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THE IMPROVEMENT OF THE EFFICIENCY OF PURCHASING BY NETWORKING OPERATION

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Abstract: Logistics as one of the most integrated science plays a key role in many segments of the operation of a company. In case one of the manufacturing companies the most significant integration segment is the purchase. Nowadays the manufacturing companies start to operative as networking to achieve optimal purchasing process thereby to achieve the most cost-effective operation. The single site production structure suppressed by networking operation, instead of the much-site operation appear which elements of the assembly plants, suppliers, warehouses and distribution users. Enhance the competitiveness of enterprises makes it necessary to dispose of any action that can make less efficiently than main task so that has become commonplace the reduction of the production depth. These companies can be grouped into two groups: assemblers and suppliers. Currently, all multinational companies operating in our country use this form of operation. Development and application of effective procurement action can generate a significant competitive advantage; as a result, increase the quality of customer service provided and/or reduced the logistics' losses. During our research, we discuss theoretical methods of optimum procurement processes by establishing and developing in connection of networking operation.
Keywords: *cooperation, purchasing, networking, supply chain operation*

1. INTRODUCTION

Purchasing has a very important role in the operation of companies as purchasing and logistic system provides the materials, tools and service needed for production in the appropriate time, quantity and quality. Companies, working in developed countries have the feature that they devote this field of logistic in practice their attention to such an extent that many of them intend strategic role to it. The modern company practice has defined new tasks and roles for the purchase too. According to a primary approach procurement becomes a strategic fact thereby it contributes to the production of values offered for the consumer. On the other hand purchasing means more than buying materials, parts, services etc. Its main task is to use external sources in such a way that it suits the purposes of the company.

2. THE STRATEGIC ROLE OF PURCHASE

The purchasing had had mostly an administrative role in company operation until the 1970s [1], later its function hiding in cutting of company expenses was also realised [2, 3]. By this time the purchase function has become into strategic importance [4, 5, 6], because it has a great effect on the performance of the company, so it plays a significant role in company strategy. During examining the changed role of purchasing, we can find an other relevant

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question which is the supply chain management. Supply chain management means the series of activities connected to each other in which everything serves the demands of consumers [7]. Supply chains compete against each other [8]. Realising and taking advantage of this situation leader companies are trying to develop their efficiency of supplier network. However, it can be seen that studies usually mention supply networks, not supply chains, since these connection systems are much rather similar to networks than chains [9].

The influence of the supply chain approach is that the widened range of duties of purchase includes the planning and reducing of expenses, measuring and correcting the achievement of subcontractors, and promoting the supplier strategy and innovation process. The effect of the supply chain management is that closer carrier relationships are reached in procurement, hereby carrier relationships are continuously analysed and the development of their performance gets in the central point. By means of closer supplier relationship the number of suppliers drops. The transformed task of purchase in the way that customers and suppliers should make a virtual organisation in which they have common aims and productivity criteria [10]. The possibility of innovation, the improvement of its quality, and cutting the expenses can be listed among the advantages of the close relationship established with the supplier [11].

One of the basic tools of coordinating the relationship established with the carrier is measuring and analysing the achievement of the supplier. According to a new approach, the task of procurement should not only be to choose the circle of suppliers but its continuous improvement is also necessary [12]. Its significance is emphasized by the fact that the permanent development of technology and the shortening term of life mean a considerable market pressure on the operation of companies, so to get the leader position in the competition it is essential to get the suppliers involved into this innovative process [13]. For the companies, using modern management strategy, supplying has not only the service but the supporter function as well.

Consequently, its task is not only to carry out the company strategy, but to search the possible solutions continuously for improving the effectiveness of the company, and to form the claims appearing on sales channels of the firm according to the external market demands. The only way to realise it if the cooperations of suppliers are effectively coordinated, and the purchase markets are observed continuously. The supplier plays a cardinal role in the field in which the company can guarantee a higher standard of service, so the quality of the relationship with the supplier is pivotal. This means that the procurement has a great effect on the profitability of the company not only because of the fact that the purchase value is more considerable than the selling value, but the reason for this is also that the claims of customers cannot be satisfied without using the abilities of supplier base in an effective and profitable way.

