account the potential of logistics, seem to lie in a change in these behaviours and activities.

One can achieve a concretisation of this new orientation, whose goal is to create value for the customer, with the aid of a deeper interpretation and analysis of the chain of creating added value. The concept of the chain of creating added value is an appropriate methodological basis for a de-

scription of the transformation process which creates value. A holistic treatment of the chain of creating value occupies a central position in the management of a system of flows. Extending the structure of the chain of creating value within a firm to phases (chains) of creating value, including the suppliers and clients leads to the formation of an appropriate system of creating value. This extended system of creating value is thus a indicator of the integration of the chains of value of various market players (clients, firms), which in result means the firms involved in this system add to the total added value, which represents the final value of goods and services to customers in the form of a cumulative value.

The concept of the chain of creating added value is defined as links or phases of the transformation process, in which products and services are realised, starting from initial materials and finishing with the final aim, that is the realisation of value to the customer [21, pp. 50, 15, and 121]. On the other hand, the added value is the result of the process of creating value defined in an appropriate manner. In economics, one understands added value to be the value which a product or service supplies (creates) to a client from the point of view of the client. The client is willing to pay an appropriate price simply for this value (benefit). Added value is a measure appropriate for the appraisal of the process of creating value by a firm, whose goal is to offer clients measurable benefits. The benefit to the client, which is defined by the value and price of the good or service may be presented as the sum of the desired attributes of the benefits offered to the customer (basic and additional). Examples of potential sources of obtaining client benefit, and thus a basis for creating value are: quality, functionality of the product, reduction in time, reduction in costs to clients, reliability and punctuality of supply, flexibility of reactions, servicing orientated towards solving customer problems, etc.

The system of creating added value occupies a central position in the management of a firm and of market relations (relations with suppliers and clients). This system embraces all the transformation processes (material and logistic), which create value, in a given firm and also in the relations with other firms. The primary goal of the system of creating value is the realisation of benefits and value to customers. The value to a customer, appearing in the form of sales achieved (as an indicator of further transformation) creates a basis for the realisation of economic success (profits) of a firm. An economic indicator of the market success of a firm is the added value to the firm, which forms a second interdependent dimension (component) of the value created. Added value, from the point of view of a firm is characterised by the market value of goods which the firm obtains as a result of resources used and activities carried out. This value may be defined as the difference between the total

value of sales (price) and the value of materials and services purchased [15, pp. 106-107; 24, p. 1270]. The difference obtained in this way, that is the monetary value (embracing the costs and gains accrued by a firm) is the added value, which a firm gains as a result of its own activities (activities and services in the process of creating value). An important dimension of the success of a firm in market relations is the gaining of additional benefits compared with its competitors.

The chain of creating value may be treated as a system of functions creating added value. It embraces, at the level of the firm, elements and functions creating value, starting from the structure of production and technology used, through material and logistic transformation processes, to servicing. A large influence on the basic structure of the chain of value comes from the scope of the basis of logistic thinking and activity implemented, which determines such important elements and functions as: source and structure of incoming supplies, relations with suppliers and clients, the reliability of incoming supplies, the level and structure of material resources and goods, the structure and channels of distribution of goods, transport and storage systems, etc.

Implementing the bases of logistic thought and action leads to the concept of a logistically orientated chain of value creation, in which especially the ratio (criteria) of value created by logistics to the costs related to this are optimised. System-wide identification and optimisation of specific increases in value within the chain of value creation give the possibility of identification, followed by a development of the logistic potential for success, as well as a formulation of a plan of action. A differentiated mechanism for generating orders in the chain of value creation is of crucial importance in formulating a strategy. A logistic-marketing concept with its orientation towards clients defines the scope of individual realisations of recognised, defined customer demands (preferences). This requires an appropriate adjustment of the structure of the chain of value creation to these demands.

The chain of value creation can be treated as a structured set of instruments for the analysis of formation of the transformation processes creating value. Since it creates the possibility of analysing the strategic position of firms, the concept of the chain of value creation is finding more and more applications in strategic analysis, diagnosis and prognosis of the market and logistic situation, as well as gaining central importance in strategic, integrated management.

