Załącznik nr 3 (dokumentacja habilitacyjna dr Ryszard Miler)

A Summary of Academic and Research Achievements

for the Post-Doctoral (Habilitation) Degree Proceedings in the Field of Economics Sciences

1. Name and Surname

Ryszard Karol MILER

2. Diplomas and scientific degrees held – please, state the name, the place, the year of their conferment and the title of the doctoral dissertation.

- Polish Naval Academy – 1988 – vocational university studies (officer)
- University of Gdańsk - 1997 – MA in Economics
- University of Gdańsk – 1999 – Ph.D. in Economics with Economics specialization

The thesis of the doctoral dissertation: *Marketing Strategies of Success in Polish Automotive Market*, under the supervision of Promoter Professor Krzysztof Szałucki, Ph.D, reviewers: Professor Juliusz Engelhardt, Ph.D., Professor Olgierd Wyszomirski, Ph.D.

3. Information on current employment in academic institutions[1]

- **1988-1999** – Naval Military Unit, an officer of the Military HQ Staff
- **1999-2001**- General Command of Polish Navy, Chief Office of Maritime Training, Chief Officer responsible for maritime operational planning, participation in regular NATO working groups; participation in the MOLS operational seminar in the USA.
- **2000 – present** - parallel teaching activities at the University of Gdańsk, University of Business and Administration in Gdynia; courses lectured (inter alia): marketing, organisation and administration, international economic relations, international logistics, logistic systems, supply chain management, introduction to international marketing, international business, transportation and international logistics, transportation economy, eco-logistics, transportation and logistics in foreign trade, BA and MA seminars, and others.

[1] Considering the fact, that most of my professional career has been realised along with practical and academic activities (Polish Navy officer), the section on employment includes the elements of my naval career (as they have had considerable significance for the development of my scientific path). – the Author's note

- **2001 – 2003 – Polish Naval Academy, Institute of Administration and Command,** Assistant Professor, academic and research work, teaching, courses lectured from the field of organisation and administration, command, HR management, theory of decision-making, strategic and marketing management, participation in the KOGA scientific research project.
- **2003-2006 –NATO Regional Maritime Command, Northwood, UK,** chief officer responsible for international operational planning, maritime logistics, navigation safety and relations with shipping at the level of national shipping authorities (NSA), NCAGS activities (Naval Cooperation and Guidance for Shipping), study work on the implementation of monitoring systems for shipping at the level of NATO and EU, work in the NSC team (NATO Shipping Centre).
- **2007-2009** – Maritime Operations Centre, Naval Cooperation and Guidance for Shipping, the Chief of the centre, international operation of NCAGS, participation in NATO Working Groups.
- **2009 – 2014 – WSB University in Toruń and Gdańsk, Logistics Department,** assistant professor, 2009 – 2010 vice-dean of the Faculty of Finance and Business Administration in WSB University in Bydgoszcz, WSB in Toruń, the author of programmes for BA and MA study courses in Logistics, substantive supervision over post-graduate study courses in logistic systems management, 2008-2009 – a member of the panel of experts at the Ministry of Infrastructure for the integration of monitoring systems of shipping in Poland, 2011- 2014 Head of Logistics Department at WSB University in Gdańsk, 2013 – certificate of professional competences conferred by the European Logistics Association at the level of the European Senior Logistician.
- **2015 – present – Baltic Centre of Applied Logistics** at the Faculty of Finance and Business Administration of WSB University in Gdańsk, assistant professor, the Head of the centre, coordinator and manager of an international research team.

4. Presentation of academic and scientific achievements since the conferment of Ph.D. degree

My professional career has been always connected with the sea, maritime transport, maritime shipping, the problems of its safety and, consequently, with the impact of a wide spectrum of elements on developmental potential of maritime transport processes.

My scientific activities between 1999 – 2015 can be generally divided into three major areas of my scientific interest and one complementary area. They include the following, immanent streams:

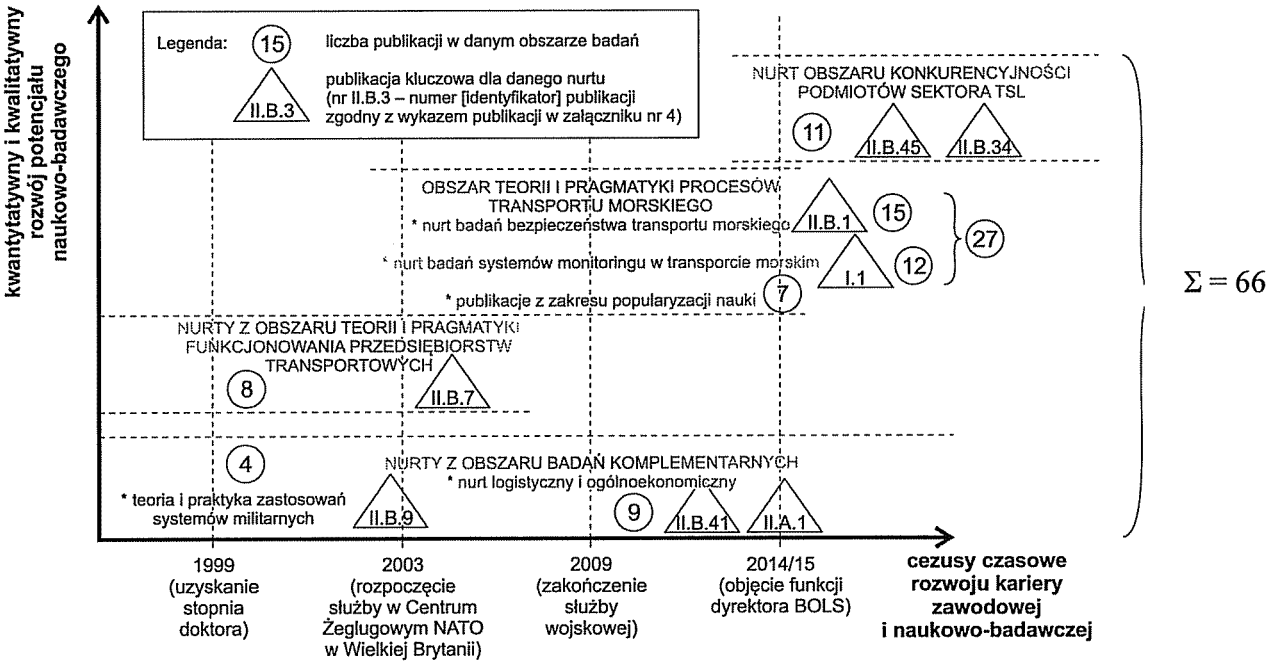
1. The area of theory and pragmatics referring to the functioning of transportation enterprises (1997 – 2003)
   a. The stream of research referring to the functioning of enterprises
   b. The stream of research referring to the market behaviour of enterprises
2. The area of theory and pragmatics of maritime transportation processes (2003 – 2015)

a. The stream of research referring to the safety of maritime transportation
b. The stream of research referring to the monitoring systems in maritime transportation

3. The area of competitiveness of entities from the transport-forwarding-logistics (TFL) sector (2014 – present)
   a. The stream of empirical research on the competitiveness of sea ports
   b. The stream of research referring to the methodology of the adaptation of tools for the assessment of competitiveness
4. The area of complementary research (1999 – present)
   a. The stream of research referring to theory and practice of military systems application (1999 – 2003)
   b. The stream of general research on economics and logistics

The chronological presentation of the academic and scientific areas in my career, along with the specified research streams are displayed in Figure 1.

