

# **Contemporary maritime activities: a case study of transport and logistics research and education at Gdynia Maritime University (GMU)**

**Adam Przybyłowski**

*Gdynia Maritime University*

Gdynia, Poland

## **Abstract**

Globalization and integration processes are important challenges for contemporary maritime activities. In particular, the growing importance of transport and logistics directly affects the whole sphere of international transport, and world maritime transport and seaports as well. This paper examines some substantial reasons and consequences of the ongoing changes in worldwide maritime transport and seaports' management systems. It also underlines a need for transport & logistics research and education at maritime universities. A case study of Gdynia Maritime University (GMU) shows how this institution tries to find practical solutions and to educate future generations in order to better serve the contemporary maritime community.

## **1 Introduction**

Global trends in contemporary maritime transport and seaport policy are important challenges for the whole maritime community. In particular, the growing importance of transport and logistics directly affects the whole sphere of international transport, and world maritime transport and seaports, as well. Thus, there is a need for transport and logistics research and education at maritime universities. Gdynia Maritime University (GMU) is carrying out research and provides education in order to prepare practical solutions and educate future generations for the contemporary maritime community.

## **2 Global trends in contemporary maritime transport and seaport policy**

The ongoing growth of the world economy in terms of GDP and industrial output accelerates the growth of international trade and consequently increases world seaborne trade. According to World Trade Organization (WTO) calculations, world seaborne trade accounts for more than 80 % of the world total trade in tonnage terms. Growth rates of seaborne trade were especially high in the last twenty years of the 20th century. In 2004 it reached 6.76 billion

tons of loaded goods. The annual growth rate reached 4.3 % over that of 2003, and the increase of the world merchandise exports volume was 13% higher at that time. The world merchant fleet grew to approximately 900 million deadweight tons (dwt), representing a 4.5% increase. The rapid increase in world seaborne trade boosts the development of maritime transport. As a result, it accounts nowadays for approximately 90 % of world transport in ton-miles. As a consequence, the total throughput of the world seaports has grown considerably, reaching (according to the provisional data) more than 14 billion tons (loaded and unloaded) (Przybyłowski 2007).

Containerization has given shipping lines greater freedom to serve markets from a wider choice of ports, and thanks to so-called transferability (Fleming et al. 1994), has deepened the globalisation process. Ports no longer have control over inland markets and cannot be sure of trade even in their own local areas. They have to invest huge sums of money in superstructure and infrastructure development to participate in the container industry. However, profitability is not a guarantee, as some of them, despite having a container terminal, may be bypassed because of the reasons linked to the whole transportation chain, such as hinterland connections. The shipping lines, being the most important players in the logistics chain, widen their maritime services and extend control over landward movements. They certainly do not take into consideration the specific merits of a particular port, but the economies of scale and conditions of the entire chain. For instance, services in the Mediterranean have concentrated in entirely new southern pivot ports, such as Gioia Tauro and Algeciras, bypassing direct services with northern ports such as Livorno and Marseilles. Thus, port operations can be compared to a lottery (Slack 1993). Actually, the most dynamic increase of the handled volume of the biggest EU ports concerns the container traffic. There is a high level of correlation between the EU ports' development and their container handling volume. On the list of the top 20 container terminals only three EU ports are named: Rotterdam, Hamburg and Antwerp, ranking 7, 9, 11 respectively. However, the percentage change of container throughput in EU container terminals is above the world average level.

In the Baltic Sea Region the level of containerization is unfortunately the lowest in Poland (see fig. 1). However the latest investments in the seaports of Gdansk and Gdynia should increase their competitiveness.

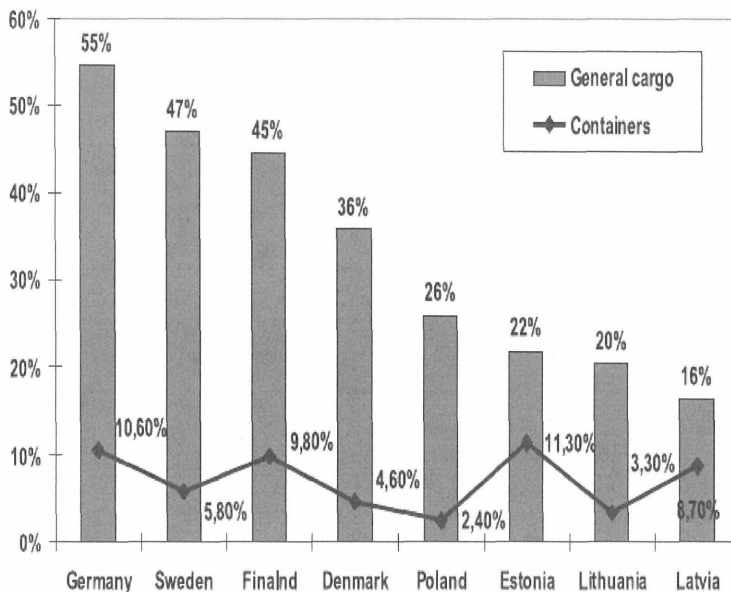


Fig. 1. Level of containerisation in external trade of the Baltic Sea Region countries

