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Decentralization of Organizational Structure and Management in Shipbuilding Industry

Review paper

Shipbuilding industry is known as a very complex business-production system. Therefore, the organizational structures of shipyards are very wide and deep, and it is very hard to manage such complex systems. Shipyards are not able to meet the demanding challenges of the globally based shipbuilding market if, among other things, they do not apply contemporary scientific achievements in the field of organization and management theory. This paper deals with possible new organizational solutions relying on scientifically based organizational theories. It describes a model of a networked shipyard where a reformed and significantly reduced shipyard is a leader in that network. Such a model provides decentralization, flexibility, innovativeness, in one word, democratization of the shipyard organization.

Keywords: *organization, shipbuilding industry.*

Decentralizacija organizacijske strukture i upravljačke funkcije u brodogradnji

Pregledni rad

Brodogradilišta su poznata kao vrlo složeni poslovno-proizvodni sustavi. Zbog toga su njihove organizacijske strukture veoma široke i duboke. Radi se o kompleksnim organizacijskim strukturama teško upravljivim. Zahtjevnim izazovima globaliziranoga brodograđevnog tržišta, brodogradilišta neće moći odgovoriti, ako između ostaloga, ne primijene suvremena znanstvena dostignuća na području teorije organizacije i upravljanja. U radu je dan prikaz moguće primjene novih organizacijskih rješenja zasnovanih na znanstvenim osnovama teorije organizacije. Radi se o modelu umreženog brodogradilišta s preoblikovanim i bitno reduciranim brodogradilištem kao liderom u mreži. Ovakvim modelom postiže se decentralizacija, fleksibilnost, inovativnost, jednom riječju demokratizacija organizacije brodogradilišta.

Ključne riječi: *brodogradnja, organizacija.*

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1 Introduction

Due to the ever-increasing amount of knowledge, both in technological and organisational fields, companies need to abandon standard forms of organization. Old notions of the industrial era have greatly changed today. Classic business strategies do not give instructions on how to adapt companies to new circumstances. Centrally planned "command-control" models of traditional organizational forms do not match the market conditions and needs any more.

Flexibility, innovation and continuous improvement of business are the elements which are becoming an integral part of the strategic approach to building competitive advantage. Due to these factors, the process of transformation of traditional companies, and thus the shipyards as well, is inevitable and unavoidable.

Today, the results of the business activity of a company, in addition to the success at the buyer, are also being influenced by suppliers, distributors, competitors and changes in the macro environment in aggregate interaction. Contemporary companies

react to the new dynamics of market conditions and increased uncertainty with the risk insurance and risk sharing strategies by entering into cooperation relationships with other companies creating thus strategic networks of strongly or less strongly connected companies. Today's shipyards, almost completely alone, bear the risks of operation in very complex and complicated market circumstances.

Customers today possess a high level of knowledge and ask for high quality products that meet their specific demands, which is especially the case in shipbuilding. Traditional shipyards can hardly meet the above requirement, because their dominant resource is physical capital, i.e. land, halls, equipment and money. Modern, agile companies actually sell their skills, knowledge and expertise, and as such can cope with demanding customers.

Today shipyards are faced with major problems in their business operation, mostly because of the exceptional exposure to expense pressure, as the consequence of complete globalization of the market in which shipyards operate. Traditionally organized shipyards with 'mastodonic', inert, inefficient, and rigid organizational structure cannot respond to the demanding

challenges of the market. With the existing model of shipyard's cooperation with partners it is not possible to respond to the new challenges of the market.

To create added value today's shipyards have the physical capital (land, buildings and equipment). Shipyards mainly provide the financial capital needed for the construction of ships in the capital market. These two elements only are not sufficient nowadays for the successful creation of value. It is necessary to have and continuously create new intellectual capital.

Existing shipyards are very complex business-production systems, and also very robust from the organizational aspect. The basic organizational structure is the dominantly functional structure and rarely matrix (project) structure. Large 'width' of the organizational structure is reflected in many of the basic functions, in both preparatory and production parts of the shipbuilding process. Thus the following main functions can be listed: development, sales and marketing, designing, construction, planning, technology, financing, procurement, general services, production, production support, relations with partners, maintenance, quality control, information technologies and guarantee jobs. There is no main function of the business-production systems that is not included among shipyard activities today. Such a 'width' of the organizational structure inevitably generates, in terms of organizational concepts, too many organizational levels (management levels), which points to the excessively great "depth" of the organizational structures of today's shipyards.

Possibilities of efficient management of such organizational structures are considerably limited, which is one of the main reasons why shipyards lag behind the necessary and modern development trends of the entire industry. Therefore, today's shipyards have significant problems in: maintaining market share, increasing flexibility, increasing the complexity of products, achieving profitability, increasing productivity, expenditure rationalization, reduction of shipbuilding time, maintaining quality level, and meeting clients' requirements.

Today's shipyards, in order to survive, are mostly dedicated to the attempts to re-engineer core business with the aim to increase the efficiency of the entire shipyard. In this case, partly unconsciously, all the internal functions that are outside the core business are being continuously ignored, which causes the decline of their efficiency and productivity.

2 Contemporary developments of organizational structures

Globalization, lack of clear organizational boundaries, focusing on complementary core activities and resources and allocation of other tasks are features of modern ways of management. Disappearance of hierarchical organizational features, the equality of participants and the geographic dispersion of business activities, are some of the characteristics of the successful global companies. Knowledge and intellectual capital represent critical business resources.

