

DIFFERENTIATION OF PORT SYSTEM TECHNOLOGICAL PROCESSES FOR ESTABLISHING THE PORT SERVICE QUALITY

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Summary

Modern tendencies of transport market globalization and traffic subsystems integration have been greatly changing the functioning methods of the social and economic life and have initiated the adaptation to new processes. Consequently, the study of port system competitiveness is imposed as the condition of successful functioning stipulating the study of implementing new technologies and establishing high safety standards. The port system competitiveness is a characteristic which is the objective of every port system since it directly reflects its status and behaviour on the maritime transport market recognizing the commercial and industrial function of a port and meeting the requirements set by the clients.

Key words: transport technology, technological processes, port system, port service quality, quality management.

1. INTRODUCTION

Over the last decades, the increased competition, the advent of information technology related to the port production as well as the evolution of the transport industry as a whole, has a significant effect on ports around the world⁴. As a result, new production capabilities and novel combined transportation practices have been introduced. Ports have to redefine their management strategies, their business processes and product –service characteristics. For the later, the traditional port services have altered including

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⁴ C.I. Chlomoudis, K., Karalis, K. A Pallis: Port Reorganization and the Worlds of Production Theory? European journal of Transport and Infrastructure Research, 3(1), 2003., pp. 77- 94.

both industrial and service operations¹. The “quality” issue has become apparent within the seaport industry, while the influence of quality on customer perceptions and consumption behavior has become a major factor affecting the end user choice of terminals and ports. Quality may be seen as the single most important factor for long-term competitive success and customer satisfaction².

The global competition process has been the main external driving force for the new challenging era of the port industry³. This new scene boost ports to create and sustain competitive advantage by increasing their ability to respond to users needs through the quality improvement of port services. The improvement of quality services must be based on management practices aiming at this target. The variety and the complexity involved in port production nowadays have been a motive for the development of different management approaches⁴.

2. ANALYSIS OF TECHNOLOGICAL ACTIVITIES IN THE PORT SYSTEM

The ports are the main sources of sustainable added value of services in local, national and regional economy. During the implementation of comparative analyses of technological activities in different ports, three important questions are raised:

1. How does the port traffic structure affect the technological activities and services?
2. How can port specialization for individual markets serve as indicator of evaluating the technological activities and added values of services?
3. Can the economic influence of cargo flow in ports (the main parameter of port functioning) in the considered competitive environment be evaluated by the use of measuring rule that takes as indicator the sum of added values generated by every traffic flow.

The technological elements of the port system are represented by the processes that are to be performed at the terminal.

The introduction of the added value concept of port sub-services allows transformation of “nominal tonnes” into “manipulated cargo tonnes” or “tonne value”. From the aspect of investments into the port infrastructure these factors promote the market positions and increase of the market share of its port sub-services.

⁵ F. Suykens: Ports should be efficient (even when this means that some of them are subsidised, *Maritime Policy and Management*, 13(2), 1986, 105-126.

⁶ P.B. Marlow, A.C. Paixao: Measuring lean ports performance. *International journal of transport management*, 1, 2003, pp. 189 – 202.

⁷ C.I. Chlomoudis, A. Pallis: Port Governance and the Smart Port Authority: Key issues for the Reinforcement of Quality Services in European Ports. *Proceedings of the 10th World Conference on Transport Research*, (CDRom), Istanbul, June 2004.

⁸ C.I. Chlomoudis: Port planning in the modern port industry, J&J Hellas, Piraeus, 2005.

Analyses at different ports apply different concepts of added value of services, calculations and determining of measuring rules to convert nominal tonnes into tonnes of manipulated cargo or tonne value. For instance, in case of ports in a competitive environment Hamburg - Le Havre the added value concept tends to the contribution of port activities in the national GDP. In the port of Rotterdam, the added value of port services is separated from the total added value in the competitive environment¹. Le Havre estimates the added value of port service on the basis of national information on the included labour costs.

These existing approaches have been almost completely based on regional data on the number of the employed and the respective labour costs. Furthermore, the differences in the definition of the concept of added value of port service at every port have brought to different procedures of data gathering. Therefore, there is no unique procedure of data gathering which allows computing of added value created at ports and allows real comparisons among ports.