Figure 1. The areas and streams of the candidate's academic and scientific research activities.



Source: the Author's own work

My graduation summa cum laude (with greatest honour) from the Faculty of Navigation and Naval Weapons at the Polish Naval Academy in 1988 came as the starting point of my professional career of the Polish Navy officer. At that time, in 1996 (when I started my

supplementary MA courses at the Faculty of Economics at the University of Gdańsk) I also started my cooperation with the Chair of Economics and Management of Transportation Companies (Chair of E&MTC). There in 1997 I wrote and defended my MA thesis entitled *The Marketing Strategy for the Sales of Cars at Fiat, Ford and Opel Authorised Dealers in Trójmiasto in 1994 -1996* (promoter: Professor K. Szałucki, Ph.D., the Head of the Chair of E&MTC). This gave me an opportunity to commence my doctoral study courses, which I successfully completed by defending my doctoral dissertation *Marketing Strategies of Success in Polish Automotive Market* (promoter: Professor K. Szałucki, Ph.D.). Naturally, just after the defense of my doctoral dissertation, my scientific interests were included in the area of scientific interests of the Chair of E&MTC. The most significant issues in my research at that time (as a continuation of my research on the problems I referred to in my MA thesis and my doctoral dissertation) were related to the selected functional aspects of enterprises and their market behaviour, especially in the context of identifying their strategies (here the historical conditions should be referred to, as well as the appearance of new market mechanisms after the political and economic transformations in Poland in 1989-1990). The research referred to the functional development of enterprises, with special emphasis laid on the adaptation stage to new market conditions. This was the starting point for my scientific inquiries: market behaviour of economic entities (search for regularities and anomalies, adaptation mechanisms referring to the market principles, mechanisms referring to the generation and implementation of market strategies) which was supported by expert literature studies and empirical research.

In 2000 I started my teaching career by lecturing the course on corporate strategy. I gradually extended the spectrum of my teaching interests with new courses. At that time I participated in scientific conferences where I could present the results of my scientific research. Some representative publications (8 in total) written after the conferment of my Ph.D. degree are the following:

- R. Miler, *Pragmatyka euromarketingowych działań strategicznych małych i średnich podmiotów gospodarczych w procesie integracji z eurorynk*iem, [w:] Przedsiębiorczość w Polsce w perspektywie integracji z Unią Europejską, red. M. Trocki, K. Krajewski, Wydawnictwo Instytutu Przedsiębiorczości i Samorządności, Warszawa 2003
- R. Miler, *Zachowania organizacji gospodarczych w warunkach rynkowych*, Zeszyty Naukowe Akademii Marynarki Wojennej (AMW) nr 1, Gdynia 2002

- R. Miler, *Determinanty funkcjonowania i rozwoju podmiotów gospodarczych*, Zeszyty Naukowe AMW, Gdynia, 2/2002
- R. Miler, *Strategie euromarketingowe w procesie integracji z eurorynkiem* [w:] Administracja, zarządzanie i handel zagraniczny w warunkach integracji, K. Budzowski (red.), Krakowskie Towarzystwo Edukacyjne, Kraków 2002
- R. Miler, *Kształtowanie się mechanizmów strategii w organizacjach gospodarczych*, Zeszyty Naukowe AMW nr 2, Gdynia 2002[2]

My complementary research in the stream of theory and practice referring to the military systems application and my professional background based on the military and scientific structures (in 2001 – 2003 I was an assistant professor at the Faculty of Command and Naval Operations, at the Polish Naval Academy and at the same time I closely cooperated with the Chair of E&MTC) resulted in the fact that some of my research was done for the military circles. The research resulted in the publications (4 in total) which were rooted in the military stream of my activities, but with some considerable reference to the theory of economics. The representative ones are the following:

- R. Miler, *Polish Navy operations in littoral waters 2002 and beyond*, Zeszyty Naukowe AMW, (Scientific Journals of the Polish Naval Academy), Gdynia, 3/2002
- R. Miler, *Ekonomiczne uwarunkowania rozwoju Polskiej Marynarki Wojennej, (Economic conditions of the Polish Navy development)* Zeszyty Naukowe AMW, Gdynia, 2/2003[3]

The crucial moment in my naval career was the winning of the contest organised at the ministerial level. After that I was assigned to serve abroad at the NATO Regional Maritime

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[2] The article refers to the problem of factors which form the strategy mechanisms in economic organisations. It discusses the relations between the development of an organisations and the development of its environment, which considerably affects the methods of strategic management. The models of strategical behaviour of an organisation which are typical in particular situations are described against the background of a matrix referring to the strategical situation of an enterprise.

[3] The article closes and summarizes the stream referring to the theory and practice of the military systems application. It presents a holistic approach to the previously stated clusters of criteria (determinants) for the development of the Polish Navy in the economic context. The article presents the problems referring to the current and predicted (in a long-time perspective by 2025) reality pertaining to the functioning of the Polish Navy structures. The synthesis of the factors determining the structures of the Polish Navy is provided. Additionally, with the consideration of some selected aspects of international, economic and social policy, the recommended directions of transformation are indicated in the reference to the naval potential of Poland, along with the relation between the extent of their realisation and the funding sources.

Command in Northwood, UK (2003 – 2006). Although that period of time was not very intensive in terms of scientific publications, apart from my duties, I organised and participated in international military conferences, I was included in the NATO standardizing group, I prepared expert opinions and I worked for the international environment of civil and naval cooperation and guidance for shipping (NCAGS). I also continued my teaching activities. Working for the NATO Shipping Centre (NSC) allowed me to acquire unique knowledge on the monitoring systems of shipping, which I finally assumed as the main area of my specialization and further intensive scientific development. This moment was a milestone of my joined careers (in this case, the scientific career finally prevailed), and in 2006 another stage of my scientific interests was started, particularly in the area referring to the pragmatics of transport processes (with particular consideration of maritime transport).

Here, two main research streams can be indicated: the research on maritime transport safety (most existing monitoring systems of shipping originate from the aspects of safety and security of broadly understood maritime safety), and the research on the integration of monitoring systems in maritime transport (with strong emphasis laid on the issues referring to economisation). At that time I intensively explored the unique knowledge I had acquired abroad. In 2008 – 2009 I acted as an expert of the Polish Navy, as a member of an expert panel at the Ministry of Infrastructure for the integration of monitoring systems of shipping in Poland; first of all, however, I constructed, systemized and methodologically prepared this field of knowledge (which had been so far enigmatically represented in scientific research). During those activities I found out that the knowledge and my experience from the research field I had been previously interested in, on pragmatics of economic behaviour (economization in the praxeological paradigm and the paradigm of strategical rationality) were very useful, as well as my work in teams consisted of Polish and foreign experts. In 2009 I finished my naval career, and since that moment I have been able to focus on my scientific and research interests. At that time, my teaching and administrative activities were very intensive (originally developed educational programmes for the major study courses in Logistics, originally developed syllabi for particular courses, responsibilities of a vice-dean, head of the department) for which I was awarded at the academic and ministerial levels. The results of the research carried out in this field of my scientific and research activities are disseminated in numerous publications (academic, national and international – 27 publications in total). The representative ones are the following:

- The stream referring the research on maritime transport safety:
  - M. Kościelski, R. Miler, M. Zieliński, *Maritime Situational Awareness (MSA)*, Zeszyty Naukowe AMW, (Scientific Journals of the Polish Naval Academy), Gdynia, 4 / 2007
  - M. Grzybowski, R. Miler, *MSA as the Aspect of European Maritime Security, Proceedings*, 2nd International Conference Future of Europe - Security and Economic Development, The Romanian Economic Journal, Bucharest, 25/2007
  - M. Grzybowski, R. Miler, *Security in the European and global maritime mar*ket, Proceedings International Conference "Energy Security, Maritime Security and Critical Infrastructures Protection ", Romanian Journal of International and Regional Studies EURISC Foundation, Romania, Bucharest 2008
  - M. Kościelski, R. Miler, M. Zieliński, *Maritime Security Operations (MSO)*, Zeszyty Naukowe AMW, Gdynia, 1 / 2008
  - R. Demczuk, M. Kościelski, R. Miler, *Miejsce, rola i znaczenie Centrum Operacji Morskich w tworzeniu Krajowego Systemu Bezpieczeństwa Morskiego oraz w procesie wdrażania natowskiej koncepcji MSA (The place, the role and the significance of the Maritime Operations Centre in the Formation of National System of Maritime Safety and in the Process Involving the Implementation of the NATO MSA Concept)*, XIV Konferencja Bezpieczeństwa Morskiego (14th Conference on Maritime Safety), Zeszyty Naukowe AMW, 172 K/1 2008
  - M. Grzybowski, R. Miler, *Global Crisis Impact on the Situation in EU Shipping Sector*, Proceedings The Fourteenth International Scientific Conference Crises Situations Solution In The Specific Environment, Žilina, Slovakia, 2009
  - R. Miler, *Security and safety aspects of the maritime logistics chain of supply*, [in:] Funkcjonowanie Systemów Logistycznych (Functioning of Logistic Systems) (ed. J. Jaworski, A. Mytlewski), Prace Naukowe WSB w Gdańsku (Scientific Journals of WSB University of Gdańsk), vol. 2 / 2009
  - M. Grzybowski, R. Miler, *Bezpieczeństwo na europejskim i globalnym rynku transportu morskiego*, (Security in the European and Global Market of Maritime Transport) Zeszyty Naukowe AMW, Gdynia, 1 / 2008

- R. Miler, K. Szczyrbowski, *Wpływ systemów klasy VTMS na bezpieczeństwo i ekonomikę transportu morskiego*, (*The impact of VTM systems on the security and economics of maritime transport*) Info Glob Mar, Porty morskie i żegluga w systemach transportowych, (Sea ports and shipping in transport systems) ed. J.Dąbrowski, T.Nowosielski, Wyd. ITiHM Uniwesytetu Gdańskiego, ITiHM UG Press, Gdańsk 2014
- A. Bujak, K. Szczyrbowski, R. Miler, *Implikacje wprowadzenia kodu ISPS dla gospodarki morskiej*, (*Implications of ISPS code implementation for maritime economy*) Konferencja TransComp'2014 (TransComp'2014 Conference), „Logistyka" Poznań 6/2014
- R. Miler, *Bezpieczeństwo transportu morskiego*, (Maritime Transport Safety) WN PWN, Warszawa 2015[4]

- To the stream referring to the research on the integration of monitoring systems in maritime transport:
  - M. Kościelski, R. Miler, M. Zieliński, *Automated Data Processing (ADP) systems used by NCAGS Organisation (NCAGSORG)*, Zeszyty Naukowe AMW, (Scientific Journals of the Polish Naval Academy) Gdynia, 2 / 2007
  - M. Kościelski, R. Miler, M. Zieliński, *Automatic Identification System (AIS) as a main tool of NCAGS ADP Systems*, Zeszyty Naukowe AMW, Gdynia, 3 / 2007
  - R. Miler, *Use of Vessel Monitoring Systems in the Logistics Chain of Supply within the EU Seas*, [w:] Funkcjonowanie Systemów Logistycznych, (Functioning of Logistic Systems) (ed. J. Jaworski, A. Mytlewski), Prace Naukowe WSB w Gdańsku (Scientific Journals of WSB University of Gdańsk), vol. 2 / 2009
  - R. Miler, *Systemy zobrazowania żeglugi i aplikacje informatyczne transportu morskiego*, (*Shipping image systems and IT applications for maritime transport)* [in:] Wyzwania i problemy transportu morskiego (Challenges and problems of maritime transport), ed. J. Dąbrowski, Info Glob Mar, Fundacja Rozwoju

[4] This monograph comes as a final result of my research on the paradigm of maritime transport safety; its crucial objective was an attempt to present a holistic approach to the identification of contemporary hazards which refer to maritime transport, the analysis of factors which determine the level of safety and the indication of comprehensive counteraction methods against such identified hazards; the considerations allowed me to verify positively the hypothesis stating that a contemporary maritime transport safety and security comes as a derivative of an appropriate identification of the hazard spectrum, and as a function of international potential (including the will of international society to incur some expenses and sacrifices) applied for the implementation of efficient countermeasure tools.

Uniwersytetu Gdańskiego, (Foundation of Gdańsk University Development) Gdańsk 2011

- R. Miler, A. Bujak, *Exact Earth Satelite AIS as one of the most advanced shipping monitoring systems* [in:] Activities of transport telematics, ed. J. Mikulski, Springer, Berlin-Heidelberg 2013
- R. Miler, *The exactearth satelite -AIS benefits for the maritime transport*, [in:] Optymalizacja systemów i procesów logistycznych, (Optimisation of logistic systems and processes) ed. R. Miler, T. Nowosielski, B. Pac, CeDeWu, Wydawnictwa Fachowe, Prace Naukowe WSB Gdańsk (Scientific Journals of WSB University of Gdańsk), Warszawa 2013
- R. Miler, A. Bujak, *Implementacja systemów monitoringu zużycia paliw i efektywności energetycznej statku jako pochodna dyrektyw proekologicznych UE w transporcie morskim*, (*Implementation of monitoring systems of fuel consumption and energetic efficiency of a ship as a derivative of the EU ecological directives in maritime transport*) Konferencja Logi Trans'2014 (Logi Trans'2014 Conference), „Logistyka" Poznań 2/2014
- R. Miler, A. Bujak, *Electronic Cargo Tracking Systems as a Part of Intelligent Freight Technologies Impact on the Global Integrated Supply Chain Security and Effectiveness*, TST, Archives of Transport System Telematics, ed. J. Mikulski, vol. 7, issue 3, Katowice 2014
- R. Miler, *Implementacja adekwatnych narzędzi oceny ryzyk w procesie podnoszenia poziomu bezpieczeństwa transportu morskiego (Implementation of adequate tools of risk assessment in the process of the increase in the level of maritime transport safety)*, Konferencja Infoglobmar'2015 (Infoglobmar'2015 Conference), Lądowo-morskie systemy transportowe. Wybrane zagadnienia, (Land and maritime transport systems. Selected issues.) ed. J. Dąbrowski, J. Miklińska, T.Nowosielski, Wyd. ITiHM Uniwesytetu Gdańskiego, (ITiHM UG Press) Gdańsk 2015
- R. Miler, A. Bujak, *The concept of the Integrated Maritime Data Environment (IMDatE) as a framework for European integrated and comprehensive shipping*

monitoring data exchange system, Activities of transport telematics, ed. J. Mikulski, Springer, Berlin-Heidelberg 2015

- R. Miler, *Monitoring bezpieczeństwa transportu morskiego – modelowanie systemów – strategie ekonomizacji (Monitoring of maritime transport safety – modelling of systems – strategies of economisation)*, UG Press, Gdańsk 2015[5]

My experience obtained during my current career, the cooperation with foreign centres and reorganizational transformations at my home university resulted in another milestone in my career (after I had finished my naval career and I followed my scientific and research path). Since January 2015, when I was assigned with the function of Director of Baltic Centre of Applied Logistics, I have been able to develop its personnel potential and to create a scientific and research team (which includes 5 professors, including one foreigner, and 5 assistant professors). I have also extended the scope of my research on the improvement (in terms of functionality, efficiency, cost-effectiveness, innovation, ecology, universal character) of representative logistic processes which are realised by the enterprises from the transport-forwarding-logistics (TFL) sector, and which form links in the land-sea logistic chains in the Southern Baltic region. This research field comes as a resultant of two previous areas of my scientific exploration (and they have become a perfect substantive and methodological basis for my present research). I also intend this research field to become the specialization developed at my centre (in the strategic plans of its development, I intend to build up our position gradually, to achieve recognition and acceptance of the realised research which could finally result in the reorganization of the centre into the Baltic Institute of Logistics).