Rapid development of technology allows classic companies to introduce flexible organizational structures that can meet rapid market changes. More and more companies are leaving the concept that they themselves realize the greatest possible scope of activities in the production of a certain product. The aim of such companies is forming a networked or even virtual organization.

Reduction of costs is still today positioned at the top of the list of priorities in many companies, but the strategy of specialization and the development of specific advantages are replacing the strategy of rationalization. Development of new technical solutions and applications, increase of productivity, acquisition of specific knowledge and skills increasingly take place in the strategic development plans of modern enterprises.

Opportunities of the company for completely independent action are becoming more and more limited, which leads to the process of specialization and externalization of all non-critical activities and keeping within the company of only those key activities in which the company has specific advantage in the market.

Outsourcing has emerged as a solution that enables companies to concentrate on the activities they can best perform. Eliminating hierarchy and decentralizing management, the companies are becoming much more agile, tending towards network organization based on team work.

The main objectives which are to be achieved with the new organizational forms are: cost savings, resource availability, reduction of risk, taking advantages of new technologies, use of the centre of expertise, and improved information technology services. The process of strategic business development is a very complex process for which the top level managerial knowledge, competence and skills are necessary.

Market orientation, i.e. production and provision of services for a specific customer has become one of the most important factors in securing survival of a company. Also, the market turbulence requires continuous adjustment to the global trends, which corresponds to:

- high quality of products and services,
- lower time to market and time to customer,
- price reduction – be cheaper than competition, and
- increased number of complex products and production processes.

The factor of time is becoming an increasingly important issue related to competitive success (it's not the big fish that eat the small ones; it's the agile that eat the slow ones). Following the motto "only the changes are constant", agility and flexibility requirements are increased by the changes of society, market, processes, and product structure [1].

During the last decade a large number of scientific and professional papers on business strategies for competing successfully in the dynamic and global business environment were published. Although many of the suggested recipes differ in part or in whole, it seems that a consensus has been reached that in the contemporary dynamic business environment the specialization of companies based on the analysis of their core competencies and management of them represents the critical activities of a company in achieving competitive advantage. However, little attention has been given to the in-depth understanding of the practical problems associated with identification and managing of core competencies in the contemporary organizational structures.

Development of a company should be a continuous process that should lead towards complex and dynamic production structures and attaining of relevant competition. The result of such development can be for example a change in the activities that will continue to take place in the company in relation to those that will be provided by external partners (in-and outsourcing activities), the introduction of strategic alliances, search for additional

production potentials, and development of new business models using the information and communication technologies.

Many companies with their limited resources are facing the challenge, which they often cannot overcome alone. Ideal type of company would be the one that would be able to achieve the necessary flexibility through effective structures and business processes, and by linking with other companies. In this way, the structures and business processes would be connected with the processes of constant changes, optimization and learning.

Proposed organizational concepts nowadays set new paradigm and goals for the company related to the increase in flexibility and possibility of innovation. This is a change in relation to the classical strategies for rationalization that have in the centre of optimization the increase of productivity. The new organizational concepts encourage companies towards continuous transformation of company organization and management.

Collaboration, as a necessary form of modern business cooperation is focused on the application of basic competencies in joint operations. Collaboration of companies in the networks of strategic alliances brings together core competencies of different companies selected by a healthy market competition. Core competencies can be combined in different ways: for example, as various forms of alliances and long-term contracts with extensive combinations resulting in the emergence of network forms of organizations [2]. To maintain effectiveness, these organizational forms require a balance between the two catalytic powers: cooperation and competition. Over time, this balance must create a dynamic equilibrium in order to avoid the constant tension between individual ideologies and common business policy.

Companies need to specialize as much as they can and get rid of their non-core competencies to become "lean" and flexible to market changes. Therefore, the old strategy of vertical integration is replaced with a new strategy of outsourcing, which results in a networked organization.

Application of the concept of networked organization, whether it concerns creating new business activities with limited resources, or transforming and redesigning old, traditional companies, is based on the symbiosis of competencies and shared use of resources.

The basic idea of the concept of networked enterprise is joining of core competencies of all members, which leads to the achievement of the key and defendable competitive advantages of networked companies on the market. Joining of competencies is done almost without any institutional governance and control mechanisms. The possession and the ability of creating the best core competencies in a particular field of industry is a basic prerequisite for participation in a networked enterprise.

The core competencies are «the crown jewels» of every company. Based on the relatively high customer satisfaction and greater ability to retain customers in relation to the competition, they are of great importance for the company compared to all other skills. Therefore, it is no wonder that successful companies focus their further development on the core competencies. The core competencies include the following features:

- they are recognizable and significant to customers,
- they are unique in comparison to the competition,
- they are hard to imitate, and
- they create a potential appearance on many markets.

The basic structure of core competencies includes: products, business processes and technologies, i.e., the abilities to build

competencies are based upon them [3]. The outcome of this approach to basic competencies is very encouraging. Namely, the core competencies, otherwise complicatedly defined, perceived through easily analyzable components, become explicit.

Return to core activities and focusing on the core competencies becomes the key development direction of modern enterprises. Companies should make a strategic selection of the core activities, i.e. those activities in which they achieve the best results in comparison with their competitors, and they should focus their resources only on performing these activities. All other activities should be entrusted to others, i.e. to those who will do them better, faster and cheaper. By focusing on the core competencies [4] and externalizing non-core activities, the companies form their strategy of business growth and development in the global business environment.