The idea and concept of creating added value presented above forms the basis of forming a logistic value chain, which can be used as a fundamental set of tools in the structuring of logistically orientated, strategic management of a firm. Logistic activities and processes orientated towards

creating value for clients play a central role in the logistic chain of value, whose basis is the concept of Porter's chain of value. Unlike Porter's model, in the case of the concept of a logistic chain of value, all actions (including primary and auxiliary actions) are ordered in a chain. Here, the criteria forming the basis of the structuring and ordering of these activities are also critical factors of success in logistics, such as: time, costs, quality, space, flexibility, etc. Particular activities and functions should be co-ordinated according to the criteria mentioned above, creating an appropriate structure of processes orientated to the effective creation of logistic value for the customer and profits for the firm.

H. Klopper defines the logistic chain of value as a structured, strategic set of tools, with the aid of which one may present and analyse material and logistic processes of transformation, in order to identify value to the customer, recognise benefits accruing from competitive advantage, as well as the formation and development of appropriate systems of value creation, leading to the effective and reliable realisation of these processes [15, p. 141].

Three fundamental determinants of the logistic chain of value are important in the methodology of the development of its concept, namely (see Figure 6):

- base elements of the logistic chain of value;
- systematics and the mechanism of relations and transformations of basic elements in the transformation process;
- basis for appraisal of the logistic chain of value.

In the case of base elements of the logistic chain of value, one may in turn categorise the following components:

- objects of activity;
- transformation commission;
- system of value creation.

The objects of activity, towards which the activities of the system of value creation are directed are the objects of value to the client as goods and services. Objects appearing in the form of material objects (raw materials, auxiliary materials, building parts, etc.) or in the form of information may be understood as input factors into the system of value creation. At the end of the transformation process, the objects of activity appear as determinants of these effects, to which appropriate, transformed attributes can be ascribed.

The transformation commission defines the planned change of state in the objects of activity with regard to time, place, quantity, quality, etc. The expected attributes (criteria) of the value and service from the point of view of the client, and defined in the transformation commission (in the order) define the goals of the transformation process.

On the other hand, the system of value creation is the appropriate 'transformer' of the co-ordinated interaction of the components of the system orientated towards value. The transformation process of the system of value creation is determined by the following components of the system:
- activities (activities in the production sphere, activities connected with the flow of products, and activities connected with the flow of information);
- resources (human resources, financial resources, material and non-material resources);