Within the framework of an academic grant and in the international cooperation with FHS Stralsund, I have realised (as the head of an international team) the research project entitled: *The Analysis of the Strategic Position and Competitive Capabilities of Business Entities in the Sector of Transport-Forwarding-Logistics (Sea-Land Links of Supply Chains) in the Region of the Southern Baltic Sea (Vornpommeren, Pomerania and West Pomerania Provinces) – The Construction and Verification of an Original Model of the Logistic Capabilities of a Commercial*

[5] It is a monograph for my post-doctoral degree (habilitation) which summarizes my current scientific activity in the field of the paradigm referring to transport processes, included in the research on the integration of monitoring systems of maritime transport safety; it is described in detail in the following part of this summary of scientific achievements.

Sea Port as a Tool for the Assessment of Competitiveness of Ports in the Southern Baltic Basin, with the Use of Analytic Hierarchy Process (the AHP Method Stage I/2014) and *The Assessment of Competitiveness of Commercial Sea Ports Based on The Original Model of Logistic Capabilties and the Verification of such a Solution Base on the Real Results of the Research (the AHP method, Stage II/2015).* The undertaken research resulted in a number of publications realised by the authorial teams (13 in total, mainly of national and international range), the representative of which are the following:

- The stream referring to the empirical research on the competitiveness of sea ports
    - R. K. Miler, B. Pac, *Zintegrowane systemy zarządzania terminalem w ocenie potencjału konkurencyjności morskich terminali kontenerowych Gdańska i Gdyni cz.1*, (*Integrated Systems of Seaport Terminal Management in the Assessment of Competitiveness of Seaport Container Terminals of Gdańsk and Gdynia. Part I*) VI Międzynarodowa Naukowa Konferencja Logistyczna WSL FORUM 2015 (WSL FORUM 2015 4th International Scientific Conference on Logistics), „Logistyka" Poznań 2/2015
    - R. Miler, B. Pac, W. Gronau, J. Breslin, *Feasibility study on the logistic competitiveness of commercial seaports in Southern Baltic Sea Region*, Economics Alternatives, ed. I. Georgiev, issue 4/2014, UNWE (University of National and World Economy) Publishing Complex, Sofia 2014
    - B. Pac, R. Miler, *Interoperacyjność logistyczna morskich terminali przeładunkowych jako kluczowa determinanta konkurencyjności polskich portów morskich*, (*Logistic Interoperability of Cargo Handling Terminals as a Fundamental Determinant of Competitiveness of Polish Seaports*) VI Międzynarodowa Naukowa Konferencja Logistyczna WSL FORUM 2015, (WSL FORUM 2015 4th International Scientific Conference on Logistics), „Logistyka" Poznań 2/2015[6]

[6] The project aimed at the presentation of the research results carried out on the level of competitiveness presented by Polish commercial seaports (CSP) in the Southern Baltic region, based on their logistic capabilities, with the use of the AHP method. During the research, the priority indices of global preferences were determined, that is namely: criteria, sub-criteria and diagnostic features of the previously provided model; the priority indices for the surveyed CSP were determined in terms of respective diagnostic features, general indices of competitiveness were determined which refer to the total logistic capabilities of a CSP; the results were compared and interpreted, the results and recommendations for the current research stage were presented. The basic limitation assumed in the research was the state and the statistical data referring to sea ports from 2012; the research included the CSPs of Gdańsk, Gdynia and

- Referring to the methodological research – adaptation of tools for the assessment of competitiveness
    - K. Ziółkowski, R. Miler, *Forecasting Cargo Turnover at Sea Ports with the Use of Quantitative Methods* [in:] *Maritime Logistics-Competitiveness Versus Sustainability*, ed. W. Gronau, R.Miler, B.Pac, Studies on Mobility and Transport Research vol. 5, MetaGIS-Systems, Mannheim 2015
    - B. Pac, R. Miler, *Zastosowanie metody AHP do oceny konkurencyjności morskich portów handlowych w oparciu o ich potencjał logistyczny*, (*The Application of the AHP Method for the Assessment of Competitiveness of Commercial Sea Ports Based on Their Logistic Capabilities)* Publikacja pokonferencyjna LogMare'2014, (LogMare'2014 post-conference publication) „Logistyka" Poznań 6/2014[7]

Following the previous division of my activities into areas and streams, the spectrum of my scientific interests is completed with the logistic and general economic stream in the area of complementary research (the stream of theory and practical appliance of military systems has been discussed above, in the respective period referring to the development of my naval career). This stream included my research on the optimization of didactic processes in the major study courses in logistics, the increase in their practicality and integration with the identification system of market needs in terms of logistics specialties (close cooperation with employers in the region) and conceptual studies on the strategy referring to the establishment of the Baltic Institute of Logistics (this concept has been presented as a project within the framework of creating intelligent specialisations for Pomerania: the centre of excellence for the maritime logistics processes in the Baltic Sea region, a think-tank for the regional authorities). The work in this field of complementary research has resulted in the publication of 10 articles, the representative of which are the following:

- R. K. Miler, B. Pac, *Adaptation of the "7 Rights" Model to Education of Logistics Engineers*, Logistics and Transport Vol 25, No 1 (2015)

Szczecin-Świnoujście, considered as one entity.

[7] The article proves that the AHP methods applied for the assessment of the logistic capabilities of a CSP allow us to define the competitiveness level of such a CSP in an efficient and reliable way. The working hypothesis stating that defining the competitiveness level of a CSP requires proper parametric assessment of its logistic capabilities has been positively verified. The parametric assessment should be provided with the use of a multi-criteria model which –at the decomposition levels - comprises key elements defining the capability of realisation of port and logistic services. (the AHP attributes)

- R. K. Miler, B. Pac, *Model "7W" w kształceniu logistycznym*, Wymiary Logistyki – ujęcie holistyczne (*The „7W" Model in Logistics Education. Dimensions of Logistics – a Holistic Approach*), ed. R.Miler, T.Nowosielski, B.Pac, ZN WSB Gdańsk, vol. 34, CeDeWu, Wydawnictwa Fachowe, Warszawa 2014
- A. Bujak, A. Gębczyńska, R. Miler, *Współczesna logistyka – obszary i kierunki przekształceń (Contemporary Logistics – Fields and Directions of Transformation)*, „Logistyka" Poznań 2/2014
- W. Andruszkiewicz, R. K. Miler, B. Pac, W. Staniuk, *A concept of the Baltic Institute of Logistics as a centre of logistic excellence set up in Słupsk, Pomerania Province, Poland*, Logistics and Transport Vol 25, No 1 (2015)[8]

My long-standing research on the integration of monitoring systems of maritime transport safety has resulted in the publishing of a monograph which comes as a scientific achievement, in accordance with the article 16, paragraph 2 of the Act on academic degrees and academic title.