The first rule that defines the added value as a relevant concept for analysing the port competition was developed at the port of Hamburg in 1976. The rule recommends that the added value for one tonne of conventional cargo corresponds to five tonnes of dry cargo or fifteen tonnes of liquid cargo.² The Bremen and Rotterdam rules³ are often indicated and applied in traffic assessments. In 1982, based on a study, the port of Bremen introduced added values taking the difference in labour costs between one tonne of conventional cargo (not containerized) as the basis of the Bremen rule.

The existing measuring rules are not adequate for wider port comparison, because of the lack of transparency in their concept and clear irregularities or differences in methods of gathering and interpreting data. Furthermore, the specific traffic structure marks every single port and represents the basis of the development of the measuring rule, determining the coefficients of rules and their application. As a result, a rule based only on the traffic structure of a single port can be applied on the descriptive statistical data on the port traffic.

The basic problems of the analysis of technological activities related to the introduction of the added value concepts into the assessment – comparison of ports refer to:

- unavailability or confidentiality of reliable data,
- characteristics of the method which is used for data gathering,
- difficulties of implementing the rules based on the traffic data of a specific port in the context of another port,
- limited transparency of data collection and interpretation process.

⁹ M. Bosch: Value Added, Meeting of North-Western European Ports (NWEP), Rotterdam, 1991.

¹⁰ E. Schultz-Berndt: Regionalwirtschaftliche Untersuchung: Value Added, working paper, Meeting of North-Western European Ports (NWEP), Rotterdam, 1991.

¹¹ P. De Lombaerde, A. Verbeke: Assessing international seaport competition: a tool for strategic decision making: International Journal of Transport Economics, Vol. 16, No. 2, p. 179.

The authors Haezendonck, Rousseeuw, Struyf and Verbeke¹ defined the Antwerp rule which takes into consideration the labour costs and reduction of the value related to cargo handling of incoming and outgoing traffic so that they are crucial components of the added value. In this sense it is necessary to include the labour costs of temporarily employed port workers in the total labour costs, especially because this variable cost, according to Antwerp port experts can have a share of 30 percent in the overall labour cost of the operator. This procedure can vary according to the traffic category (type of cargo) and the analysed operator. Expert information and the consideration of the selected, representative operators provide the research team with the assessment of the share of labour costs and reduction of the value in the overall added value of the port service.

3. THE CONCEPT OF QUALITY AND QUALITY OF PORT SERVICE

3.1. CONCEPT OF QUALITY

The general definition of quality according to the Encyclopaedia on quality² is: Quality is a measure or indicator of the volume i.e. amount of the usage value of a product or service to satisfy the exactly defined requirements on a certain place and at a certain moment, i.e. when this product and this service are confirmed in the social process of exchange as goods.

According to standard HRN EN ISO 8402 the definition of quality is:³

Quality is the totality of properties of a certain entity which make it capable of satisfying the expressed or assumed requirements.

After the 2000 revision, the official definition of quality is given in ISO 9000 standard and that is: Quality is the degree to which a set of inherent characteristics fulfils requirements.

Service is any activity or act which one party can offer to another party, and which is completely intangible and does not result in owning something. Its production can but does not have to be related to a physical product.⁴

The offer of a company on the market always includes some of the services as well. A part which includes the service can represent a smaller or a bigger share of the overall offer. Five categories of offers are distinguished:

1. fully tangible assets: services do not accompany these products,

¹ E. Haezendonck, G. Pison, P. Rousseeuw, A. Struyf, A. Verbeke: The Competitive Advantage of Seaports, International Journal of Maritime Economics, Vol. II, No. 2, 2000, p. 113.

² N. Injac: Mala enciklopedija kvalitete, 1st part, Oskar, Zagreb, 1998, p. 64.

³ Ibidem, p. 65.

⁴ P. Kotler: Upravljanje marketingom, Northwestern University, Mate, 2001, p. 467.

2. tangible assets with accompanying services: the offer consists of tangible product accompanied by one or several services which have the purpose of improving its purchase attractiveness,

3. hybrid assets: the offer consists of equal shares of products and services,

4. majority service with accompanying minor share of products and services: the offer consists of the main service together with additional services,

5. full service: offer consists primarily of service.