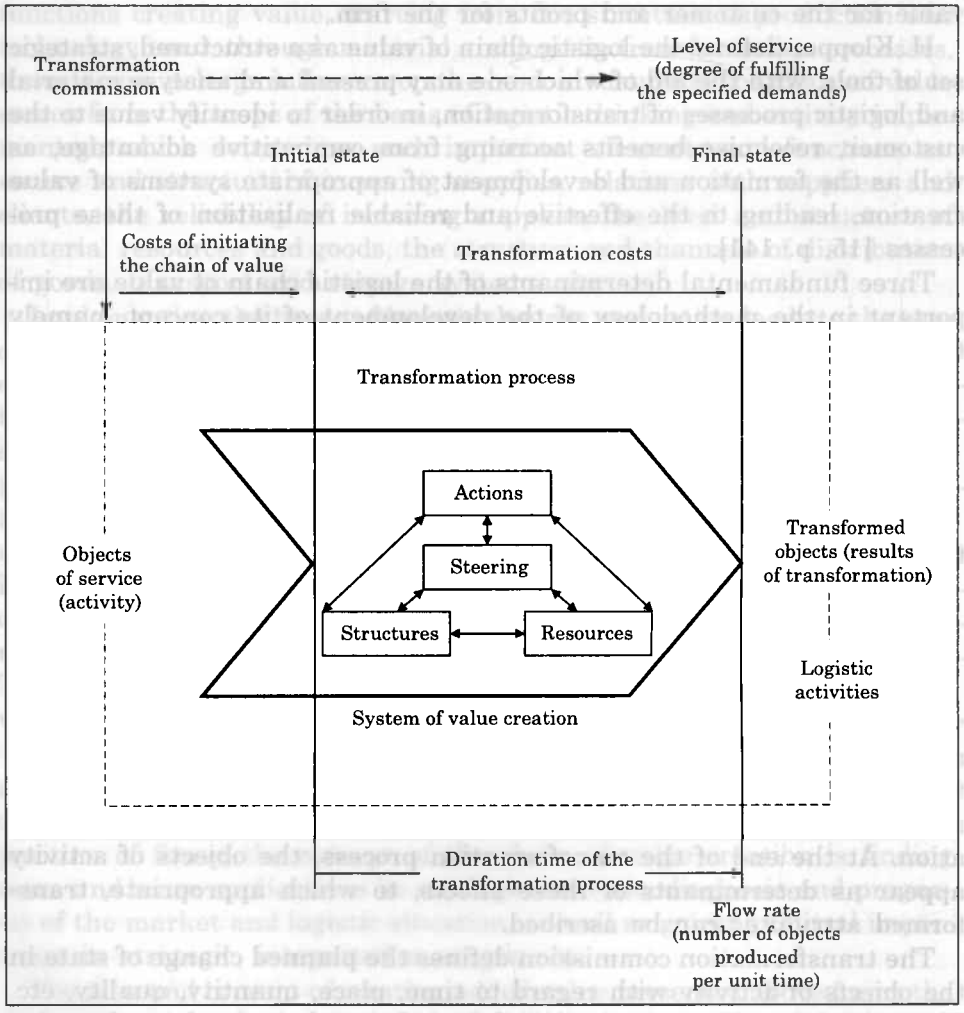

Fig. 6. Fundamental determinants and elements of a logistic chain of value
Source: Author's own interpretation based on: Klopper, H., op. cit., pp. 142-170.

- structures defined and static ties with the appropriate, interacting activities, resources, and also objects being transformed in the transformation process;
- the process of managing the elements of the system, embracing dynamic ties, namely steering and regulation of factors in the system of value creation in order to complete the order (transformation commission).

With regard to this systematics of ties in the logistic chain of value, one should note, above all, the mechanism and structure of the ties and transformation of the fundamental elements and parts (sub-processes) of the transformation process.

A concrete transformation process is described by a defined activity, a defined object of activity and the resources used. The object of activity is transformed by the defined activity from the initial state to the final state, which should be a reflection of the defined attributes of the object. The final state indicates the result of the transformation, during which one or more attributes of value defined in the transformation commission are changed in an appropriate manner. This object embodies, as a material element, a translation (change) of value. By the mutual interaction of several transformation sub-processes following one after the other, it is possible to obtain a logistic chain of value, in which the transformed object of a given transformation sub-process simultaneously becomes the input for the following sub-process, or otherwise the following transformation subsystem within the framework of the logistic chain of value is the recipient of the service, which was carried out in the previous subsystem. This type of tie between so called 'recipient' and 'supplier' may be accepted as sensible only when the 'supplier' supplies exactly what the 'recipient' requires. A connected system of several chains of value leads to a network of value. A characteristic of this system is the branching out of one chain of value into several chains, or the connection of several chains into one. One may talk about a network of chains, when the transformation process is formed in such a way that the result of one chain is the input for several further chains, or the result of several chains forms the input of a single chain. Finally, in the case of the third fundamental determinant of a logistic chain of value, namely a basis for appraising the chain, it is worth paying attention to its basic properties and functions, as well as the categories and criteria of assessment.

The assessment of a logistic chain of value should be orientated towards an appropriate structure of a multi-dimensional strategic effect, namely value to the customer, the benefits of the firm resulting from its competitiveness, as well as an effective and reliable system of creating value. Here, an appropriate mechanism and assessment criteria should be orientated towards the demands and bases of a logistic chain of value.