5. The list of achievements as defined in the article 16 (2) of the Act of 14th March 2003 on academic degrees and title and academic degrees and title in art. (Journal of Laws no. 65, item 595 with later amendments):

a)The title of the scientific achievement

a monograph: ***Monitoring of Maritime Transport Safety – Modelling of Systems – Strategies of Economization***

b) the author, the title of the publication, the year of the publication, the name of the publishing house

Ryszard K. Miler, ***Monitoring of Maritime Transport Safety – Modelling of Systems –***

[8] The article presents an original strategic concept of establishing the Baltic Institute of Logistics (BIL), based on the SWOT analysis which indicates local and regional benefits resulting from the establishment of such a scientific and research institution, costs and developmental programme. Referring to the highest international standards, the project aims at the establishment of a scientific and research unit which will come as a think-tank for the Słupsk region and finally the centre of excellence in the field of logistics for the whole Pomorskie Province, that could contribute to the Intelligent Specialisation Smart Port & City in the horizontal area. The priority task of the BIL should be the development and implementation of creative and systemic solutions in the field of logistics, that would come as the added value in the concept referring to the development of the Regional Integrated Logistic System (RILS). It would allow the region to achieve a strategic supremacy based on the harmonic development of logistic infrastructure and systems.

Strategies of Economization, the University of Gdańsk Press, Gdańsk 2015

c) the scientific aim of the publication and the achieved results with recommendations referring to their application

The problem of providing safety to shipping and, in a broader sense, to maritime transport by efficient counteraction against contemporary hazards becomes crucial to the global economy. It is no longer a local, or even a continental issue; it has global and international character, and it has given the reason for the development of various concepts which refer to maritime transport safety in two holistically understood aspects: maritime safety and maritime safety of the state, which strictly correspond to the division into two fields of safety and security. Maritime safety and maritime security come as conceptual aspects which contain two most important areas where hazards appear: nautical hazards of probabilistic character and conscious hazards of determined character that are caused by anthropogenic factors. The level of safety, therefore, comes as a derivative of the ability to identify hazards which have been defined in such a way, and the perseverance of the international society in the development of integrated countermeasure systems, which must result in new standards of maritime transport safety over the coming years[9]. An indispensable instrument in the processes of providing safety in the maritime domain are the monitoring systems of maritime transport safety which have been developed in the recent years[10].

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The present level of their technical advance lets us state that the implemented architecture does not provide a satisfying level of integration, as it is usually developed independently by various maritime states. It has been based on some national standards, with low potential of harmonization. An imperative to provide maritime transport safety is one of the supreme and mandatory functions of the state. Therefore, the investments in the infrastructure of these systems are usually of the state budget character, and they undergo the processes of commercialisation only to little extent (this fact considerably affects possibilities of increasing their economic efficiency and the process of economisation). Such dispersion of standards and national effort on one hand, and a permanent pursuit to standardisation of global processes pertaining to maritime

[9] These problems were presented in detail in my monograph publication *Maritime Transport Safety* PWE, Warszawa 2015.

[10] Working in the NATO Regional Maritime Command at the NATO Shipping Centre allowed me to have practical contact with the discussed systems, to participate in their design, in the analysis of the potential referring to their application and in testing their subsequent working versions.

transport on the other hand, must drive us to a conclusion that it is necessary to provide standardisation and centralization of the monitoring systems of maritime transport safety manifested by the pursuit to their full integration. The first symptoms of this process appeared during the implementation of experimental system solutions in this field at the regional, European level (the CISE doctrine) and the international level (the MSA doctrine). It is therefore necessary to continue further efforts which aim at the integration of current systems based on conceptual system solutions of a global character (a model construction), with the identification of the potential connected with minimising costs and increasing benefits in the categories of external effects (feasibility of the solutions, the potential and strategies of economisation).

Summing up, the choice of my post-doctoral degree (habilitation) dissertation may be justified by a statement that an imperative to maintain an acceptable level of maritime transport safety is a derivative of its strategic role in the global economy; it leads to a dynamic development of instruments, namely: monitoring systems of maritime transport safety. Appearing at diversified levels (from an operational level to the strategic level, from a local level to a global level), these systems need integration and coordination to gain more efficiency, a synergetic effect, and systemic economic benefits. It is therefore necessary to make an attempt at defining some universal criteria of integration, and to create a referential model of an integrated monitoring system of maritime transport safety which could join the characteristics and functionalities of current systems, and which could be enriched with new functions resulting from the analysis and distribution of risk. Hence, it is important not only to determine its crucial role in increasing the efficiency of current monitoring processes, but also to identify the strategy of its economisation.

The aim of my post-doctoral degree dissertation is to present an original concept of an integrated monitoring system of maritime transport safety (IMSMTS) constructed on the basis of the process modelling tools, to identify the economisation potential, and to make an attempt at defining optimal strategic options for this process at the national and global level.

To realise an objective which has been defined in such a way, it was necessary to assume a working hypothesis stating that the result of integrating current systems and constructing the IMSMTS is the appearance of its economisation potential. Economisation as a process of increasing economic efficiency of the whole system may be realised with the use of properly prepared strategies at the level of national and international (regional) solutions.

To provide logical coherence of postulating reasoning - defined in such a way – in achieving the aim of the dissertation and a positive verification of the presented hypothesis, it was necessary to assume the following theses, based on the rational premises:

1. Maritime transport plays a strategic role in the processes of overcoming the spatiotemporal gap in global land-sea supply chains which come as a basis for the functioning of contemporary economic processes.
2. Considering its significance, its immanent features, and the fact that it is a crucial element of global economic processes, maritime transport is subject to a number of determined hazards, and it must undergo the dynamic processes of providing safety. By definition, these processes are of an international and global character, although they are operationally realised at the national level.
3. The monitoring systems of maritime transport safety come as an integral element (sub-system) of safety/security systems. This fact is a key determinant of their dynamic development (in the national, regional and global aspects), but it also causes their considerable disaggregation and disintegration resulting in the lack of efficiency and multiplication of costs.
4. There is a possibility of identifying the key structural features, creating a concept (based on the quartile division) and constructing a model of an integrated system of maritime transport safety (based on the process modelling tools) which would consider its crucial morphological fields (maritime shipping and port operations), the cargo (mainly containerised cargo), and IT and informational instruments (interfaces, standards, software).
5. In order to achieve some order, to increase efficiency and, finally, to achieve economisation of the monitoring processes of maritime transport safety, the model must be based on an assumption that it shall be commonly applied, and it shall provide straightforward identification of benefits which would result from its implementation, considering the real costs understood generally as the economisation potential.
6. There is a possibility of identifying a spectrum of strategic options connected with the economisation process, and the potential implementation of an integrated monitoring system of maritime transport safety, and also the identification of optimal solutions.