Resulting from this variable mix of products and services, it is difficult to generalize about the services unless certain other differences are emphasised. Still, some generalizations are valid:

First, services differ in whether they *depend on the equipment or on people*. The services that depend on people differ in whether they are performed by unqualified, qualified or professional workers. Port service is a good representative of the service that depends both on the equipment and on the people;

Second, some services require *user's presence*. Port service has precisely this characteristic;

Third, services differ in whether they satisfy the *personal need* (personal services) or *commercial need* (commercial services). In this case the service providers usually develop different marketing programmes for personal and commercial markets. Port service satisfies the commercial needs and

Fourth, service providers differ in their *objectives* (profit or not-for-profit) and regarding ownership form (private or public). Port service, as a rule, is a product of private ownership (concessionaires, operators).

3.2. CONCEPT OF QUALITY OF THE PORT SERVICE

Segmentation of the port service market represents a process in which the total heterogeneous market in a certain region, which has individual specific characteristics, is divided into smaller parts / segments which are then, to such a measure representative, that one may speak about their homogeneity – each segment established in this way for the subject of offer represents a separate target group of the port service, i.e. *target market*.

Although that quality is a requirement, a limited number of ports adopt quality management due to the following reasons¹⁶:

- The variety and the complexity involved in the port industry have been a barrier for the development of quality management approaches

¹⁶ C. Lambridis: Prosperities for the implementation of quality management within the port industry, Doctoral (PhD) Thesis under submission. Piraeus: Department of Maritime Studies University of Piraeus, 2007.

- The absence of specific quality standards for the port industry is a disadvantage for the quality management implementation
- The quality management system of a single port producer cannot guarantee the quality of services in the maritime port logistic chain
- The holistic character of the Total Quality Management is a main barrier for its application to the port industry

In defining the port service it is necessary to identify the main features of a service, independent of the subtype of the service, which strongly influence the design of the approach and programme of service placement on the market and realization of competitiveness: **intangibility, inseparability and perishability.**

Intangibility - services are intangible. Unlike physical products, services cannot be seen, tasted, felt, heard or smelled before they are used. Whereas marketing experts of products are forced to add abstract ideas to their products, service providers are forced to give physical evidence and a visual image of their abstract offer.

Inseparability – services are usually provided and used simultaneously. This does not refer to physical assets that are produced, stored, distributed by several agents to be used later. Since the customer is present when the service is provided, interaction between the service provider and customer is a special feature of service marketing. Both the provider and the customer (user) affect the service outcome.

Variability – since services depend on who provides them and when and where they are provided, the services are considered to be very variable. Directly related to the notion of variability of service is the quality of service. The port service providers can undertake three steps in quality control. The first step is the investment in a good choice and education of human resources; the second step is standardization of the process of service provision through organization; the third step is recording of the users' satisfaction by surveying their opinions and by comparing the levels of usage (scope) of services which enables poor or bad service to be identified and corrected.

Perishability – services cannot be stored. The perishability of services is not a problem when the demand is constant since it is easy then to prepare in advance the workers to provide the services. When the demand is not constant (discontinuous) the service providers are faced with difficult problems.

The strategies for achieving better relation between the demand and the supply of port services distinguish the following methods:

on the demand side:

- different pricing will shift the demand from the high demand period to low demand period;
- development of demand for services in low demand periods,
- complementary services can be developed during high demand period in order to provide alternative possibilities to the waiting users,

- booking systems, as obligation, represent a method of managing the demand level.

on the supply side:

- seasonal workers can be employed in order to provide support during high demand period;
- efficient processes during high demand period can be applied so that the workers perform only the important procedures during high demand period;
- benefits for future expansion can also be developed.

Although quality represents a requirement, a limited number of ports accept quality management because of the following reasons:

- diversity and complexity of port industry are barriers to the development of quality management approach;
- absence of specific standards for quality, for the port industry is the lack of implementing quality management;
- quality system management of a port cannot guarantee the quality of service in the logistic chain of the seaport.

4. FORECASTING POTENTIAL CARGO FLOW IN THE PORT

Port competition is developed at different levels. From the aspect of long-term planning and investment of the port, the objective is for the potential growth not to be slowed down by the limited capacity, and therefore it is very important to forecast the flow rate regarding future.

Furthermore, adequate capacity is not sufficient but it has to be used as much as possible. Maintaining of the existing level of port competitiveness in the environment in which the ports operate is not sufficient, and the port should tend to maintaining or expanding its share on the market. If one considers the activity of transport forecasting as the basis of studying competitiveness, the next important feature is the insight into the factors which determine the share on the market as the indicator of possible capacity expansion.