In their entirety, assessment criteria should be appropriate to the changes in the system from traditional, mainly static, and cost-orientated assessment, to dynamic, process-orientated assessments taking into account customer demands. A holistic assessment of a logistic chain should take into account two categories, namely economic-market assessment based on the ascribing of appropriate criteria (values and cumulated costs set from the perspective of the client) to each object in a defined state of the transformation process, together with logistic assessment, which with the aid of its base criterion in the form of logistic activity supplies measures for the assessment of transformation processes orientated towards physical attributes and creates measures with respect to the structuring, steering, and development of a logistically orientated system of creating value. Both categories and fields of assessment complement each other. Economic-market assessment enables the analysis of the dependence between value and costs in the transformation process and the recognition the determinant of value and costs; and in this way the strategic factors of success. The value of the object of activity in the transformation process is a function of that object. A value, from the point of view of the client is attributed to this object according to a specific reflection of its attributes. The price, which the client is willing to pay for the given effect of transformation is the value of the result of transformation from his point of view. This value, expressed in monetary units of the object of activity is variable in the transformation process, due to the appearance of various benefits and various attributes defining the value of the object of activity. On may take the following to be fundamental elements of logistic activity of the chain of value:

- service time;
- rate of flow;
- level of service.

The service time is defined to be the duration of the transformation process with respect to a given object in units of time (transformation time) and its reflection in concrete transformation processes might be time until supply, time until transport, reaction time, intervention time, assembly time, etc. The flow rate of a logistic chain of value is defined to be the number of objects transformed in a unit of time and as such is an important measure of the service capability of the logistic chain of value. On the other hand, the level of service may be defined generally as a measure of satisfying the demands defined in the transformation commission, characterising the quality of the transformation process. External, client-orientated assessment criteria for the level of service determine the market nature of logistic activities to an important degree.

Considering the elements of activity (activities) of the logistic chain of value, one can differentiate between the following fundamental types (elements) of costs, ascribed to objects and the transformation process.

- costs related to the preparation and ensuring the availability of the input factors (the objects of activity);
- transformation costs.

The costs of preparing the creative factors may here be treated as the costs related to the initiation of activity in the logistic chain of value, localised at the border of the actual activities of the chain and the environment. The costs of transforming an object, on the other hand, embrace the so called preparation costs (costs related to ensuring the supply of resources and capability within the transformation process, independent of the level of activity, type, number, and scope of the processes being realised), operating costs (costs related to the consumption of resources in the realisation of appropriate activities, depending on the activity programme realised, the level of activity, type, number, and scope of the transformation process), and the costs associated with specific results (additional costs of the transformation appearing in the form of costs related to the tying down of capital, as well as so called disagreement costs, resulting from not satisfying customer demands). The sum of the costs related to initiating the chain of value and the transformation costs form the final costs, embracing all the elements of the logistic chain of value. However, the logistic costs calculated within this framework only relate to the logistic transformation process within that chain (without the material costs of the transformation process, namely the costs of initial transformation and assembly).

The process and transformation orientated modelling of the chain of value is based on the above mentioned elements describing the initial and final states, namely the sources (transformation commission, inputs) and the effects of the chain, and also on the elements enabling the description of the significant processes within the chain. The system of fundamental elements determining key processes and then the fundamental types of transformation are created by the following groups of actions, according to A. Kuhn [14, pp. 124-125]:

- the production of goods: transformation with regard to form or identity; effectiveness and reliability of the production activities and activities handling the product play a central role here;
- assembly: transformation in the time dimension; waiting time can appear as a result of asynchronicity, overproduction or a high level of goods in store;
- transportation: transformation in the space dimension; optimisation of the transport process is a key idea in orientation towards flows;

– control: creating information about realised objects and decisions; a high level of requirement for control and regular corrections indicates inadequate or unstable processes.

The processes mentioned above can be characterised with respect to transformation with the aid of three groups of activities, namely activities connected with the formation of the product, activities connected with the flow of materials and products, and activities connected with the flow of information. In the case of the first group of activities, the character of the transformation appears as a change in the form or the attributes of the object of operations by transformation or assembly activities, while in the other groups activities appear in the form of temporal and spatial transformations, or in the form of data processing. Here, the realisation of functions involving temporal and spatial changes is often also connected with functions involving changes in type and quality, caused by internal handling (the sorting of products), as well as with functions involving change and improvement of transport-storage procedures, caused by packing processes and marking of the products [19, pp. 8-9]. A change in the quantity, quality, or structure parameter is contained within an appropriate concrete or categorical aspect of the concept of transformation. This concept also contains the processing of information as an integral component of the structure of objects of a logistic process.

