

Networks And Quality Improvement

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Abstract: *Tools used in the past to analyze business value creation, such as value chain and process models, are simply too slow, inadequate, or inappropriate to address this new level of business complexity. Instead of that, company has to find way to create quality management system in a multi-layered supply chain. The problem can be solved by networking in the cluster. Cluster can be known as a competitive cooperation in the purpose to gain higher level of competitiveness and success. But there is another problem: Organization of the production process in a company is extremely complex process itself, and when we transfer it to the cluster level, we get a complex task which is difficult to solve. For that purpose, this paper analyses the conditions and possibilities that would enable those structures to adapt to changes in the surroundings - flexibility and management adequacy of production and organizational structures - by creating network value system.*

Keywords: *Industrial Clusters, Quality, Network value, Quality System Management, Supply chain*

1. INTRODUCTION

One of the main drivers of global integration has been the consolidation and globalization of the outsource base. In the past, multinational firms either exported parts to offshore affiliates or relied on local suppliers in each location, but today global suppliers have emerged in all areas of business [35]. Since the mid-1980s and through the 1990s, outsource took on a much larger role in the industry, often making radical leaps in competence and spatial coverage through the acquisition of firms with complementary assets and geographies. A rapidly integrating global economy, technological developments, and shifting consumer preferences are together resulting in intense competition between firms. Consequently, firms are forced to revise their strategies, structures and work practices in order to stay competitive. They are seeking ways to enhance the flexibility of their business processes as well as their responsiveness in relationships with clients and other firms.

While in the past, organizational change was undertaken mostly by firms exposed to international competition, larger enterprises, and those in manufacturing, new work approaches are now being implemented across countries, sectors and firms of all sizes.

In modern global economy, companies are facing ever increasing challenges for short time-to-market to enter into the market early, for reduced time-to-volume to occupy the market quickly, and for decreased time-to profit to get return from market shortly. These business requirements drive technology needs [36] to speed up product and process development [37] to enhance manufacturing and supply capability and capacity, and [38] to improve revenue from lifecycle efficiency. Today's high product variety environments come not only with the higher number of differentiated products with higher number of design changes but also with higher variations in demand and lower volumes of production.

In competitive environment success of an organization is a function of industry

attractiveness, its relative position in the industry, and the activities (strategy) it undertakes to remain ahead of others ([7] and [9]). Mintzberg explained that strategy is evolutionary, organic process and is unpredictable; [15] explained that core competence gives an organization competitive capability and remains central to its strategy planning process. Small and medium organizations (SME) encounter different kinds of problems such as resource limitations (especially human and financial resources), and market information [16], they face competition within and between large organizations [4].

2. NETWORK VALUE SYSTEM AND QUALITY IMPROVEMENT

Quality improvement in a firm's must encompass much more than just machinery or technology improvement. Technology is a much more complex bundle of knowledge, with much of it embodied in a wide range of different artifacts, people, procedures and organizational arrangements. These embodiments of knowledge include at least: product specifications and designs; materials and component specifications and properties; machinery and its range of operating characteristics; together with the various kinds of know-how, operating procedure and organizational arrangement needed to integrate these elements in an enormously variable range of different production systems. Moreover, as these elements of technology are highly interconnected, improvement in something as "simple" as product quality may require changes to be made across several linked elements of the bundle, e.g., in machine hardware or operating procedures, the organization of production flows, or the specification and treatment of materials.

Second, there is no sharp distinction between innovation and diffusion. Very few components of production technology are simply acquired "ready-made" and then brought into use according to standard "recipes" which are identical to, and replicated from, previous applications. Even in cases where the introduction of some element of new technology involves a fairly close approximation to such noncreative technology

"adoption," the interactions with other elements of technology in the production system typically requires creative problem-solving and innovative re-configuration of at least some elements in the overall production system. Furthermore, firms do not acquire the capabilities to generate these creative changes spontaneously merely from the experience of doing production, as implied by notions of learning curves. Indeed, studies of infant industries (e.g., Bell, Scott-Kemmis and Satyarakwit, 1982) have demonstrated that the performance of production systems may not increase at all over time, and can easily stagnate or decline over the long-run.

Third, external sources of technology are not limited to machinery suppliers. Customers, for instance, may be much more important sources of technology, providing not just knowledge about product specifications but also a wide range of other elements (e.g., operating procedures and know-how, or knowledge about materials properties).

It is clear we need new lenses and tools to succeed in this current economic environment — understanding of how people, process and technology really work together to create both social and economic value.

Tools used in the past to analyze business value creation, such as value chain and process models, are simply too slow, inadequate, or inappropriate to address this new level of business complexity. Instead of that, company has to find way to create quality management system in a multi-layered supply chain.