Generally considering, two types of forecasting methods can be distinguished: **quantitative** and **qualitative** methods.

Method of quantitative forecasting uses historical data with the aim of discovering the flow or connectivity, based on the fact which forecasts are going to be realized for the next development. The quantitative model can be divided into models per time and per sample. According to the time model, the objective of forecasting the variable values is based on extrapolation or usage of mathematical or statistical deduction on the basis of historical development of the considered variables. **Qualitative approach** is based on expert information and evaluation, rather than on empirical evidence. Qualitative models

of forecasting are based on research methods. In case of quantitative forecasting method, the future forecast development is based on empirical data about the past, which are complementary with expert information on the volume of future traffic.

In studying of the potential cargo flow in the port, it is especially important to observe the port features such as: flexibility, productivity, logistic services, such as distribution, improvement of service quality, service quality control, resource management, etc. which play an important role in determining the level of competitiveness of a port. Also, it is necessary to consider the criteria of port operation in relation to the market conditions i.e. levels of harmonizing the operation criteria to the conditions existing on the market.

5. DIVERSIFICATION OF TECHNOLOGICAL PROCESSES IN PORT SYSTEM

The research of technological processes in the port system requires a systemic approach and implementation of systemic methodology. The technological processes in the port system are the result of harmonized usage of technical means according to given organization parameters. The technological processes are marked by a large number of participants, subjects, which makes the management of technological processes more complex and demanding. According to the defined quality of port services, it follows that the ports continuously implement (or should implement) the activities regarding the improvement of technological processes with the aim of achieving the status of a competitive port. Consequently, the diversification of technological processes in the port system includes the following activities:

1. specialization according to the type of cargo and cooperation with the ports in the environment;
2. creation of port alliances (e.g. in case of the port of Rijeka – the alliance of north-Adriatic ports);
3. implementation of new information-communication technologies,
4. orientation of the port to establishing intelligent port as the subsystem of intelligent transport system;
5. pro-active port operation regarding integration in the intermodal transport system, especially the forming of intermodal hub centres i.e. short sea shipping (SSS) centres.

The diversification levels of technological processes are initiated by the ports themselves and the respective port authority. At the national level the support regarding the development strategy is the key aspect due to the chaotic environment in which the today's ports operate. The actions towards Business Excellence in port industry based on criteria analysis are shown in table 1.

Table 1: Actions towards Business Excellence in port industry based on criteria analysis [2]