Source: M. Matczak, *The Baltic Container Outlook 2007*, Actia Forum, p. 26.

The changes in the maritime transport sector concern not only the growing volume of commodity flows and structure, but also ships' size, specialization, containerization and transport chain organization. The growth in ship size involves huge capital expenditures in ports. They refer to extensive dredging, greater dockside and handling capacity, for example. However, such anticipation may be a risky undertaking, as there is uncertainty over the ultimate size of the vessels. As far as the organization of maritime transport is concerned, some forms of cooperation such as strategic alliances (SAs) and equity merger and acquisition activities (M&As) have been developed. They refer mainly to the international container transport - Hanjin/Senator, P&O Nedlloyd, Hamburg-South-Group, etc.

The main result of this capital integration and other forms of cooperation is the enhancement of competitive position by improving learning capabilities and the timely access to technological knowledge and also vertical integration, control of intermodal and logistic cycles and logistics outsourcing, as well. Thus, the cost of transporting goods by sea have been decreasing and the effectiveness of the international combined transport chains has steadily grown. This process is still ongoing, despite huge unavoidable port investments (Grzelakowski & Przybylowski 2006). Major shipping lines formed strategic

alliances because the pressures of globalization require a presence in all the major markets of the world. As a result, formerly separate services of members are being integrated to create new service configurations, the outcome of which ports are unable to predict. Meanwhile, port operations become more capital intensive, labor saving and space consuming. Due to the liberalization of EU transport markets, seaports are under huge competitive pressure mainly from container transport operators committed in the logistic transport chains. Not all of them are able to face such a competitive environment.

The adjustment to the above mentioned globalization processes needs huge additional public investment in port infrastructure and the lowering of operational handling costs. Only the biggest terminals and port handling operators can meet the challenges and requirements set by the growing competitive environment (pressures from container operators, liners). Due to the relatively low port tariffs, ports are unable to increase their income. Therefore, they need to apply for huge public assistance and for access to the capital of parties involved in the multimodal transport chain. However, such a strategy is very often connected with the change of their contemporary role in the transport chain, and the evolution of their model of administration and management, in particular. Polish ports should consider specific approaches depending on the environment in which they operate, in order to face ongoing challenges.

Existing traditional seaport administration and management systems, as well as port policy objectives and requirements based principally on the concept of exclusively port-oriented management forms in Polish ports, no longer comply with the new logistic management challenges and the growing competitive transport environment. Traditional concepts and models of national seaport policy are steadily evolving, becoming much more global and transport chain oriented. Polish seaport authorities, confronted with the abovementioned processes, must adopt efficient survival strategies in order to resist global and integration pressures. Slack mentions two possible reactions that could be adopted by seaports: keeping pace with market demands, or pursuing customer-driven strategies. The Porter and Robinson studies suggest providing superior value-delivery to targeted customers at a cost that provides acceptable profit levels. The first strategy consists of carrying out expensive investments in superstructure and infrastructure in order to keep pace with shipping line expenses on larger vessels. The second is a response to concrete demands coming from shipping line clients. Certainly, large investments are not a guarantee of success and may not be even economically and economically sustainable. The third approach requires important adjustments in ports' functions to fit better into local, regional and global markets (concentration on passenger business or container feeder port role, f. ex.). This solution could be a good idea for Polish ports as their participation in the container market is relatively low.

A port authority may be not only a port operator but also a land developer. Sites that no longer have a port-use character can serve for urban redevelopment. Such an alternate use of port sites may bring a lot of income,



because waterfront land is of a great value (Slack 2001). As mentioned above, the necessary step is a full integration of those entities into the transport chains. Such a process has already started. It is performed by horizontal and vertical forms of integration. The first is caused by the ongoing process of privatisation of port terminals, mainly container ports. Global container operators, like HPH, take over container terminals becoming their owners in the world scale. The reason for this is an increasing rentability of port container terminal companies. According to Drewry Shipping Consultants, the leading container operators like HPH, CSX WT, PSA Corp., ICTSI and P&O Ports reach turnover rentability of 33%, 29%, 25%, 18.8% and 17.4% respectively. Vertical integration is based on capital concentration among port terminal companies and other logistic transport operators such as global container alliances (Maersk).