Outsourcing represents a contractual relationship for transferring a part or entire business/production activities to outside partners (outsourcers) who in this way take responsibility for the performance of one or more business/production functions and activities. Outsourcing is a management strategy by which a company outsources most of the non-core activities to specialized suppliers¹.

Traditional externalization is the process of separating certain activities or entire business processes from enterprises in order to realize financial savings and is often accompanied by a transfer of the part of assets, personnel, databases, and intellectual property. Externalization may be a complete abandonment of certain functions or activities by a company, while in the case of outsourcing some of the functions or activities are subcontracted to specialized companies that will perform them more successfully. The connections between the parent company and the new subcontractor are permanently retained. Therefore, it can be said that outsourcing is also externalization, but the externalization is not outsourcing. It is also necessary to differentiate outsourcing from conventional contractual relations with suppliers, where a company (the buyer) orders goods or services from another company (the supplier). The difference between simple contracting and outsourcing is that outsourcing involves a complete restructuring of the company and orientation to the core competencies and external relations. Depending on the need, the company gets engaged in this reorganization to a smaller or larger extent.

Outsourcing of business activities can bring to the company, in addition to savings, significant advantages. Outsourcing companies, specialized in certain products or services can be significantly more efficient; they can develop innovative solutions, increase flexibility, speed up the redesign of the entire business process, increase the portfolio of services and can continuously participate in the business improvement of the client.

Companies' decisions to outsource are less and less frequently made in the interest of lowering costs, and more and more in the interest of acquiring new technologies and better readiness for the changing market conditions. Organizations that outsource are also seeking to realize the benefits of access to operational expertise and knowledge of the outsourcing services providers, as well as the advantages of economies of scale. The main objectives of outsourcing are [5]:

¹ From The Outsourcing Institute, www.outsourcing.com

- cost savings,
- resource availability,
- reduction of risk,
- taking advantage of new technologies,
- centre of expertise
- improved information technology customer service.

It is often hard to justify non-core capital investments when areas more directly related to the core activities compete for the same money. Outsourcing can reduce the need to invest capital funds in non-core business functions.

However, the need of a company to increase efficiency may often run into direct conflict with the need to invest into core business. If the company decides to focus on the core activities, all non-core internal functions will be continuously neglected, and thus they will become less and less efficient and productive. Therefore, a good option is to outsource these non-core functions to an outside provider. Only then will the actual benefit from the re-engineering come to light. Outsourcing will enable refocusing of own resources from the non-core activities to the core activities that are directly concerned with the creation of higher added value [6].

Modern management theorists claim that today's integrated companies are "stumbling dinosaurs" which will be soon replaced by narrowly focused, fast and flexibly networked or even virtual enterprises. Such organizations, created by focusing on the best core competencies and outsourcing of non-core functions will be able to respond to every market opportunity and challenge.

3 Model of restructuring a conventional shipyard into a networked shipyard

Each shipyard should face with the critical analysis of its business, with the aim to determine the importance level of activities, i.e. to distinguish between the core and non-core activities. This job belongs to the domain of strategic management of each shipyard. By focusing on the core activities and outsourcing the majority of activities or functions that are not core, a possibility is created for organizational and technological re-engineering of the shipyard, which is necessarily needed in order to achieve successful operation of the shipyard. Fast and adaptive response to new and more complex ship projects can be more easily achieved in the conditions of a shipyard networked with a number of agile partners. Without new organized forms of participants in the chain of ship building, one remains locked into the past thinking, which certainly leads into the uncertain future.

The problem of a shipyard company should be considered as a transformation of a classically organized enterprise into a networked or virtual enterprise organizational structure. The main goal is that the shipyard, as a leader in the networked enterprise, limits its operation to the vital and strategic activities and areas in which it achieves the best results in comparison with the competitors. The shipyard should focus all potentials only on the performance of these core competencies, and all other activities should be outsourced to other companies that will do them better, faster and cheaper.

Today's shipyards completely alone bear the risks of operation, regardless of the number of partners participating in the construction of the ship. In the networked and virtual structures, each outsourcer takes over a part of the risk of the joint business.

The shipyard as initial (leader) company in a networked or virtual organization possesses unique competencies in: certain technological methods, established market reputation, market position, developed business relationships with partners and thus created confidence, and most importantly in the know-how. The leading company, in this case, the shipyard, organizes and optimizes the chain of new value creation, where it with its name guarantees the product quality and market position, and uniqueness of the company within the given market.

Since there are many different types of networked and virtual organizational forms, it is important to determine the level of stability of such a model, which is in the case of shipbuilding industry of great importance. On the other hand, it is necessary to investigate typology as well as the type of organization from the aspect of coordination and duration.

In this connection, very important is the decision concerning what will be done in the shipyard itself, and what will be procured from external sources, i.e. bought in the market. In other words, it is necessary to investigate the areas of core competencies of the shipyard, taking into account technological aspects as well.

Viewed from the legal aspect, it is important to point out that the members of a virtual or networked shipyard retain their independence. The formal legal framework relies on the concept of a corporation as a series of long-term contracts. The conception of the nature of a corporation as a series of long-term contracts extends the boundaries of a company beyond the range of single ownership, which represents a formal legal framework of a company. This is important for the modelling of the networked structure of the future shipyards. Each member of a networked shipyard through a contract automatically acquires the rights and obligations, and thus such a shipyard can be defined as a company. In relation to the customer, from the legal aspect, a networked shipyard appears as a single contractor, which is also preferred by a customer.