3. COOPERATIONS IN THE BUSINESS WORLD

Watching the economy nowadays it can be said that different economic societies (networks, clusters and co-operatives) are appearing one after the other. The network system between companies can be explained in the most well-arranged way as a relation system between firms [14]. In the last decades, different co-operative forms appeared in the company practice which is more complicated than this. Within the co-operations we can only speak about network co-operations if they are above a certain level. The co-operation between companies appears in the most different places, while providing the possibility to type the colloborations.

The coalition forms between firms can be classified according to two approaches: partly according to the strength of the mutual confidence and dependence and partly on the bases of its effect on the competitiveness *(Figure 1).*

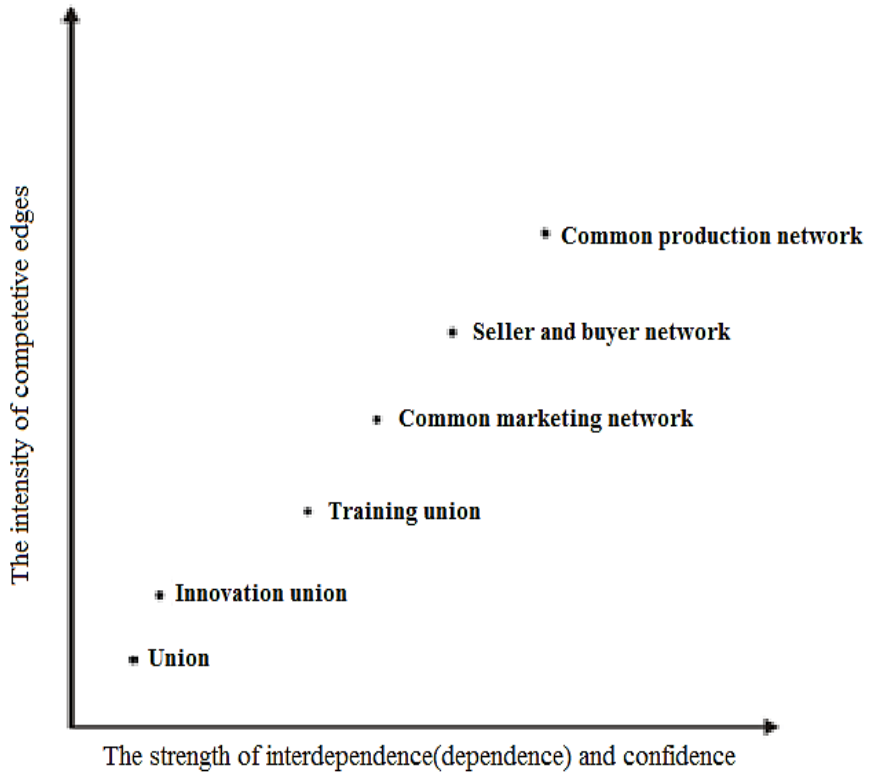

Figure 1. The levels of company collaboration

Along the two indexes seen in the diagram the joining companies can co-operate on several "fusion levels" [15]:

- The first collaboration form is the "professional union" between companies which forms the lightest category. In this case, the contacts are loose, occasional and ad hoc style. From this results that their effect on competitiveness is quite small.
- The next one, a bit deeper collaboration form is the "innovation union". Its characteristic features are similar to the previous one, its main aim to create common works.
- The third level is the so-called "training union", which is formed to get the knowledge together; the organisations of the union try to get new knowledge jointly and hereby to increase their competitiveness.
- The next stage of development of cooperation is the "common marketing-network" when the members work jointly keeping their own interest in view to increase their popularity and to finance certain market acts together.

- We can speak about "seller- costumer networks" (supplier networks) if the work of companies are built upon each other's, taking the opportunity of the realisable advantages from the proportions- efficiency and the flexibility.
- Finally, the highest level of the advanced stage of the cooperation is the "common production network", where the members who are involved in the fusion do collective production.