An exact, verbal classification and identification of the structure of transformation processes and their sub-processes requires, in a concrete situation, analysis and diagnosis taking into account the appropriate criteria and identifiable attributes of the concretisation. The possibility of concretisation of transformation processes within the framework of material and goods flows is presented in Table 8 at a somewhat lower level of abstraction

Within the framework of the material and logistic transformation system influencing all spheres of the system of creating value in a firm and chain of supply, which is a result of the integration of the activities and the resulting transformations given above, a central role is played by fundamental (basic) logistic processes, namely: transport, storage, internal handling, packing, carrying out and realising orders, etc. These processes, sometimes described as transfer processes [21, pp. 48-49; 19, p. 4], starting from a recognition of the logistic situation on the market and finishing with the satisfaction of the client's preferences, influence the formation of appropriate relations between clients and suppliers in an important manner. The analysis of their behaviour as elements in the chain of the system of creating value gives significant reasons and potential for the rationalisation and increase in the market-economic effectiveness of the system.

Table 8. Concretisation of transformation processes

Fundamental logistic processes	Variable parameter (criterion)	Examples of such logistic processes	Functions of the logistic transformation
Transport	Place	Transportation, transfer	Overcoming spatial problems/differences
Storage	Time	Temporary storage at certain stages of the flow of the process	Overcoming temporal problems/differences
Internal handling	Quantity, type	Disassembly, sorting products, grouping	Changing the order or structure, change of spatial location
Transformation, manipulation of the product	State, form and properties of the product	Packing, loading palettes, creating loading units, assembly	Change of state, position or attributes (e.g. value, form, size) from the point of view of transport, internal handling and storage
Processing of information	Attributes of the information or informational state	Handling and carrying out commissions, recording, marking, control	Change in the informational and logistic determination of production, improvement in the ability to 'read' a situation

Source: Author's own interpretation based on: Koch, U., *Bewertung und Wirtschaftlichkeitsermittlung logistisher Systeme*, Gabler Verlag, DUV, Wiesbaden, 1996, pp. 81-82.

4. The process of logistic circulation

A further important property and new attribute of strategic logistic management is the broadening of the field of logistic operations with regard to the widening of the horizons of the logistic system, from a logistic chain orientated towards the flow of goods to a process of logistic circulation entirely orientated towards processes. Strategic logistic management and the scope of its activity defined by the logistic circulation is a basis for the identification and optimisation of all processes as a whole, connected with the creation (transformation) and use of value (logistic operations). Within this framework, one may create and extend logistic potential and new, significant determinants of the success of a firm, based on such criteria and attributes of the contemporary operations of firms as: time, quality, flexibility, innovation, ecological demands, etc.

A holistic approach based on processes, from the strategic point of view is a necessary, conceptual reason for the closing of the goods flow and information in the logistic chain in the form of a flow of goods and information in a logistic circulation. Figure 7 presents the general structure of logistic circulation understood in this way, this being a fully developed logistical system.