Until now, ports behaved passively when taken over by other operators' players/ carriers. Thus, despite the growing concentration of the commodity flows in the main EU ports which strengthen their competitive position on the open European seaport market, the majority of them seem unable to resist the enormous global challenges. However, since the mid 90s some European seaports have become much more pro-active on the global transport market, which is not yet the case for Polish seaports. The simplest form is the biggest EU container terminal operators (Eurogate) getting together with the strongest railway companies container railway services to operate as a global player on the European transport market. Such services connect the main European terminals (Bremen, Hamburg) with the main consumer and production centers in Europe. Consequently, European ports bind huge areas of the hinterland and the main initiative is overtaken by the container terminals.

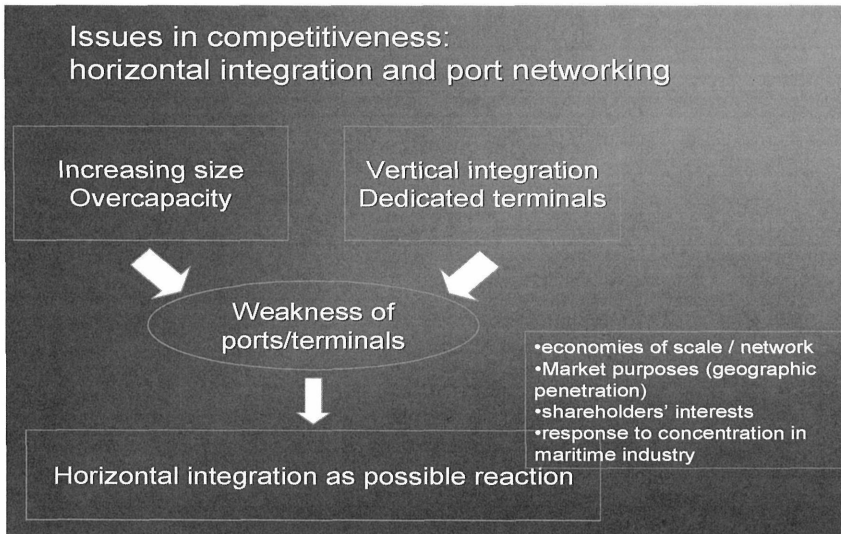
The wider concept, based on the stronger position of container terminal operators in land transport relations is aimed at strengthening their position in relation to the container transport operators (container alliances). Nevertheless, port container operators are partly overtaken by still stronger maritime transport operators. In fact, shipping lines become multimodal logistics providers controlling the routing of the flows in conjunction with the ocean services of the consortia. Thus, a port is an incidental entity in this global network system. Containerization has reduced the economic impact of ports on cities, because ships' crews are smaller than they used to be, and spend little time in port, considerably diminishing dock labour. As local economic benefits (employment) are declining, investing public monies in port areas is no longer justified. The European Commission wants to minimise subsidies in accordance with proper competition policies and restrictions on public state aid.

The increased competitiveness of Polish ports can be achieved by establishing port clusters either via port authorities or via municipal governments. Port clusters may be defined as 'the set of interdependent firms engaged in port related activities, located within the same port region and possibly with similar strategies leading to competitive advantage and characterized by a joint competitive position vis-à-vis the environment external

to the cluster' (Hong-Seung-ROH 2004). There is an urgent need to enhance relationships between the port and associated companies in the port area in order to create an added value (Notteboom T. E. 2005). Moreover, the strategies for port competitiveness must take into account local impact in order to strengthen the link between the port and its city/region (Pando J. et al. 2005).

Port management systems should also meet the criteria of sustainability, i.e. combining economical, ecological and social factors. A sustainable composition will be reached if all stakeholders having different goals are taken into account (Musso E. 2007). It is not an easy task, as port authorities may often be in conflict with legislation, environmentalists and the general public while trying to accommodate their sites to growing economic needs (i.e. access to water depths requiring frequent dredging). There is a need for more partnership solutions as regards port management, an for implementing ecological systems preventing pollution and excessive emissions. This requires paying more attention to local labour markets in order to avoid social protests (EU 'service' directive proposal, for example). The possible reaction leading to raising ports' competitiveness could also be horizontal integration and port networking and combining competition and cooperation (fig. 2).