Inside the cooperative forms, the two most frequent collaboration types are the networks and the clusters. Networks and clusters can be separated from five points of view [15, 16]:

- Networks provide possibilities for the companies to get available special services at low prices. In contrast to it, the clusters draw the special services needed in the particular region as over a significant mass of enterprises demand them.
- Networks have the feature that they are always closed; they have memberships which can be exactly given, within the network members are bound by a contract. Opposite to this in the case of clusters, this membership cannot be defined, it cannot be known which organisations belong to the cluster, the members are mostly not bound by contracts. Characteristically it can be experienced that we can meet "fare-dodgers" at clusters who can gain from the advantages of clusters through the cooperation and conurbation benefits without doing anything for it.
- A network can help a company to take up its position in the production system and to get a stable and long-lasting position. In contrast to it, in the case of a cluster, the position in the production system always changes, as the cluster provides demand for the companies having similar capacities.
- The cooperation is primary in the network, the rivalisation is not typical of it, but in the cluster rivalization is always present next to the cooperation.
- Company networks only consist of companies, while in a cluster there are other institutes (universities, research institutes) beside the companies and there are also professional organisations (chambers, agencies for the development of private businesses, technology-transfer organisations etc.).

4. NETWORK VARIATIONS ON THE BASIS OF NETWORK BUILDING

The motive of network collaboration is the realization of the workable advantages by the collaboration. To reach these possibilities different organisation forms were made. Several forms of the network collaborations can be seen, but in the function of the small and medium-sized private business the most important are the vertical and the horizontal ones. The difference between the vertical and horizontal network is not only in their structure but it is in their characteristic of function as well. The aim of establishing vertical networks is the common collaboration, where the cooperations form along the value chain. Between the cooperated members there is only a collaboration behaviour so there is no competitiveness. In contrast to this in the case of horizontal networks the competitiveness, in other cases the collaboration appears to reach to common aim. So the name "competition jointly" is typical of these networks. It often occurs that the interests of the members do not coincide. The two different attitudes define the behaviour feature of the network forms.

4.1. Vertical networks.

Examining the construction of the vertical network, it can be said that it consists of one or more large industrial company or an organisation which carries out the integrator function which is surrounded by small and medium-sized private businesses *(Figure 2).* The main task of this type of network is to integrate the operation of the small and medium-sized private businesses which are independent of each other; in a lot of cases, it can be realised on the occasion of a kind of market collaboration. The relationships are usually formed, every member is aware of its task to be performed, typically they put the mutual expectations down as well. In reference to vertical networks, the key of the successful cooperation is mostly up to the work of integrator. It is a general statement that in this case of collaboration form a long-lasting mutual cooperation can only be imaginable if each of the partners can gain through the process. This is the exact reason why the vertical networks are based on settled relationships, the partners often make network frame agreements with each other for more years.

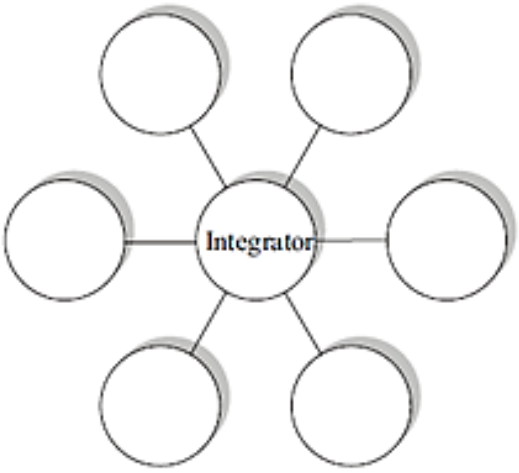

Figure 2. The structure of vertical networks

The most typical form of it is the supplier network, in which the main emphasis is on the production flow, however, in some cases other additional processes can be seen. The small and medium-sized private businesses taking part in this type of network can realise the advantages resulting from their membership [17–19]:

- By networking an opportunity presents itself to step into the international market.
- The small and medium-sized private businesses get in touch with partners who motivates their development.
- The Benchmarking-type learning process is provided.
- The success of the companies which are already in the position of supplier motivate the small and medium-sized private businesses to develop and become a supplier.
- The financial mediates prefer sponsoring small and medium-sized private businesses which are in relationship with larger companies.