It is known that shipbuilding is an atypical and specific branch of industry compared to other industries. Because of this, the methodological approach in determining the core competencies, which is valid for other industries, cannot be directly applied in the case of shipbuilding. Therefore, it is necessary to set a new methodology more suitable for the case of the shipbuilding industry.

Viewed from the aspect of products, a ship as a final product of shipbuilding is also characteristic and specific in comparison to other industrial products. In the process of creation, it originates from a large number of input raw materials, materials and equipment, through very different intermediate products and services, to the final individual complex product of capital value. At the level of the shipyard there is a meta-competency, seen from the aspect of the product, however, in the analysis of the shipyard core competencies from the product aspect, one should go to a lower level, i.e. to the level of intermediate products or services, which represent outputs of each process, i.e. sub-process.

Building of a vessel is a lengthy, discontinuous, overlapping procedure, which involves a large number of processes and sub-processes. Therefore, in the analysis of the core competencies, from the aspect of the entire shipbuilding process, the analysis should be done at the level of individual processes, i.e. sub-processes that generate certain intermediate products and services.

In all shipbuilding processes and sub-processes a very large number of different technologies that have different technological

levels are applied. Thus, in the analysis of technological aspects of the core competencies in shipbuilding, the technological analysis should be also done at the lower level, i.e. at the level of processes and sub-processes.

Due to a large number and diversity of criteria for determining the core competencies in the shipbuilding industry, it is necessary to have a different and more complex methodology for their determination than in the case of other industries. The primary feature of the proposed methodology is the two-level principle in the approach to decision-making on the shipyard's core competencies.

The first level of decision-making involves the elimination criteria in determination of the shipyard's core competencies. The second level involves the assessment criteria in determination of the shipyard's core competencies. The proposed methodology is illustrated in Figure 1.

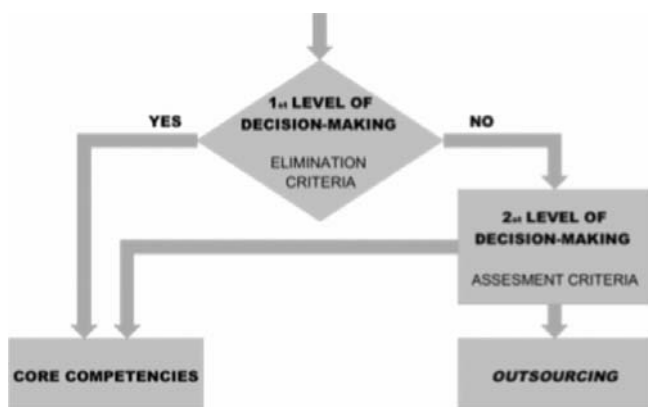


Figure 1 The principle of two-level decision making on the shipyard's core competencies

Slika 1 Dvorozijski princip odlučivanja o temeljnim kompetencijama brodogradilišta

As it can be seen from Figure 1 at the first level of decision-making on the core competences, some sub-processes, i.e. intermediate products or services are immediately defined as the shipyard's core competencies, while the remaining ones are directed to the second level of decision-making, after which some of them are also defined as the core competencies, while the remaining ones are defined as candidates for outsourcing.

The result of the application of this methodology to the shipyard of today provides the answer to the crucial question, and that is: which sub-processes, i.e. intermediate products or services constitute the core competencies of the shipyard and as such should remain in the domain of the shipyard as a leader in the networked shipyard, and which sub-processes, i.e. intermediate products or services should be left to outsourcers (partners), connected in the same network.

The set of the elimination criteria for the first level of decision-making involves the following criteria:

- 1.1. High degree of impact on the ship customer (market aspect),
- 1.2. The lack of necessary technologies in the environment (in other industries),
- 1.3. The presence of hard to solve (technical and/or cost) transport problems.

Criterion 1.1. has the task to identify the sub-processes, i.e. intermediate products or services that have critical impact on the customer of the ship, and thus also on the positioning and the survival of the shipyard in the world shipbuilding market.

Criterion 1.2. identifies the processes that use specific technologies that do not exist in the closer or more distant environment, i.e. in other industries.

In the shipbuilding industry there is a number of intermediate products of significant size (mass and/or dimensions). Because of that, the criterion 1.3. has the task to identify the sub-processes that generate intermediate products where there are technically and technologically unsolvable transportation problems, or where they are unacceptable from the aspect of cost, i.e. considerably exceed the amount of added value realized on that respective product at the outsourcer.

In the analysis of processes, i.e. sub-processes or intermediate products or services in accordance with the above criteria, the possible result of the analysis is either YES or NO. The analysis resulting with at least one YES points to the core competencies of the shipyard, while the analysis resulting with all the three NO's indicates that it is necessary to undergo the decision-making process at the 2nd level, i.e. assessment procedure.