Strong value creating relationships support breakthrough innovation, quality management and organizational resilience. The value network approach helps individuals and work groups better manage their interactions and address operational issues, such as balancing workflows or improving quality of the process or product. It also scales up to the business level to help forge stronger value-creating linkages with strategic partners and improve stakeholder relationships.

A value network is a complex set of social and technical resources. Value networks work together via relationships to create social goods (public goods) or economic value. This value takes the form of knowledge and other intangibles and/or financial value. Value networks exhibit interdependence. They account for the overall worth of products and

services. Companies have both internal and external value networks.

The network value system: integrated demand and multi-layered supply chains. They have attempted to meet all the changes identified within the new economy. Network value system management has focused on moving products and services downstream towards the customer. Typically the multi-layered supply chain is coordinated by manufacturing companies or dominant resellers who use in-house manufacturing and distribution facilities to achieve market-based objectives such as market share volumes and customer penetration. Demand chain management changes the emphasis towards “customization”, responding to product and service opportunities offered by specific customers or customer groups sharing particular characteristics. It is crucial to segment customers intelligently in order to offer more targeted and personalized products and services. The preference is to outsource rather than own the functions and processes that facilitate and deliver value. Focus is on asset leverage and communication through distributed assets and outsourcing.

3. CLUSTERS AND NETWORK VALUE SYSTEM

Companies are constantly asked to improve performances in order to get the chance to maintain or to improve their own market positions and financial situation. A network value system is the full range of activities and participants necessary to bring a product or service from the point of being an idea through to delivery to the final consumer while a company can be found at any of the various steps within the value chain. Various actors can be “clustered”, at any step of the value chain, for training, collective production, bargaining and/or selling to the next step of the value chain. In either case, myriad actors are involved in and influence the development of the value chain or cluster

The network value system must be integrated in the core business of the industry cluster. Both of them focus on improving the competitive advantage over their competitors. The cluster support the network value system by integrating academic institutes, government

agencies, association and supporting industry in order to create the innovation and enhance the knowledge in the value chain.

Cluster theory, in effect, builds on the advantages of interfirm cooperation propounded by value chain theorists. The network value system management integrates processes and builds long-term relationships among firms involved in the flow of products and services from the source through to end-users. All firms in the network value system can benefit through achieving lower costs, improved customer value and satisfaction, and greater competitive advantage. When members of a network value system all operate in the same general geographic location, they gain the cost efficiencies of supply chain coordination, as well as the boost in competitive drive and innovation that comes from working together in close physical proximity.

In a network value system, each participating company operating as an individual enterprise tries to maximize its own corporate goals, thus sub-optimizing the overall performance. An extended enterprise is a part of network, which essentially behave as a single enterprise trying to maximize the corporate goals of the extended enterprise, thus optimizing the performance of each individual enterprise.

Network value system defines the specific roles in an activity and their value creating interactions. Value interactions or deliverables are of two types. Tangible deliverables are the contractual or mandated interactions between participants. Intangible deliverables are the informal, more personal, exchanges of knowledge, favors, and benefits. These are the interactions that help keep things running smoothly and build relationships. Intangible exchanges are actually the practices ignore these important intangible exchanges, but they are made visible with network value system

Clusters have the possibility to develop their own specific mixture of competitive advantages which is created on the basis of locally-developed knowledge as a result of mutual relations, cultural heritage and local characteristics. This is evident in the focus on clusters as an important concept in understanding growth and in thinking about development policy [8].

The idea of localized economies of scale in geographic agglomerations has a long

history in economics, going back to Adam Smith's early observations of labour specialization and to [24.] explanations of why companies continue to localize in the same areas. Clusters arise in the presence of Marshallian externalities, which signify that companies benefit from the production and innovation activities of neighboring companies in the same and related industries. There is abundant evidence that such externalities exist and lead to industry-level agglomeration [13].

Development of clusters is an effective way to improve quality of the product and the process and bring it to a higher level. Modern business is based on the fast response, quality, flexibility, innovation, connections and building the critical mass of capital and production / service potential. This relatively new style of doing business requires – network value approach based on cluster concept. Clusters represent the complex organizational systems that are flexible and can be quickly adjusted to oscillatory changes at the sale and purchase markets, generate employment, help the diversification of economic activities and make a significant contribution to exports and trade. Clusters also play an important role in innovation and businesses where there is a need for application of modern technology. Thanks to their innovative flexibility, many of them become more productive and efficient than some large international corporations. In this process, emphasis should be focused on creating a friendly business environment where the transformation of society towards a market economy shall take its place.