In the relationship of the vertical networks the supplier relationships have more separatable type [20]. These are the next ones [20] *(Figure 3):*

- At the "standardised" transportation the suppliers offer only unified product, they do not consider non-series claims; if the business contacts are interrupted there will be no significant results.
- In the case of the "traditional" transportation the collaboration is closer between the partners, the relationships and the tasks are more complicated. The suppliers try to aim the free capacity of the potentional customers with their offers which change flexibly. The expenses of stepping out are low in this case too.
- On the other hand, the "strategic" transportation relationships show inter-dependence; it is very often that the supplier has a serious customer, which can also pass technology or they do improvements jointly. Because of the close relationships, the expenses of stepping out are usually significant.

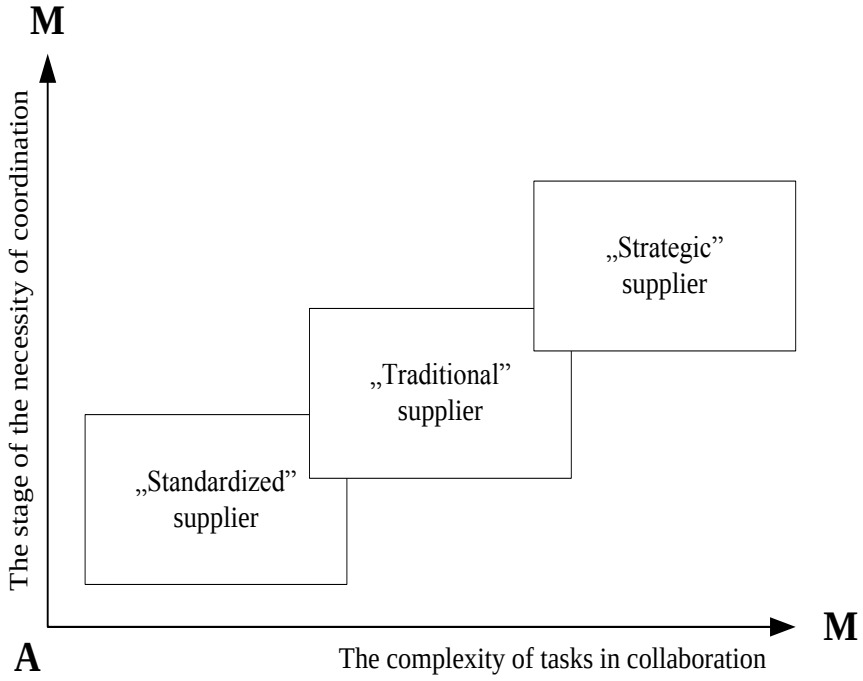

Figure 3. The types of supplier networks

4.2. Horizontal networks.

The other typical form of presence of the network collaboration is the horizontal network [21] *(Figure 4).* In this case there is no integrator company but the small and medium-sized private businesses cooperate with each other in the interest of a common aim defined in advance.

The most important features of networks of this type [18–19]:

- Small and medium-sized private businesses work jointly who approximately have the same strength.

- The most frequent forms of presence of cooperation in the field of marketing, development of production or transportation.
- One of the main aims is to overcome the disadvantages caused by proportion efficiency.
- Growing innovative and learning possibility.