The approach to the realisation of such an aim may itself prove original: the construction is based on a three-dimensional matrix which arranges the contents of the particular chapters in order; the elements of the matrix are the vectors which place the contents of the dissertation in the reality of:

- methodological aspects, with an analytical sequence: maritime transport, safety of maritime transport, monitoring systems as the pragmatics of counteraction against identified hazards in maritime transport, the imperative of integrating current monitoring systems, and the concept of the IMSMTS as an antidote to the lack of harmonization, identification of the economisation potential and, in consequence, presentation of strategic options for economisation (using a systemic approach, considering the limitations of the reductionist approach);
- theoretical aspects, with the reference to the paradigms of the safety theory, the cybernetic paradigm in the theory of systems, the praxeological paradigm in the theory of efficient operation and the paradigm of strategic rationality in the theory of strategic management, and innovative use of the Gartner Hype-Cycle type instruments, the Petri net, algorithms, elements of the financial analysis of investment projects which come as theoretical foundation of the particular chapters, but also as the elements which determine the interdisciplinary limits of the dissertation.
- empirical aspects, with the emphasis on practical exemplification of facts presented in the discussed areas, presentation of the suggested solutions with the use of existing (real) semi-integrated systems, on the basis of the systemic research results obtained in the field of maritime safety Gartner *Sustainability and Efficiency of Visions for CISE*, Report for European Commission-Directorate General Maritime Affairs, 330012909 -Version 1.0 and *Study on Maritime Security Financing* TREN/05/ST/S07.48700, Final Report.

In order to verify the assumed hypothesis positively, and to realise the function of the objective of the dissertation, its contents has been divided into six thematic fields.

Indicating its place in the branch structure, in the first chapter I emphasize the role of maritime transport in contemporary global economy. Here, I introduce the concept of parameters which pertain to maritime transport on the basis of the identified characteristics of the maritime domain which – considering the character of the sea environment – determine the potential, transport opportunities and attributes of the maritime transport. I refer to the fundamental determinants,

such as freedom of maritime shipping, internationalisation of jurisdiction and legal regulation systems, and anthropopressure of maritime transport. Here, I also list the immanent features of maritime transport which result from the impact of the maritime environment, such as universality, accessibility and degression of unit costs. At the same time, I also presents operational trends (exploitation of bigger and bigger vessels, cost and time pressure).

For understanding the question of its safety, it is also necessary to present a "morphological analysis" of maritime transport, where determining the line structure (sea lanes) the nodal structure (sea ports and terminals), the suprastructure (seagoing vessels) and the IT infrastructure (applications and sensory systems of data acquisition, analytical and decision-making systems and effector systems for the realisation of decisions) gain key significance. The taxonomic elements considering the division of maritime shipping in terms of the character of strategic alliances entered by ship owners close my considerations which aim at presenting the specificity of maritime transport strictly corresponding with its safety requirements. To emphasize the significance of maritime transport in global economy, I document the elements of its potential in figures; I also provide an outline referring to the further anticipated directions of its development as the derivatives of the identified global geo-political and economic trends. Summing up, the significant contribution of this chapter into development of economic sciences can be defined:

- in terms of theoretical aspects, as a redefinition of the maritime transport concept in order to implement it into the definition of the references to its safety;
- in terms of empirical aspects, as an analysis of trends which appear on the maritime transport market indicating some potential reasons for its further dynamic development.

The second chapter refers to the safety determinants in maritime transport. I present the concept of safety by defining its essence, and the reference to maritime safety in the systemic approach. I indicate a clear phenomenon of shifting the balance point from direct counteraction against hazards to active prevention against them. This fact places prevention in a catalogue of currently accessible means of providing maritime safety (in this way approving the essence of monitoring systems). I also identify the phenomenon of asymmetric character of hazards connected with maritime transport safety in terms of the cost-effect economic categories. Another important aspect discussed in this chapter refers to the problems connected with efficient management of safety processes in maritime transport, particularly with the questions of a unified structure of the management system, and precise indication of instruments which support this process. I also

present the architecture of the safety management system in the maritime domain, and its transition into an institutionalized structure. Two fundamental groups of factors: maritime safety and maritime security are defined here. Additionally, I point out their regularities and cause-and-effect schemes.

Defining hazards makes it possible to exemplify them, to identify risks, and to present the mechanisms and instruments of their assessment. It leads us to further considerations which refer to systemic mechanisms and instruments of preventing hazards in maritime transport. Considering the global and international range of maritime transport, international maritime organisations become of special importance, along with their legislative initiatives which come as a significant regulating element in the suggested global integrated model. Here I lay the emphasis on the pragmatics of developing systemic legal regulations which can formulate good practice and international standards for maritime safety (LEX), the use of tools supporting navigation (AtoN), providing civil and military cooperation (MSA/MSO), implementation of port facilities security (ISPS), and unification of standards which refer to dangerous goods transportation (HAZAMAT), also in terms of ecological safety. All the systemic aspects of maritime transport safety defined in this way at the local, national, regional and global levels have internal sensory, analytical and decisional components. These components enable us to map, to monitor (follow the regularities and detect anomalies) and to provide the analysis of the processes in the function of risk assessment, and assuming appropriate preventive and counter-measure solutions. The indication of dedicated monitoring systems of maritime transport safety come as the conclusion of this chapter. The systems instrumentally support the processes of managerial information acquiring in these specific fields of maritime transport safety. Summing up, the value of scientific significance presented in this chapter is:

- in terms of methodological aspects, ordering and unifying methods and instruments of risk assessment in maritime transport, in accordance with the latest knowledge concerning current hazards,
- in terms of theoretical aspects, ontological ordering of concepts concerning maritime transport safety, with the consideration of the imperative referring to the monitoring of transport and logistic processes, and the presentation of a model which refers to the management system of maritime transport security (as a complementation of the current model of maritime transport safety),

- in terms of empirical aspects, the identification and comprehensive presentation of major incidents connected with maritime transport safety and their estimated economic results; also the identification and comprehensive presentation of instruments implemented to provide safety in maritime transport.

Having indicated tasks and morphological elements of the monitoring systems of maritime transport safety, in the third chapter I present a taxonomic division of these systems, based on the original identification and the assumed criteria (of the vertical and horizontal division). Indicating a considerable diversification of the existing systems in terms of the determined homogenous factors, the criterion of the horizontal division proves my thesis referring to the lack of harmonization and unjustified multiplication of such solutions. In Table 1 I present the original taxonomy obtained in this way, along with the stratification of monitoring systems of maritime transport safety (Tab.1).

Table 1. The horizontal classification of monitoring systems of maritime transport safety

Division criterion	**Categories of monitoring systems of maritime transport safety**
the subject of monitoring	• monitoring systems of shipping • monitoring systems of loading units (e.g. containers) • monitoring systems of operational parameters of vessel systems • monitoring systems of maritime environment • monitoring systems of fishery • monitoring systems of port facilities safety
entities collecting and processing information obtained from monitoring (data administrator/manager)	• civil and military systems • national (home), sub-regional and international systems • commercial and maritime administration systems
the sensory factor	• systems based on the AIS signal • systems based on the LRIT signal • systems based on the video technologies
the purpose of collecting information	• systems of picturing the situation at sea • analytical and decision-making systems (mixed effector systems)

the range (the area of data collection)	• local systems • regional systems • global systems
availability of databases and the character of the information	• systems of general availability (unlimited access by the Internet) and systems of restricted availability (user registration required to obtain a permission) • open and classified systems • registered systems with an access to commercially sensitive data, only for the previously registered entities (e.g. ship owners' systems)
the type of the information and its significance for the safety processes	• safety systems (shipping, navigational, of nautical information, monitoring systems of vessel operational parameters and modes, IBS/INS, monitoring systems of dry and liquid cargo loading, terminal and ship owners' systems) • security systems (informational and analytical and decision-making systems of services responsible for state security – in the reference to the maritime domain, security systems of seaports)