CRITERIA	SEAPORT MANAGEMENT ACTIONS TOWARDS BUSINESS EXCELLENCE: DIMENSIONS OF TOTAL QUALITY PORTS
1. Leadership ENABLER	<p>Long-term commitment for TQM and resources deployment for quality organization.</p> <p>Port-wide leadership culture (everyone involved in port management, teamwork, process control, training etc.)</p> <p>Align port staff in achieving specific goals, empowerment and motivation of staff.</p> <p>Focus in change management & improvement techniques.</p> <p>Establish a vision and a mission for the port enterprise & instill values for excellence.</p>
2. Policy & Strategy ENABLER	<p>Define Port Stakeholders and their expectations from the port –port enterprises (<i>budget providers, regulation bodies, community, competition, customers, staff, suppliers, shareholders, partners, port communities, port networking, horizontal and vertical partnership development</i>)</p> <p>Information management (<i>port information from stakeholders for port strategic thinking</i>)</p> <p>Development of a strategic business plan (<i>employ techniques such as the balanced scorecard</i>) based on vision and mission (<i>communicate, review & update the plans</i>)</p> <p>Develop staff commitment to the port mission and goals.</p> <p>Develop Management and support processes (<i>quality and safety management, human resource management, stakeholder communication, information system, financial processes</i>)</p>
3. People ENABLER	<p>Explicitly define Port Staff (<i>full time, part time, support, temporary, volunteers</i>)</p> <p>Development of a Human resource management plan</p> <p>Appraisal processes development (<i>reward and recognize port staff</i>)</p> <p>Staff development & training & Staff empowerment (<i>development of self-directed teams committed to excellence</i>)</p> <p>Develop staff satisfaction feedback –management process.</p>
4. Partnerships & resources ENABLER	<p>Define a twofold strategy and culture for port resource management: a) within organization (<i>port owned and controlled resources</i>) & b) outside the organization (<i>partnerships, port interrelated organizations and suppliers the public sector, competitive businesses within transport industry</i>)</p> <p>Define port partnerships as all those (<i>organizations, enterprises etc</i>) interrelated with port activities creating added value for port customers (<i>port competitors can in some instances be partners</i>).</p> <p>Define and manage port "internal" resources through a fourfold analysis: a) port finance b) buildings, technology and equipment c) technology d) information and knowledge.</p> <p>Private sector and port authorities partnerships for the development of information systems.</p> <p>Interactive Information exchange between port and port users through formal processes.</p>
5. Processes ENABLER	<p>Development of a port –wide process based, rather than function based, management culture.</p> <p>Build a port process model: <i>Determine and build key and support port-processes in order to satisfy stakeholder needs within the strategic plan content.</i></p> <p>Interrelation of port processes to specific measurement factors (<i>inclusion of horizontal & vertical integration of ports as elements along the transport chain</i>).</p>
6. Customer results RESULTS	<p>Customers are all those who are recipients of products and/or services from the port.</p> <p>Ports operate as customer focus organizations measuring external customer satisfaction.</p> <p>Customer satisfaction, customer loyalty and customer value are key indicators of port operation.</p> <p>Port customer segmentation lead to specific measures, i.e. dedicated terminals available to principle customers.</p>
7. People results RESULTS	<p>Port staff ought to be considered as an important port stakeholder.</p> <p>Staff perception of the port is measured through their satisfaction and their motivation.</p> <p>Development of internal specific staff performance measures.</p> <p>A specific strategy is developed in order to communicate port and people results to all port staff.</p>
8. Society results RESULTS	<p>Define Port cooperate citizenship strategy & influence port position in relation to "Society" in terms of any individual or group influenced by port activities other than the port staff, external customers and suppliers.</p> <p>Port cooperate citizenship refer to at least five port policies: a) safety of individuals b) port longevity c) resources preservation d) harmony with local community e) contribution to public interest.</p> <p>To some degree the fivefold port cooperate citizenship strategy can be made measurable.</p> <p>Define port communication strategy for the society results.</p>
9. Key performance	<p>Definition of the key performance results in terms of port strategy, quality, plans and customer experience.</p> <p>Break down the key performance results to key outcomes (both financial and non financial) to key performance measures</p>

6. CONCLUSION

The geographical position of seaports in the Mediterranean is of crucial importance. Those seaports from which land transport to clients – consumers is shortest have the most advantageous position, considering they are also located near the main European transport routes. The possibility of fast, adequate and continuous transport by railway to the user is of utmost importance as it is the most cost-effective transport. It should be noted that the use of road and railway infrastructure will become more expensive over time. Two factors are important in the implementation of maritime transport in the supply chain: economies of scale in ship and port productivity.

In this work the preliminary studies of the concept of the port service quality have been performed as well as the influence of technological processes on the port service quality. The concepts presented in this work should serve for further consistent and coherent research of port systems and the traffic system quality on the whole which will provide port authorities, ports and indirectly the customers as well, with the necessary information on the potential possibilities of port system improvement. Diversification of technological processes, omnipresent today in seaports, represents a means of achieving competitiveness and business excellence in the field of port systems.

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DIFERENCIIRANJE TEHNOLOŠKIH PROCESA LUČKOG SUSTAVA U FUNKCIJI USPOSTAVE KVALITETE LUČKE USLUGE

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Sažetak

Suvremene tendencije globalizacije prometnog tržišta i integracije prometnih podsustava uvelike mijenjaju načine funkcioniranja socijalno-ekonomskog života i iniciraju prilagodbu novim procesima. U tom svjetlu istraživanje konkurentnosti lučkog sustava nameće se kao uvjet uspješnog funkcioniranja uvjetujući istraživanje primjene novih tehnologija i uspostave visokih sigurnosnih standarda. Konkurentnost lučkih sustava je obilježje kojemu teži svaki lučki sustav budući da izravno odražava njegov status i ponašanje na tržištu pomorskog prometa uvažavajući trgovačku i industrijsku funkciju luke i zadovoljavanje zahtjeva postavljenih od strane klijenata.

Ključne riječi: tehnologija prometa, tehnološke aktivnosti, lučki sustav, kvaliteta lučke usluge, upravljanje kvalitetom.

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