Fig. 2 Horizontal integration and port networking



Source: [www.enricomusso.it/VigoSlides3.ppt](http://www.enricomusso.it/VigoSlides3.ppt), 14.02.2007

So Polish seaports need to be much more efficient in micro and macroeconomic terms. They should become an integral part of the vertically integrated logistic transport chain. The simplest form of performing these

strategies is the development in their areas of distribution and logistics centres, for example. This is the case of three major seaports in Poland: Gdansk, Gdynia and Szczecin-Swinoujscie where such investments are taking place. They also need to enforce much more integrated and logistic transport chain-oriented sea port activities because of the still growing competitive requirements from maritime and land transport operators, as well as exporters and importers. This kind of seaport reorientation cannot be efficiently carried out without a transformation of their administration and management systems, i.e. going towards more partnership solutions, for instance. Some of them will have to find other solutions and cultivate niches as secondary ports. Others may be forced to be pro-active and work closer with logistics providers, railroads and truckers, raising the service attractiveness of the port (Przybylowski A. 2008).

However, the abovementioned strategies would require more partnership solutions, going far beyond the port area. Ports could also allocate berths to a single user in exchange for a long-term commitment, which would integrate and even completely attach shipping lines to the particular port. The development of logistics features; inventory control, data management, packing and processing, could also enhance the economic benefits of port operations, such as in the Port of Rotterdam. Horizontal port alliances seem to be a good solution for survival as well. A group of northern European ports have already gathered together to solve common problems. However, this process is quite a challenge because of the differences concerning port management models and systems.

### **3 Transport and logistics research & education at Gdynia Maritime University (GMU)**

The abovementioned processes need to be constantly analyzed and taught within a transport and logistics research & education framework at maritime universities in order to prepare practical solutions and well-educated future generations better to serve the contemporary maritime community. This is conducted and coordinated at Gdynia Maritime University (GMU) by the Department of Transport Systems (formerly the Port Planning and Management Department), established in 1998 as a unit of the Faculty of Navigation. The Department cooperates with many Polish and foreign institutions and runs research and teaching activities which focus on the following topics:

- transport, logistics and forwarding,
- port planning, designing and maintenance as well as port management and economics,
- port - city relations and urban planning of seaport cities,
- EU transport and cohesion policy,
- preventing disasters from a collapse in transport structures (monitoring of structure reliability through intelligent materials application),

- development of maritime transport as well as railway, road, air, inland waterways and intermodal transport,
- transport infrastructure planning, financing and management.

GMU scientists provide theoretical justifications for practical solutions for the Polish government and for companies involved in transport and logistics. Some aspects of this research has been presented in the previous work.

As far as education is concerned, the curriculum for transport students provides subjects giving them a wide scope of transport and logistics issues. *Transport economics* (2 versions: 30 h and 20 h in the 4th semester) embraces such important elements as:

1. The role and function of transport sector in the national economy and in the global scale ;
2. Transport system – its structure and relations to the surrounding environment ;
3. Intermodal and combined transport - conditions of their development ;
4. Transport costs – micro- and macroeconomic aspects ;
5. Charging schemas for the transport services ;
6. Transport markets and their mechanisms ;
7. Models of transport markets regulations ;
8. Transport policy and EU regulatory measures .

*Seaports economics* (2 versions: 30 h and 15 h ; 6th semester) addresses the following topics:

1. Seaport economics as a didactic, educational and academic school and its place in the system of transport sciences ;
2. The role and relevance of seaports in the economy; macroeconomics aspects ;
3. Systems and models of seaport administration and management – their characteristics and evaluation in macro- and microeconomic aspects ;
4. Markets of seaports services as spatial and economic categories ;
5. Models of seaports markets' equilibrium and disequilibrium; economic consequences of both market conditions ;
6. Seaport costs and port dues, fees and charges ;
7. Methods and forms of seaports markets regulation;
8. Seaport policy in the EU and outside Europe .

*Seaport companies' economics and management* (15 h ; 2<sup>nd</sup> semester) deals with:

1. Seaport companies – their economic functions in the port system and their relation to the surrounding environment ;
2. Analyses of the economic activities of the port businesses;
3. The impact of external and internal factors on the effectiveness of seaport companies ;
4. Methods of evaluating the effectiveness of seaport companies' economic activity results;

5. Forms and methods of seaport companies management and stimulation of their development .

*Maritime transport economics* (15 h ; 3<sup>rd</sup> semester) concerns :

1. Maritime transport economics as a didactic, educational and academic school and its place in the system of transport sciences ;
2. Maritime transport economic activity – its characteristics and analyses ;
3. Costs in maritime transport and their measures and classifications ;
4. Charging schemas and practices in maritime transport sectors ; freight indices ;
5. Freight markets and methods of their analyses ;
6. Tonnage investments and their effectiveness ;
7. Shipping Policy and regulation;
8. The role of maritime transport In the national economy.