The set of criteria for the second level of decision-making, i.e. assessment procedure involves four subsets of criteria as follows:

2.1 Subset of criteria related to intermediate products or services

- 2.1.1 Impact on the functionality of the final product 1→5
- 2.1.2 Impact on the quality of the final product 1→5

2.2 Subset of criteria related to sub-processes

- 2.2.1 Complexity of sub-processes 1→5
- 2.2.2 Degree of interaction with other sub-processes 1→5
- 2.2.3 Core processes or auxiliary processes 3→5 (for core processes)
1→3 (for auxiliary processes)

2.3 Subset of criteria related to technology

- 2.3.1 Complexity of organization structure of sub-processes 1→5
- 2.3.2 Comprehensiveness of process with respect to the final product 1→5

2.4 Subset of other criteria

- 2.4.1 Impact on the cost price of the ship 1→5
- 2.4.2 Share in the value added in the construction 1→5 of the ship

Subset of criteria 2.1. is related to intermediate products or services. As it can be seen from the descriptive names of these criteria, they are applied to assess the level of impact of intermediate products or services, as output of certain individual sub-processes, on the functionality and quality of the final product, i.e. ship.

Subset of criteria 2.2. related to sub-processes takes into consideration the complexity of sub-processes, degree of interaction with other sub-processes and the fact whether core or auxiliary shipbuilding processes are in question. These criteria have important influence in the assessment procedure during the analysis of the shipyard core competencies.

Subset of criteria 2.3. is related to the technology applied in shipbuilding processes. Assessment of sub-processes from this aspect starts from the complexity of the organizational structure necessary for successful performance of each individual sub-process. On the other hand, the comprehensiveness of a certain sub-process refers to the fact whether the activities of an individual sub-process take place at the level of an overall final product, i.e. vessel, or only at its one part.

Considering the characteristics of the final product in shipbuilding, where we primarily think of the capital value of a vessel, in the analysis of the core competencies in shipbuilding, apart from the above criteria, one should also take into account the additional - new criteria, which contain also other aspects of the analysis of core competencies, i.e. the subset criteria 2.4. While doing so, it is necessary to determine the impact of sub-processes, i.e. intermediate products/services on the cost price of a vessel. Also it is important to determine the contribution of individual sub-processes in creating added value in the whole shipbuilding process.

Each of the criteria is scored 1 to 5 points in the analysis of the shipbuilding core competencies in the process of evaluation. In the process of analysis of the core shipbuilding competencies, the score 1 indicates no level of impact, 2 low level of impact, 3 medium, 4 large and 5 very high level of impact.

After the core competencies of the shipyard have been defined, it is logical that everything that has not been defined as the shipyard core competencies according to the proposed methodology for determination of shipbuilding core competencies is to be considered for outsourcing.

The main reasons for outsourcing a part of the shipbuilding process, and thus part of production of intermediate products or services are as follows:

- ship construction cost savings,
- reduction of risk, by transferring them partly to outsourcer,
- necessity of implementing re-engineering of the overall shipbuilding process,
- more rational use of existing resources,
- reduction of suboptimal performance of some of the processes,
- improved information technology service
- taking advantage of new technologies.

Significant expansion of the area of outsourcing in shipbuilding is also enabled by the following facts relevant for implementation of outsourcing phases:

- shipyards are able to define precisely all the features of products or services ordered from outsourcers,
- shipyards have a methodology for monitoring and measuring the characteristics of these products and services and
- shipyards already have experience in cooperation with many partners.

The basic product of networked industrial groups is the information about core competencies of their network members. The core competencies of a networked industrial group are a set of competencies of its members who must have a clear focus. The core competencies of a networked industrial group represent the ability of the group to produce certain types of products, to offer a number of business processes, or to implement specific technological solutions. A similar approach to networked groups is given in [6], where the term «networked industrial group» is also used. The concept developed from industrial groups as regional industry networks with common chain of production, as a result of linking globally dispersed companies with complementary competencies with the support of information technology infrastructure.

The classification of networked enterprises given in [7] is interesting for the case of the shipbuilding industry. This classification attempts to integrate previous thinking and classifications, and it is based on the features such as duration, topology, participation, coordination and visibility scope. An overview and explanation of this classification is given in Table 1.

Table 1 **Classification of networked and virtual enterprises**
Tablica 1 **Klasifikacija umreženih i virtualnih poduzeća**

<i>Criterion</i>	<i>Classification</i>
Duration	- single project - long term alliance
Topology	- variable / dynamic nature - fixed structure
Participation	- single alliance - multiple alliance
Coordination	- star-like structure - democratic alliance - federation
Visibility scope	- single level - multi-level

Networking is becoming a current trend but it is also a presumption of a modern way of doing business for individuals and for enterprises as well. According to [8], division of a classical company into smaller business units to which all vital functions are transferred is a precondition for switching to a network organizational form. The smaller and more focused to its task the business unit is, the faster and better on the market it will be. In this way, the soul of a small company enters the body of a large company [9].

Considering the organizational transformation of today's shipyards according to the concept of core competencies and outsourcing, it is once again necessary to recall the features of the final product of a shipyard, the overall shipbuilding process, applied technologies in the shipbuilding process, and the role of the customer – ship owner. To achieve the economic goals through such organizational transformation of the shipyard, during the transformation itself, it is necessary to take into account untypical features of the shipbuilding industry in comparison to other industries.

The final product – ship is a complex product of capital value, and to some extent it is a specific, unique and very often one-of-a-kind. Due to such features of the final product, the process of

shipbuilding is also complex, with a large number of processes and sub-processes, with a large number of participants in the process and important and often complex interactions between processes and sub-processes, which all together make the complete shipbuilding process considerably longer than other industrial business and production processes.