Source: the Author's own work

In this chapter I pay some special attention to the VTMIS sytems (*Vessel Traffic Monitoring and Information System)*, with their basis sub-systems of the following types: VTS, AIS, SRS, MAS and their supporting systems: DGPD, INMSRSAT, GMDSS. The consideration of the subsequent criteria referring to the division of the monitoring systems of maritime transport safety has made it possible to identify a group of partially integrated systems including, among others: SWIBŻ at the national level (Poland), IMDatE (EMSA - UE), BRITE (as an experimental tool of the MSA concept developed by NATO); complementary systems which include the following international systems: GMDSS (*Global Maritime Distress and Safety System*), MSSIS (*Maritime Safety and Security Information System*), NAMESIS (*Naval Merchant Shipping Information System*), VMS (*Vessel Monitoring System*), and national systems (examples from Poland) ZSRN (*Automatised System of Radar Surveillance of Polish Sea Areas*), PHICS (*Polish Harbours Information and Control System*). The common character of the standards has made it possible to provide full commercialisation of some IT solutions. Hence, some commercial monitoring systems of maritime transport safety have been identified (represented by such applications as AIS Live,

Marine Traffic, Vessel Tracker, exactAIS™ based on a satellite signal AIS-S, Gatehouse AIS Display System). Another group of systems which has been defined on the basis of the assumed the division criteria includes the terminal and ship owner systems which include TOS (*Terminal Operation System*), applications supporting processes which take place at the level of fleet management (for example: AMOS - *Asset Management Operating System*), CBM applications (*condition-based monitoring)* used to monitor the operational parameters of propulsion systems, fuel consumption and GHG emission and the GSOP (Geo-informational System of Port Protection) which meets the ISPS requirements. The last identified category includes the monitoring systems of container cargo units in maritime transport ECTS (*Electronic Container Tracking Service).* The chapter is ended with identification of monitoring systems and their functionality, including electronic systems for monitoring containers as some of the most technologically advanced systems which support minimisation of safety and security risks in intelligent maritime transport. Summing up, the values of scientific significance presented in this chapter are:

- in terms of methodological aspects, identification of the criteria which refer to the construction of an original matrix of monitoring systems of maritime transport safety;
- in terms of theoretical aspects, classification of current monitoring systems of maritime transport safety, based on the originally defined criteria;
- in terms of empirical aspects, presentation and "inventory" of current monitoring systems of maritime transport safety with their crucial functionalities.

The variety and comprehensiveness of the application fields and processes referring to the commercialisation of standards pertaining to monitoring systems of maritime transport safety (for example the AIS at the sensory level) have resulted in a massive dispersion of systems. Subsequently, such dispersion results in measurable negative effects, such as lack of coordination, difficulties in communication and data use, multiplication of initiatives and incurring multiplied costs (the same systems are multiplied by particular operators, countries and regions). Observed particularly in the EU sea areas, this situation has released the potential for conceptual work on the development and implementation of a unified, integrated monitoring system of maritime transport safety. In the fourth chapter I make an attempt to follow the concept identification with the construction of a model referring to an integrated monitoring system of maritime transport safety. I identify the basic notions from the fields of the system theory, processes and modelling, along with the application of graphic notations (algorithms, the Petri

net), indicating some theoretical frames for the construction of the IMSMTS conceptual model. I also identify the fundamental systemic assumptions pertaining to the architecture, organisational and subjective structure of the suggested system, with the particular consideration of the role and place taken by the stakeholders in the information flows, with the use of the quartile division (the model of the system consists of four subsystems, each subsystem consists of four component subsystems and each component subsystem consists of four elements). All these arrangements have allowed me to provide the overall structure of the system and to develop the concept into a model.

To perform all the current tasks referring to the integration of existing monitoring systems of maritime transport safety (monitoring of shipping, loading, port operations, reliability of vessel systems, ecological safety, authorization and competences of crews and many other elements listed in the previous section), the recommended system should be able to integrate information which refers to the phenomena from the field of nautical safety (PS_1 SAFETY), and maritime security (PS_2 SECURITY), ecological safety (PS_3 ECO), and broadly understood field of maritime administration responsibility (PS_4 MARADMIN).

Identified and designed in such a way, the architecture of the IMSMTS model is presented graphically in Figure 2, with the consideration of the quartile division.

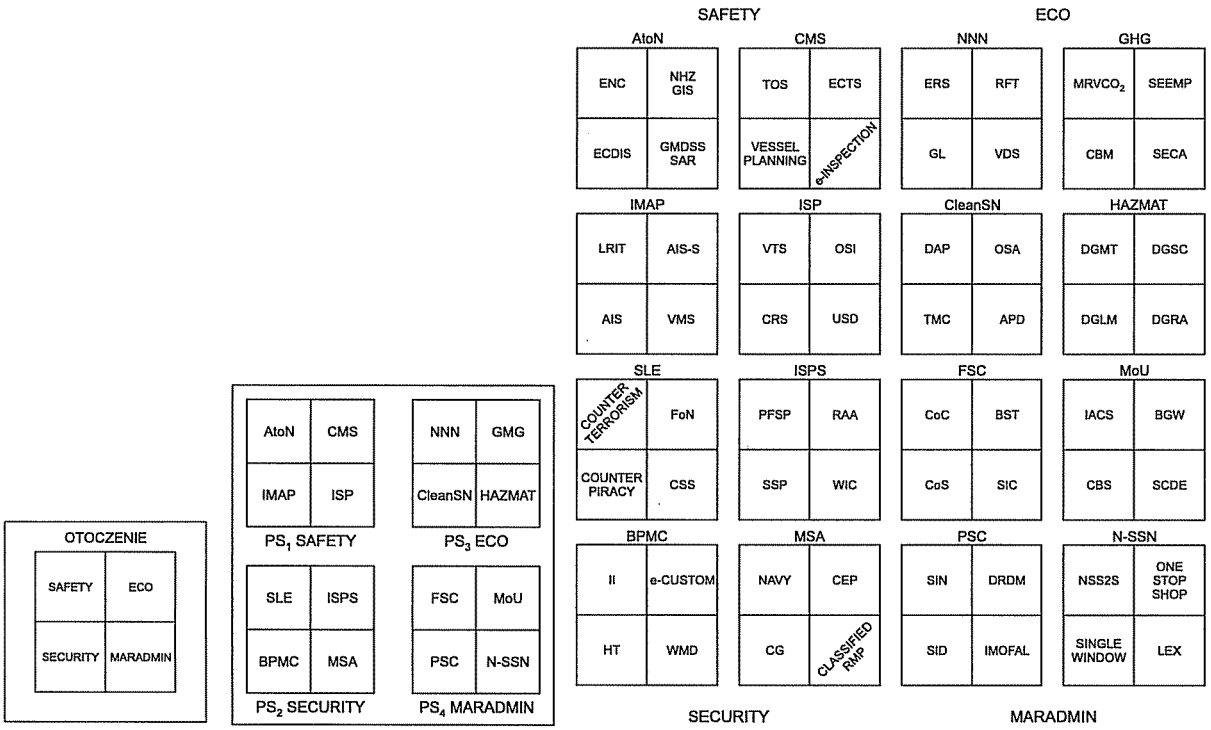

Fig. 2. Subsystems SS 1-4 – Level 1, the development of Level 2 (component subsystems CS 11-44, and Level 3 (elements E111 –E444) as the quartile architecture of the integrated model referring to the monitoring system of maritime transport safety (IMSMTS).