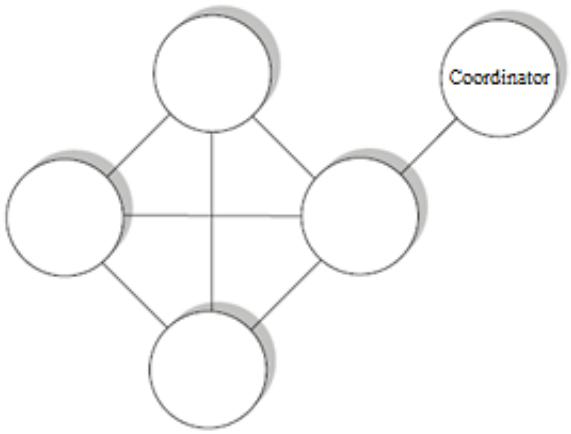

Figure 4. The structure of the horizontal networks

In the case of horizontal collaboration, the role of the co-ordinators is prominent. The role of the co-ordinator is in co-ordinate relation with the businesses, its main task is to unify the functions and to hold together the network despite the different processes. Without this type of coordinating organisation it is impossible to realise the long-lasting collaboration of parties with these extremely different and ramifying business interests.

5. THE INCREASE OF THE RELIABILITY OF THE VERTICAL SUPPLY CHAIN WITH HORIZONTAL EXPANSION

The reliability of the supply chains has extraordinary importance in the competition for the customers. Besides the optimization of supply chains' progress [22, 23], establishing the supply chain's structure has a growing significance, in particular the cooperative forms [24]. While in the case of vertical cooperation, fundamentally the linearly connected participants define the reliability of the whole supply chain, then in the case of horizontal cooperation, even the participants who are competing in the market but cooperating as partners in the particular progress, are parallel participants in the supply chain. Therefore, during the establishment and operation of the supply chains, it is important to be aware of the development of the reliability features emerging within the organization of the participants of the supply chain [25].

The probability of the flawless time of operation of a supplier, can be described with exponential distribution:

$$p_o = 1 - e^{-\lambda t} \tag{1}$$

In the case of the same supplier, the required time for troubleshooting can be described with exponential distribution as well:

$$p_m = 1 - e^{-\alpha t} \tag{2}$$

For individual participants of the supply chain, a so-called κ distraction can be defined. Hence, the average value of the flawless operation time and an average time of troubleshooting tasks for faulty supply needs to be defined. The distraction can be defined with the following simple correlation:

$$\kappa = \frac{\lambda}{\alpha} \tag{3}$$

The probability of malfunction is definable with the following distraction:

$$p_e = \frac{\kappa}{1+\kappa} \tag{4}$$

The probability of reliability as well:

$$p_o = \frac{1}{1+\kappa} \tag{5}$$

In the case of horizontal cooperation, the reliability can be defined as the multiplication of the reliabilities of the participants of the supply chain and the probability of operation can be calculated with the following correlation:

$$p_o^{hor} = p_1\, p_2\, p_3\, \ldots p_m \tag{6}$$

In the case of vertical cooperation, the reliability can be calculated with the following correlation:

$$p_o^{ver} = 1 - (1-p_1)(1-p_2)(1-p_3)\ldots(1-p_m) \tag{7}$$

The participants of the economic life, especially the mechatronic assembly industry and the automobile industry attribute great importance to achieve horizontal cooperation in the particular levels of the vertical supply chain, thereby forming a mixed model. Though the horizontal cooperation gives additional costs in a particular level of the supply chain, but increases the reliability of the whole supply chain, giving competitive advantage to the participants of the supply chain.

An arbitrary operation cost of a supply chain, even replicated as a mixed model, is given:

$$C_o^1 = \sum_{i=1}^{m}\sum_{j=1}^{n} c_{i,j} \tag{8}$$

where $c_{i,j}$ is the cooperative partner cost *j*, on the supply chain's level *i*.

This supply chain's resultant reliability is $p_o^1 = p_o^1(\Theta)$, where Θ is te set of the reliabilities of the participants building the supply chain.

If we wish to increase the reliability of this supply chain, either we increase the reliability of the extant partners or we increase the reliability of the particular level through horizontal cooperation of additional partners. The goal is the application of partners on the particular levels, where the operation cost of the additional partners' lover than the long-term profit increase caused by the reliability.

Increasing the reliability with horizontal cooperation on a particular level of the vertical supply chain only worth it, when it meets with the following disparity:

$$C_p^2 - C_p^1 > C_o^2 - C_o^1 \tag{9}$$

in other words, the profit from the increased reliability is larger than the operation cost of the horizontal expansion.