Considerable differences between individual shipbuilding processes and sub-processes are also reflected in the application of a large number of different technologies, different technological levels needed in the course of shipbuilding processes and sub-processes. As far as the buyer is considered, the buyer appears at the beginning of the process, i.e. in the pre-contractual phase and is present continuously for the entire duration of the shipbuilding process, i.e. until the delivery of the vessel to the buyer. It is important to stress that the buyer participates in the construction of the vessel with his financial assets in smaller or larger share of the selling price of the vessel.

At the very beginning of designing the model of a networked shipyard it is necessary to say that it is a question of transformation of a classically organized company by applying the concept of a networked enterprise. Therefore, it is a question of renovation, and very often of expansion of the existing enterprise. In the case of shipyards, it is necessary, using the process approach, to divide the robust classical organizational structure of today's shipyards into smaller business units to which all vital functions necessary for their functioning on the market are transferred.

The flowchart representing the phases of the process of transformation of a classical shipyard into a networked shipyard is shown in Figure 2.

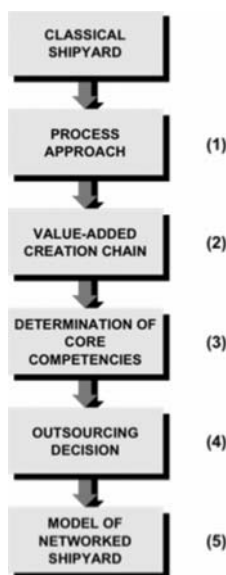


Figure 2 **The phases in creating of a model of a networked shipyard**

Slika 2 **Etape u oblikovanju modela umreženog brodogradilišta**

Taking into consideration the features of overall shipbuilding process, the model of a networked shipyard should have such an organizational framework that will not have time-limited duration. This means that large and frequent fluctuations of the networked members are not to be expected. The model will represent

a relatively stable networked organizational structure, which will be based on cooperation between various organizations created by outsourcing of non-core competencies. A considerable part of the network members will result from the process of outsourcing non-core competencies of today's shipyards, i.e. a part of the network will be created by extracting some functions of today's shipyards. The outsourced parts of today's shipyards will continue to be linked with similar resources from a wider environment, both because of their further growth and development, and because of the winning of new markets, i.e. survival in the market. All this will contribute to creating of a desirable networked environment in which the shipyard as a leader enterprise in the network will take care that the business is conducted under one name, which will further facilitate the creation of more favourable market reputation of the so networked shipyard.

One of the main features of the model of the network of modern future shipyards is long-term alliance between the network members, which lasts for an indefinite number of business processes or for an indefinitely long period of time. This feature of a modern shipyard network is fully in line with the already mentioned characteristics of the shipbuilding process, i.e. shipbuilding industry. From the standpoint of network topology, it is almost a fixed network structure with very little change among members of the network. Having in mind the duration of the process of contracting, preparation and building of a vessel, such a feature of the network is inevitable. Changes among members of the network must be agreed and planned in advance and in accordance with the anticipated and forecast new demands of the market that are to be adequately responded in proper time. Requirements for new members of the network can be motivated by the need to provide new specialized resources, new technologies, new intermediate products, new services, etc.

The next important feature of the network model of a modern shipyard relates to the issue of the form of participation of the network members. In a network shipyard network members can simultaneously participate in a number of networked enterprises, i.e. be at the same time members of multiple networks or just members of one networked shipyard. It is a flexible model that includes both single and multiple alliances, i.e. it allows achieving of the status of exclusive membership in the network, as distinguished from non-exclusive membership. The criteria for attaining the status of exclusive network membership will refer to the size of the share in the operations of the networked shipyard, and this is also related to the importance of activities that are being performed by the concerned network member.

One of the important features of a networked shipyard will be also that the shipyard retaining only the core competencies, will take on the role of dominant enterprise in the network, and will be surrounded by a relatively fixed network of other members in which a star-like coordination structure will be established. This implies a major role of the shipyard concerning coordination within the network. Such features of the network are fully in line with the basic features of the shipbuilding process and characteristics of the final product, i.e. vessel. The star-like coordination structure implies a large communication load between the dominant enterprise (shipyard) and individual network members, compared to a small communication load among the network members themselves.

As regards the aspect of visibility scope within the network configuration, the model of networked shipyard will have multi-

levels visibility scope, which means that all members of the network have the right of visibility over the activities and information of other network members. This follows from the nature of the final product as a joint product of the network, which significantly affects the level of trust among participating members and the possibilities for optimization of the operational processes within the network with the aim of achieving even greater efficiency of the network as a new organizational system.

On the basis of everything that has been said, it is logical that the basic model of the networked shipyard will have the features of the "spider web". In such a network, the shipyard which retains only the core competencies will be the leader of the network or a leading enterprise that will give the form to the networked shipyard which includes all the other network members that are essential for the process of ship construction. Members of the networked shipyard take over all the non-core and outsourced activities, i.e. individual processes or sub-processes. Dominant role of the shipyard of core competencies in the network follows from the character of the final product, which provides an important guarantee and feelings of security to the buyer - ship owner that the contracted vessels will be successfully built within prescribed time and at required standard of quality. Leader in the network retains the "critical mass" of tasks, and thus also of the process or sub-processes from the entire shipbuilding process, and has responsibility to make all efforts to improve maximally the efficiency of operation of these processes or sub-processes. The improvement of the efficiency of operation of the processes or sub-processes outsourced to other members of the network becomes the obligation of these members, with the necessary cooperation with the leader of the network, i.e. the shipyard. In this way it is possible to achieve the efficiency of the entire network as a single and specific system, which is a permanent commitment of the leader and all members of the network.