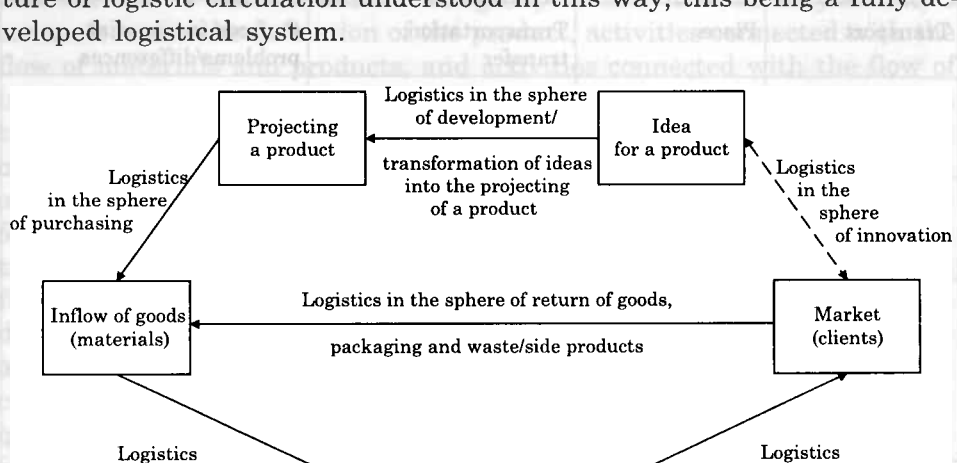

Fig. 7. A broadened logistic system (logistic circulation)

When using the criterion of segmentation in the form of a 'logistic object' throughout the whole system of creation and transformation of logistic value, one may distinguish the interior of the fully developed logistic system (logistic circulation) between the following subsystems (segments):

- logistics in the sphere of innovation (ideas);
- logistics in the sphere of development, as well as the transformation of ideas into the concept of a product (into a product matrix);
- logistics in the sphere of purchasing;
- logistics in the sphere of production;
- logistics in the sphere of distribution;
- logistics in the sphere of returns of goods, packaging, waste/side products, etc. ('inverse logistics').

The segments of logistic circulation mentioned above, simultaneously represent a series of phases of development and enrichment of the logistic product in a holistic process and system of creating and adding value.

Logistic circulation defines a new, in the conceptual sense, framework for the understanding and strategic analysis of all the processes important to the firm in the categories of time, quality, ecology, cost, etc.

The integration and co-ordination of the partial processes of creating and transforming value at the scale of this logistic circulation and arising from it, embraces new (the process in the sphere of ideas and project of a logistical product), as well as repeated aspects of the logistic chain. Here, important sources of new potential for value and logistic effects seem to lie in the spheres preceding the purchasing and production processes, which form at the same time the so called 'marketing and technological scenario creators for logistics'. The information from these spheres creates the essential basis for all the remaining spheres of operation in the firm ('scenario creator for business') [10, pp. 140-152]. This type of approach to the problematics of the structuring of a logistic system and strategic analysis of logistic processes has rarely been used up to now. The closing of the flow of information in the first segment of logistic circulation, on the basis of a feedback system, results in a more successful process of innovation (ideas) and projecting a product from the point of view of client preferences, as well as the potential and interests of the firm and the possibilities of increasing the effectiveness of the whole process of creating market-economic value.

Logistics in the sphere of innovation is the missing link, enabling the closing of a managerial logistic chain of information, orientated towards the flow of products in the form of an autonomic circulation of logistical information (see Figure 8)

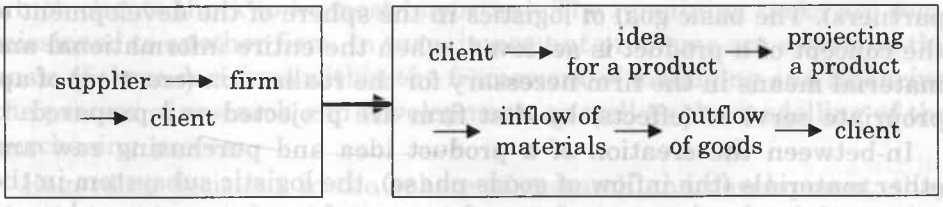

Fig. 8. The transformation of a chain in a logistic circulation

The logistic subsystem in the field of innovation forms a new variant of logistics in the field of information, being the starting point of the process of creating logistic value. The basic problem of this segment of the logistic circulation is to solve the problem regarding the type and nature of necessary logistic information, which is particularly important and

should be created, as well as support for the long-term initiation and development of appropriate products and processes. In particular, this concerns information, from which ideas, which fulfil market criteria for new (or improved) products and processes, form or can be thought up. In a innovative-logistic context, this means that innovation projects regarding products and processes initiated by a firm act on the environment of the firm, which then in turn initiates new, modified processes in the firm, etc. Interactions take place between the elements of the feedback system of information, which induce mutual interaction between firms and clients. In other words, firms not only react to changes in the wider environment, but take part in the formation of that environment in a creative way. On one hand, this means the active 'involvement' of the market (clients, demand) in the process of generating ideas in the firm. The logistic information arising in this way, being a significant indicator of the potential ('ability and a virtual good') of logistics and the firm, forms a starting point for effective strategic planning and realisation of the sequence in the product flow (in the process of the birth, 'realisation', and repeated use of the product).