As it is visible on the 5th illustration, it is practical to examine three cost components to achieve a simple analysis:

- The cost of the horizontal expansion: the more reliable elements being placed on a particular level of the vertical supply chain for the purpose of horizontal cooperation, the larger operation cost of the whole system will be.
- Income loss caused by the lack of availability of the system: the larger is the reliability of the system, the less is the loss of production caused by unreliability of the horizontal level, thus the loss of profit is fewer for the production company.

Income, which can be defined as the amount of the cost of horizontal expansion and lack of income loss.

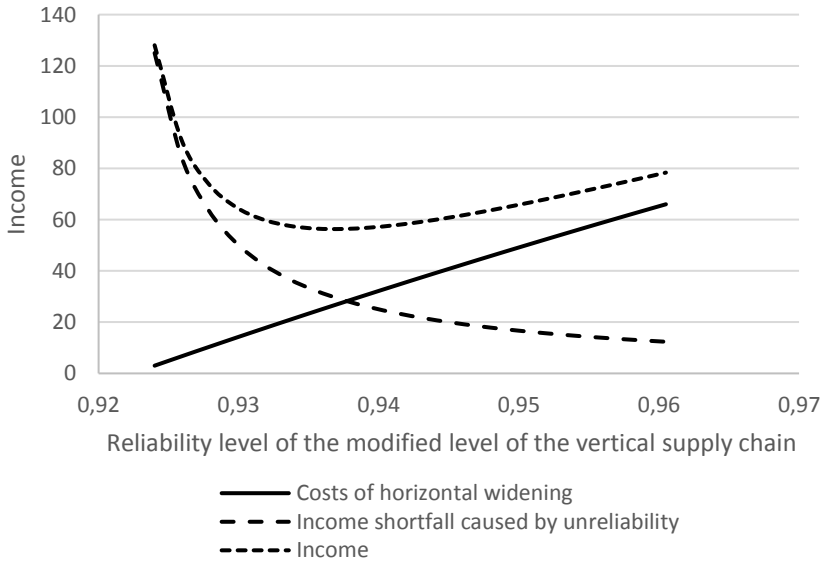

Figure 5. The structure of the horizontal networks

As *Figure 5* shows, it is not worth it to increase reliability of the system endlessly, because after a certain point the expansion of reliability can be only achieved with costs cannot be balanced with the minor expansion of the income. It is ascertainable that the expansion of a specific operation cost of an object embedded in a particular level of the vertical supply chain, resulting horizontal expansion, causes the incorporation of object having lover reliability level.

6. FUTURE RESEARCH DIRECTIONS

Within the framework of this research, we examined the expansion possibility of the supply chains materialized with the expansion of a vertical level in horizontal cooperation. The execution of the following tasks is planned as a direction of research in the future: the detailed examination of the specific costs; the examination of the effects and duration of the activities concerning the solution of the anomalies of material flow in case of the malfunction of the supply chain, in the perspective of the whole system.

7. SUMMARY

The role of the supplier logistics changed significantly in the last decades; to this development a fact contributed: the significance of information process plays a more important role through the time. The relation system of purchase (suppliers, relations within the company) is usually quite complex so its conscious handling is not an easy task. On the other hand, purchasing plays a strategic role in the practice of developed business, so its efficient management (and as its part, the right handling of information) can be the source of several advantages. Information technology has gone/go through a rapid development, knowing the information processes it will be easier to make the best of the possibilities hidden in it.

Through the development of information processes an opportunity presents itself to make optimal transportation networks and by means of this purchase expenses can be reduced, hereby the effectiveness of purchase logistic process can be improved. Because of the growing complexity in the purchase chains and the uncertain supply and demand one of the most important tasks will be to supply the flexibility through plannig the purchase chains. One important condition of making the purchase chains flexible is to form networkbase collaborations. In network based collaboration the approaching fourth industrial revolution gives new possibilities among others by using cloud-based technologies. These possibilities, like “smart purchase chain” opens new perspectives in terms of development of purchasing logistic networks.

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