As shown in Figure 3, the shipyard, which retains only the core competencies as the leader of the network, is located in the centre of the network surrounded by the network members. As already mentioned, the main communication takes place between the leader and members of the network, although for the sake of efficiency improvement of each network member, the network does not exclude communication among individual members of

the network, which is also shown in Figure 3. In this way a high flexibility of such a network model is achieved, and this allows the leader and all members of the network to have communication with entities outside the network, i.e. with the wider environment, which is consistent with the participation of network members in multiple alliances. With such organizational network model, the hierarchical approach to organization typical for classically organized shipyards is significantly changed.

The model of a networked shipyard will have one more important characteristic and that is the feature of the united front to the market. Considering the characteristics of the globalized shipbuilding market, particularly in the sales domain, it is important that the shipyard as a leader in the network, retains the lead role in relations with customers and towards the market. This means that the leader of the network appears on the market as a single deliverer of vessels on behalf of all members of the network. In the shipbuilding industry this is actually the only possible model the market is ready to accept. This feature of the network model is shown in Figure 4.

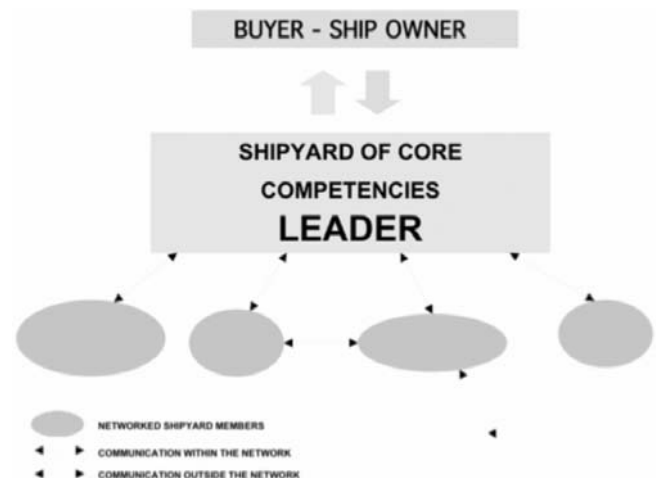
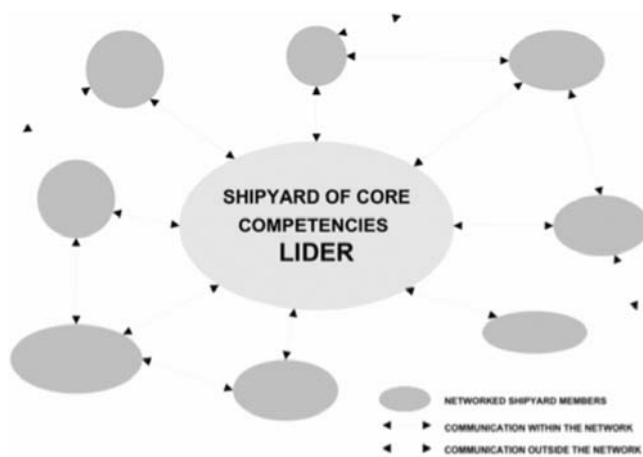


Figure 4 **United front to the market as characteristic of the networked shipyard model**

Slika 4 **Ujedinjeni front prema tržištu kao značajka modela umreženog brodogradilišta**

Figure 3 **The basic model of networked shipyard**
Slika 3 **Osnovni model umreženog brodogradilišta**



The organizational model of an assembly shipyard that dominates in the global shipbuilding industry today is focused on the assembly of a vessel, whereas the manufacturing of the elements of the vessel equipment is left to numerous partners outside the yard. A model of a shipyard of core competencies that the shipyards of today are tending to, aims at further narrowing of the shipyard activities to those that are directly and most closely related to the vessel, which implies further involvement of new partners in the process of vessel construction. In this process new partners can originate from outsourcing of some organizational units from the existing shipyards or by finding and involving new partners from a wider market.

A model of a networked shipyard implies further narrowing of activities of the shipyard as a leader in the network, to the core competencies only, while all other activities are left to the numerous partners - members of the network. Graduality and standardization in the hierarchical procedure of assembling, of both hull

blocks and equipment units, and dislocation of the major part of these jobs from the vessel, enables also much greater involvement of partners outside the shipyard into the assembly processes as compared to the previous organizational and technological models of shipyards. Backbone of operations in the shipyard itself will only consist of the remaining part of the assembly processes in the construction of the vessel hull.

4 Conclusion

Changing of the traditional organizational form of shipyard by introducing new modern networked forms should lead to the following results, i.e. to the achievement of certain strategic, and operational objectives of the shipyard.

Strategic objectives include: retention of market share, increase of flexibility, increase of the network level, and increase of product complexity.

Operational objectives are: to achieve profitability, increase value added, increase productivity, costs savings, lower time of ship building, maintenance of the quality level, and increase of the client's satisfaction.

The new organizational approach should also ensure the following:

- optimization of organizational processes,
- greater flexibility of the business-production system,
- integration of individual resources and different skills in a more effective way,
- collective approach to the global market, which many participants in the network would not be able to do individually,
- utilization of synergy effects,
- possibilities of production of more complex higher value-added products,
- focusing on the core competencies for the sake of cost reduction, increase of profitability and efficiency,
- economies of scale of small enterprises from the environment,
- increased business opportunities for small enterprises,
- maximization of resources,
- higher level of product quality,
- avoiding a significant new investment with increase of capacities at the same time,
- access to new markets,
- loyalty of clients – ship buyers,
- increase in enterprise performances and
- strategic growth and development.