Students also get acquainted with such other important subjects as:

- *Transport infrastructure*, presenting the main characteristics and parameters of transport infrastructure, the indication of the modal specific concern infrastructure, the state-of-art and future development plans of the European transport infrastructure and the financial aspects of the infrastructure development (including national budget structure, PPP, European Funds assistance);
- *Transport systems* - characteristics of the main elements and intra-relation of the transport system; mutual influence between the transport system and framework conditions; the functional potential of the particular modes of transport (including means of transport, turnover and performance); the challenges of the modal split redefinition in Europe; and the relation between transport policy and contemporary transport operation and development.
- *Logistics* - the definition, origin and main characteristics of logistics; basic rules and kinds of logistics systems; logistics of delivery, production and distribution, main challenges and solutions; spatial planning of logistics system location and development; characteristics and management of the integrated logistics chains/networks; and the role of transport in logistics management.
- *Benchmarking in transport* - presentation of benchmarking as the modern tool for management; crucial stages in the process of benchmarking research; implementation opportunities of benchmarking in transport systems; the utilization of the tool in analysis of the real and regulatory sphere of transport systems; and benchmarking in seaports.
- *Forwarding* - the essence of forwarding; participants in the forwarding market; troubles of transport and insurance commerce customs; the forwarding process in export and import of goods, procedures of

customs duties; methods of transport cost calculation; means of payment in commerce transactions; multimodal transport; the role of informatics in forwarding; international convention influence over forwarder work; international organization influence over forwarder work; and basic documentation in transport and forwarding services.

- *Sea-port freight forwarding* - the basic notions connected with port-sea freight forwarding; prices for services in port-sea freight forwarding; influence of the General Polish Freight Forwarding Aptness 2003 on the work of the port-sea forwarder; role of wrappings in port-sea freight forwarding; the role of computer science and taking bar codes in port-sea freight forwarding; setting for forming loading units; and freight forwarding aspects in the multimodal transport.
- *Transport & Cohesion in the EU* - EU structural and cohesion funds in transport/infrastructure projects, and TEN-T as a basic instrument of ensuring cohesion within the EU territory.
- *Port Planning and Operating*:
  - Seaports - general considerations: definition, classifications, and function
  - Basic measures of seaports: ship's dimensions, port trans-shipment
  - Port infrastructure and superstructure: spatial configuration of functional elements of a port
  - Planning and designing of port water area: access channels, anchorages, port entrances, inner channels, turning circles, basins, docks
  - Designing of berthing line: general cargo terminal, container terminal, ro-ro and ferry terminals, dry-bulk terminals, liquid-bulk terminals
  - Designing of port terminals, storage facilities, cargo-handling systems: general cargo terminal, container terminal, ro-ro and ferry terminals, dry-bulk terminals, liquid-bulk terminals.

Besides working in class, students have to do a two week placement in seaports (2<sup>nd</sup> semester) and another individual one (7<sup>th</sup> semester) in institutions, companies or other entities related to transport and logistics.

## 4 Conclusion

1. Contemporary maritime activities are influenced by globalization and integration processes. The growing importance of transport and logistics directly affects the whole sphere of international transport, and world maritime transport and seaports.
2. The transport and logistics sector plays a major role in the economy and is a significant contributor at both the national and local level. It underpins the economy, enabling the movement of goods, services and

- people as efficiently as possible. It is often described by the method of transporting goods – road, rail, sea or air. In reality, large logistics companies work across all types of transport and with multiple industries.
3. There is a need for transport and logistics research & education at maritime universities in order to prepare practical solutions and well-educated future generations for the better to serve the contemporary maritime community.
  4. Gdynia Maritime University (GMU) has been carrying out research and providing education in this field for several years. GMU scientists elaborate theoretical justifications for practical solutions for the Polish government and companies involved in transport and logistics.
  5. Students have an opportunity to receive proper knowledge and prepare for jobs in this sector, especially in maritime transport and seaport related institutions and companies. Also, those who study navigation may be willing to work in this business after their sea-experience. Thus, GMU provides courses enabling them to study transport management and logistics.
  6. Transport and logistics research & education may be a solution for future activity of some maritime universities confronted with a serious shortage of seafarer candidates.

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