Cluster differs from other forms of associations within its geographical boundaries, involvement and utilization of funds, ways of exchange of products and partially finished products, information management - knowledge chains, and the importance of how they are connected. Clusters can be best understood and used as a regional systems and they represent, according to Porter [10], "Geographic concentrations of mutually connected companies, specialized suppliers, service providers, companies from similar industries and institutions tied to them (i.e. universities, standardization agencies, trade unions), who compete, but also cooperate".

Associating into a cluster can bring a broad range of benefits to all partners as well as to the economy in general. Some of the benefits are the following:

- Increased level of expertise; associating gives companies better knowledge about supply chain and makes it possible to companies to learn from each other and to cooperate;
- Capability of companies to join complementary strengths and contract new works of larger scope for which, individually, they would not be able to bid in a public tender procedure;
- Potential for large scale production (economy of scale), which can only be realized via specialized production in each of the companies, through joint purchase of supplies with large discounts or through joint marketing;
- Strengthening of social and other informal connections, which leads towards creation of new ideas and new companies;
- Better information flow within a cluster, e.g. making it possible for investors to identify good entrepreneurs, and for business people to find good service providers;
- Enabling development of services' infrastructure: legal, financial and other specialized business services.

This paper focuses on establishment of organizational and managerial mechanisms within a cluster, which will enable increase effect of network value system to the level of a cluster as a whole. That is why one of more important segments is to determine levels of specialization in companies – participants in a cluster, and what desirable levels of specialization for more effective business are in case we have specialization, in other words, economic diversity. Research that has been done shows that traditional production sectors are inclined to doing better business when densely concentrated in one geographical area. Contrary to this, newer, high-tech and service sectors are more comfortable with economic diversity environment.

General opinion is that specialization means lack of economic diversity and vice versa. If that is the case, then improving industrial clusters bears risk of creation of highly specialized local economies. If local economies are specialized in only one industrial sector or only couple of them, then they are

indeed much more sensitive to cyclic falls in those sectors. However, other opinion suggests that specialization and diversification do not necessarily exclude each other. Malizia and Feser [27] define economic diversity as "existence of multiple specializations". It means it is possible for local economies to be highly specialized in certain sectors and, at the same time, to have sound combination of economic activities. So we come to the concept of flexible specialization, which represents possibility of companies to do what they do best, and cluster has the obligation to provide optimal utilization of capacities.

Establishment of network value system in complex organizational systems like cluster represents a big challenge because of diversity of clusters and characteristics of member companies. One of the possible models, which application shall enable optimal use of clusters' potentials is described in more details in Chapter 4.

4. GROUPING AND STANDARDIZATION PROCESS

Companies recognize the next stage of business optimization, in order to improve the quality of the process, will come from visualizing and defining their internal and external network value systems. Organization of the production process in a company is extremely complex process itself, and when we transfer it to the multi-layered supply chains level or the cluster level, we get a complex task which is difficult to solve. Quality can be defined as a measure of customer satisfaction. The key question is how to achieve the necessary level of quality of product or process in conditions in which many things depend on the quality of our subcontractors or suppliers.

Making a cluster is an important strategy that provides significant support in establishing an effective management system that connects suppliers and subcontractors and other companies that directly or indirectly involved in the production process or the process of providing services. Connecting companies in the cluster is the way to increase effectiveness, and comprehensive way to increase the quality of work

For the time being, there are no simple models developed which would enable to improve quality management system in a complex organizational units like clusters. In that regard, this paper makes a pioneering attempt.

One of the possible solutions which would decrease complexity of flows and increase process effectiveness and quality level within a cluster is application of Network value system.

Applications of network value system in cluster ensure the quality of a product that is made:

- It combines tasks, equipment, gages, tooling and schedules into larger groups of similar elements for similar solutions.
- Purchasing can group similar parts and achieve quantity discounts. For non-standard purchased parts, grouping helps suppliers to increase quality, achieve savings and reduce price.
- Accounting in industrial cluster is simpler in a group technology - costs are collected by cell and family rather than individual part.

Cluster production program can be diversified and consisted of all products which are made by the member companies. Disparity in regional economic development is strongly influenced by the proportion of trade, local industries, resources and mix of organizations present in the cluster [11]. Participating companies can enter a cluster with only one part of their production program, and produce or distribute other products on their own, or in cooperation with companies which are not in their cluster. It is necessary to define basic products which are offered by a cluster, and adjustments of organizational and managerial cluster structures is done in regard to these products. Production program is further divided into structures and sub-structures, where individual requests towards cluster companies are defined for processing and assembling. Possibilities for process control and shortening of production cycle depend on organization of a cluster.