The new organizational and technological structure of the shipyard would have the following basic features:

- specialization of operations, costs reduction and quality increase,
- non-core activities externalized by outsourcing, which provides significant cost savings and competitive advantages,
- network-connected previously specialized organizations that achieve better business results,
- properly selected model of economic relations with partners increases satisfaction of the networked shipyard members,
- application of modern information and communication technologies enables a high intensity of communication,
- networked organizational model ensures greater flexibility and adequate response to market demands, and
- the model also supports the application of modern technologies in shipbuilding.

In the designing of networked enterprises two main trends are present: on the one hand there is segmentation, i.e. the process of “disintegration” of big companies (“top-down” virtualization), and on the other there is linking of independent organizational units and small enterprises through various forms of cooperation (“bottom-up” virtualization). These trends are shown in Figure 5 [10].

In the case of shipyards, there is abandoning of existing organizational structures based on hierarchy and Taylor's principles, whereby the organizational restructuring of the shipyards follows in three stages [10]:

- in the first stage there is restructuring of the organization based on functional structure into a process-based organization,
- in the second stage the shipyard's core competencies are determined,
- in the third stage a network shipyard is formed.

In the networked model of the shipyard, a shipyard of core competencies, as a leader in the network, focuses all of its resources only on performance of its core activities, while all other activities are entrusted to other companies (members of the network), i.e. to those who will perform them better, faster and cheaper. The focusing on the core competencies and externalization (outsourcing) of non-core activities represent the business strategies that enable the survival, and business growth and development of modern enterprises in the global business environment.

Network of economic-production relations in a networked shipyard, established for an unlimited duration of cooperation, is based on contractual relations. Accordingly, the concept of a networked shipyard with its formal legal framework directly relies on the theory of a corporation as a series of long-term contracts, which extends the boundaries of an enterprise beyond the range of single ownership.

A key element in the functioning and development of the networked shipyard is establishing of high quality economic relations among its members. The basis of the economic relations is the determination of the share of the members in the joint business results, which in the case of a networked shipyard means the application of the model of joint income.

The application of the model of a networked shipyard would not be possible without simultaneous development and implementation of new technological achievements in the vessel building methodology. Thus, the application of production engineering is necessary, which will have as a result the overlapping of the processes of hull construction and vessel outfitting, and the application of high technologies in the major part of the shipbuilding process. This allows dislocation of a great number of assembly jobs from the vessel itself to either close or more remote locations, and provides better working conditions, which enables outsourcing of these activities with all the advantages that it brings.

The dynamics and procedure of the process of shipyard restructuring according to the networked shipyard model, in addition to economic criteria should also take into account socio-social aspects. Care should be taken about own employees who will become part of outsourcing, especially if the same aims at privatization, small, or medium enterprises. The employees should be given a chance, that by accepting a new position, the question of their future existence is resolved in an acceptable way both for them and for the networked shipyard. The model of the networked shipyard would be able to function, among other things, only if

the network is constituted of a set of trusted partners, who have a clear vision of the future business existence.

The future global economy will be characterized by heavy competition. The business environment will be no longer dominated by huge multinational corporations, but by cooperatively and mutually linked and intertwined networks of organizational forms. Alliances of specialized flexible companies will displace from the market big and slow classical companies. Only associated companies that are specialized for the production of a particular product can achieve the best results and accomplish the set goals in the best way. The complexity of the new economy can be conquered only by developing awareness for teaming with others and networking, where all parts of the organizational system, using their knowledge and skills, will mutually contribute to the creation of a new value added.

References

- [1] WIENDAHL, H. – P.: «Verteilte Produktion», VDI Berichte 1299: Dezentrale Fabrikplanung VDI Verlag, Düsseldorf, 1966, p. 33-57.
- [2] MILES, A., SNOW, C.C.: «Organisation: New concepts for new forms», California Management Review, 23, 1986, p. 62-73.
- [3] CAMARINHA–MATOS, L. M., AFSARMANESH, H., ERBE, H-H.: «Advances in Networked Enterprises», Kluwer Academic Publisher, Boston/London (2000).
- [4] PREHALAD, C. K., HAMEL, G.: «The Core Competencies of the Corporation», Harvard Business Review, 68 (3), May – June, 1990, p. 79-93.
- [5] WILLIAMS, O. D.: «Outsourcing: A CIO's perspective», CRC Press LLC, 1998.
- [6] BENDOR – SAMUEL, P.: «What is Outsourcing ?», www.outsourcing.com
- [7] HENNART, J.F.: «Explaining the Swollen Middle : Why Most Transactions are a Mix of Market and Hierarchy», Organizational Science, Vol. 4 1993, p. 529-547.
- [8] CAMARINHA-MATOS, L. M., AFSARMANESH, H.: «Infrastructures for Virtual Enterprises», Kluwer Academic Publisher, 1999.
- [9] KARNER, D.B. :“Business network and cooperation“ Journal of International Business Studies, Vol. 27, No. 5, 1999, p. 21-22
- [10] ČAGALJ, A.: «A Contribution to the Modelling of Organizational-Technological Structure of Contemporary Shipyard», (in Croatian), PhD Thesis, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split, 2008.