A further task of strategic logistic management, as a complement to generating new product ideas is the effective formation of the process of transforming these ideas into projecting a product. Logistics in the sphere of development of the concept of a product leads to effective formation of the process of transforming ideas into projecting a product, as well as the form of the creation matrix of the value of that product, grouping expected traits (values) of the product and also defined functions of particular links in the supply chain (goals and tasks of market partners). The basic goal of logistics in the sphere of the development of the concept of a product is achieved, when the entire informational and material means in the firm necessary for the realisation (creation) of appropriate services (effects) by that firm are projected and prepared.

In-between the creation of a product idea and purchasing raw and other materials (the inflow of goods phase), the logistic subsystem in the sphere of the development of a product must form, integrate, and co-ordinate various spheres and partial processes within the framework of the birth of a product. Within this context, one can categorise the following three strategic decision fields:

- decisions regarding the infrastructure of the firm;
- decisions regarding the sphere of research and development;
- decisions regarding purchasing.

The first case regards the problem of assessing whether the firm's appropriate material resources (machines, storage space, etc.) and non-material resources (know how, innovation, etc.) create the possibility of the

firm obtaining defined effects (logistic results) independently. A management task, known as key competencies (indicators of the consolidation of modern technology and specific abilities of the firm) is the identification, development, and care for roles of particular (strategic) importance in the able functioning, development, and competitiveness of the firm in the market. A central role in the solution of the problems above is played by the tasks of key competencies as immanent resources of the firm, ensuring its long-term success, namely deciding the question of what sort of sequences of key competencies should be built and developed within the firm and which should be reduced. In connection with this, an important strategic decision is the resolution of changes and the form of specific partial processes, which the firm must carry out independently and which should be commissioned out to partners. This is connected with the problem of assessing and forming infrastructure, as well as the depth of the processes carried out within the firm. The result of comparing the infrastructure, regarding the competencies of the firm, with market demands is recognising the possibility of and the need for decisions in the following areas: whether to produce within the firm (dominant field – managing the research and development process) or whether to take advantage of an external process of creating a product or components of a product (dominant field – managing the purchasing process). Even though, in general, each part of the matrix mentioned above leads to an increase in the general value of the product, only a few of them have direct influence on the choice made by a client. In certain situations, a firm concentrates on these tasks and processes increasing value which clients think to be most important. The remaining tasks are commissioned to another firm. In turn, important problems are solved on the basis of these decisions within the framework of managing and financing the process of research and development, as well as the modelling of the purchasing process.

Regarding decisions in the sphere of research and development, they should be orientated towards the demands arising from the sequences of processes creating a product (value), which remain within the firm. The process of deepening the interpretation and structuring of the product from the point of view of fundamental criteria (time, ecological demands, etc.), as well as the determination of these criteria in the logistic circulation, takes place within the framework of management of the process of research and development. In connection with this, the cumulated (connected) demands of the chain of sequences of the process of creating a service should be taken into account in the course of making decisions within the process of research and development. The resulting orienta-

tion in this field is a significant means increasing the effectiveness of the entire process of creating a product.

Logistic components, which are not created in a given firm, find themselves in the area of responsibilities of the purchasing sphere. The purchasing process is presently orientated, above all, towards the identification, finding, and use of sources of supply which are favourable from the point of view of costs. The integration of strategic success criteria (ecological demands, time, etc.) into decisions connected with purchasing gives rise to significant modifications in the behaviour of a firm in this strategic area of creating a product. From the strategic point of view, the behaviour of a firm in this area, regarding the place and intensity of purchasing is defined by decisions connected with the object, sources, and market.

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