Application of the Network value system on complex cluster type organizational systems represents a new method to

implementing TQM (Total quality management) approach, and it is being developed as the integral part of the Center for Competitiveness and Cluster Development at the Faculty for Technical Sciences in Novi Sad. Given approach is based on concepts of flexible specialization and Working Units with extended flexibility. Flexible specialization, as one of the basic advantages of Clusters, provides companies in Cluster to work on what they do best, for what they have trained labor force or technical-technological capacities, and still to have enough volume of work. Companies, Cluster members, considered from the aspect of flexible specialization represent Working Units of extended flexibility. Having in mind that Companies participating in a Cluster can choose which part of the Cluster production program or production capacity they will be part of, then the same applies for branches of the Companies as well.

4.1 Harmonizing a common Cluster production program

Companies in a Cluster have to harmonize which products, assemblies, subassemblies and parts are important on the Cluster level from the aspect of requests coming from the environment and from the aspect of companies participating in producing them. In that way, two basic goals are being accomplished: directing activities towards fulfilling customers' demands and creating the synergy effect amongst the companies participating in the production. Researches carried out in the period 2007 – 2009 by the Center for Competitiveness and Cluster Development both individually and also participating in GIFIP1, and UNIDO projects supporting development of the Cluster AC Serbia2, demonstrate that without the existence of the above mentioned elements it is very difficult to accomplish effective functioning of Clusters. Production program of a Cluster can comprise a huge number of different elements –

assemblies, subassemblies or parts. These elements can differ in regard to shape, material, technical-technological specifics etc. Also, these elements are integral part of different products which can be produced in different companies. For each of individual elements being produced in a Cluster, it is necessary to define the technological procedure starting from geometrical and technological characteristics of an element what, in case of huge number of elements, requires a considerable waste of time. Network value system has in its basis the procedure of grouping of objects according to their similarities. When the homogenous groups of elements are generated, then the designing of technological procedure for a group is carried out, and then and finally the designing of individual technological procedures including utilizing defined technological procedure for a group as the starting point. The essential is that due to similarities of elements in a Group, there are existing technological procedures covering the whole group what reduces the waste of time in regard to individually defined technologies. Modification of an application of the Group approach in a Cluster is also in the fact that the process of designing a Group technology is placed on the Cluster level – what significantly relieves resources of participating companies and decreasing the costs.

In order to reach the optimal choice of companies, in other words, the effective distribution of homogenous groups of objects of work amongst the companies, compares the possibility of companies in relation to the technological requirements of the group elements. In that way, the problem of participating companies having similar technical-technological potentials is being solved. Each group of products has its flow which is defined on the Cluster level what enables easier control and consideration of possible critical points and possibilities for improvement. On the other hand, each innovation implies small changes in the layout of such arranged processing structures of Clusters.

5. CONCLUSIONS

Network value system helps the organizations acquire process competence and better process control. Investment on

¹ BILATERAL COOPERATION PROGRAMME ITALY – SERBIA : Integrated Governance of productive companies in sectoral clusters (GIFIP)

² UNIDO project: and title: Facilitating International Market Access for Manufacturing Suppliers in the Automotive Component Industry in Serbia

measurement and testing equipments leads to long term advantages. They can manufacture high precision products and get price advantage on these value added products as they grow through forward integration [5]. With this approach, a number of structural elements and a variety of relations between them are the basic parameters which define the complexity degree of organizational structure and simultaneously determine the complexity of clusters information flows. Therefore, the complexity degree of organizational structure determined upon those parameters enables comparison of the designed structure variants using the quality defined as control adequacy. With process expertise they can also develop many new products and also cater to the international market [12].

The system defined in this way enables high-performance production, and provides optimal use of capacities and great flexibility of the entire system. Such systems enable the production in small series with very low costs. Since there is a large number of small and medium-sized enterprises, any changes in processing, shaping or any changes of material are solved within a few enterprises either by replacement or purchase of a small number of machines or by including in the cluster some companies with required developed technology, and by doing so we

achieve a very fast reaction to any disorder or any changes. It means that the processes of development are carried out simultaneously, because each company gets the task to develop a part of a product for which they are specialized, and doing so we achieve the development of shorter duration, and increased number of different combinations available for utilization.

In summary, despite the movement to global outsourcing, a firm should strategically assess its local area for resources that might provide a lower total cost alternative in better managing its supply chain. Firms considering relocation should analyze geographic regions that currently possess cluster characteristics or that have emerging potential for developing clusters. Cluster areas can improve both supply chain and firm performance and allow leveraging of complementarities and external sales. Upstream and downstream partners may exist in these areas that can provide synergistic benefits that do not occur as readily with distant supply chain configurations. The integration of cluster theory and Network value system offers firms a way to build competitive advantage by initially focusing primarily on local resources when selecting supply chain partners, rather than looking only for low cost advantage through distant outsourcing.

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