Source: the Author's own work

I also present this structure with the use of the following matrix (the basic matrix for Level 1):

$$[A_{ZSMBTM}] = \{ [PS_1 \text{ SAFETY}], [PS_2 \text{ SECURITY}], [PS_3 \text{ ECO}], [PS_4 \text{ MARADMIN}]\} \quad (1)$$

hence:

$$[A_{ZSMBTM}] = \begin{bmatrix} PS1 & PS3 \\ PS2 & PS4 \end{bmatrix} \quad (2)$$

but also in a similar notation respectively for Levels 2 and 3. For the Level 3 notation I have obtained the following:

$[A_{ZSMBTM}] = \{ [[E_{111} \text{ ENC}, E_{112} \text{ ECDIS}, E_{113} \text{ NHZ GIS}, E_{114} \text{ GMDSS SAR}], [E_{121} \text{ LRIT}, E_{122} \text{ AIS}, E_{123} \text{ AIS-S}, E_{124} \text{ VMS}], [E_{131} \text{ TOS}, E_{132} \text{ VESSEL PLANNING}, E_{133} \text{ ECTS}, E_{134} \text{ eINSPECTION}], [E_{141} \text{VTS}, E_{142} \text{ CRS}, E_{143} \text{ OSI}, E_{144} \text{ USD}]], [[E_{211} \text{ COUNTERTERRORISM},$

E_{212} COUNTERPIRACY, E_{213} FoN, E_{214} CSS], [E_{221} II, E_{222} HT, E_{223} eCUSTOM, E_{224} WMD], [E_{231} PFSP, E_{232} SSP, E_{233} RAA, E_{234} WIC], [E_{241} NAVY, E_{242} CG, E_{243} CEP, E_{244} CLASS RMP]], [[E_{311} ERS, E_{312} GL, E_{313} RFT, E_{314} VDS], [E_{321} DAP, E_{322} TMC, E_{323} OSA, E_{324} APD], [E_{331} MRVCO_2, E_{332} CBM, E_{333} SEEMP, E_{334} SECA], [E_{341} DGMT, E_{342} DGLM, E_{343} DGSC, E_{344} DGRA]], [[E_{411} CoC, E_{412} CoS, E_{413} BST, E_{414} SIC], [E_{421} SIN, E_{422} SID, E_{423} DRDM, E_{424} IMO FAL], [E_{431} IACS, E_{432} CBS, E_{433} BGW, E_{434} SCDE], [E_{441} NSS2S, E_{442} SINGLE WINDOW, E_{443} ONE STOP SHOP, E_{444} LEX]]} (3)

and hence the following matrix has been obtained

$$[A_{ZSMBTM}]= \begin{bmatrix} \begin{bmatrix} \begin{bmatrix} \square 111 & \square 113 \\ \square 112 & \square 114 \end{bmatrix} & \begin{bmatrix} \square 131 & \square 133 \\ \square 132 & \square 134 \end{bmatrix} \\ \begin{bmatrix} \square 121 & \square 123 \\ \square 122 & \square 124 \end{bmatrix} & \begin{bmatrix} \square 141 & \square 143 \\ \square 142 & \square 144 \end{bmatrix} \end{bmatrix} & \begin{bmatrix} \begin{bmatrix} \square 311 & \square 313 \\ \square 312 & \square 314 \end{bmatrix} & \begin{bmatrix} \square 331 & \square 333 \\ \square 332 & \square 334 \end{bmatrix} \\ \begin{bmatrix} \square 321 & \square 323 \\ \square 322 & \square 324 \end{bmatrix} & \begin{bmatrix} \square 341 & \square 343 \\ \square 342 & \square 344 \end{bmatrix} \end{bmatrix} \\ \begin{bmatrix} \begin{bmatrix} \square 211 & \square 213 \\ \square 212 & \square 214 \end{bmatrix} & \begin{bmatrix} \square 231 & \square 233 \\ \square 232 & \square 234 \end{bmatrix} \\ \begin{bmatrix} \square 221 & \square 223 \\ \square 222 & \square 224 \end{bmatrix} & \begin{bmatrix} \square 241 & \square 243 \\ \square 242 & \square 244 \end{bmatrix} \end{bmatrix} & \begin{bmatrix} \begin{bmatrix} \square 411 & \square 413 \\ \square 412 & \square 414 \end{bmatrix} & \begin{bmatrix} \square 431 & \square 433 \\ \square 432 & \square 434 \end{bmatrix} \\ \begin{bmatrix} \square 421 & \square 423 \\ \square 422 & \square 424 \end{bmatrix} & \begin{bmatrix} \square 441 & \square 443 \\ \square 442 & \square 444 \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(4)

Solving the explicative problems in the subsequent section has allowed me to identify the relations among the defined elements of the modelled architecture of the system. To display the relations (understood as the main functionalities of the system), I present the example of some representative processes for the main subsystems SS1-4. For instance, for PS_1 SAFETY it is the process of obtaining an integrated shipping picture of the IMAP type (Integrated Maritime Picture) from the sensory sources, its analysis in terms of identified anomalies (including the risk of catastrophe) and the consequences in terms of decisions and management in the system of safety management (the systemic reaction of the effector block). The essence of the process understood in such a way is based on the algorithm presented in Figure 3.

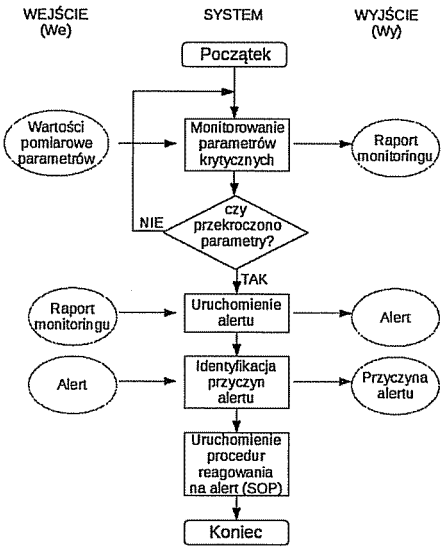

Figure 3. The basic algorithm of the monitoring processes referring to the critical parameters and initiating the Alert function in the analysis of the IMAP type picturing in the monitoring systems of maritime safety [$\Delta KR>30°$; $v(t) \rightarrow v_{min}(t)$]

Source: the Author's own work

The process of obtaining and analysing the integrated shipping picture of the IMAP type for the defined nautical anomaly is presented graphically in the block scheme (Fig. 4), in the algorithmic way (Fig. 5) and with the use of the Petri net (Fig. 6).

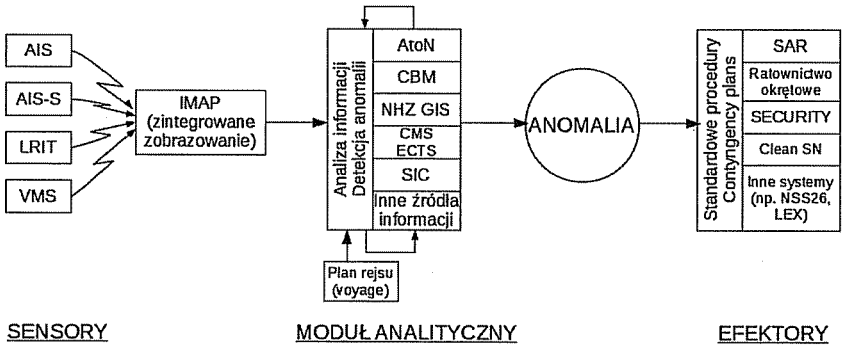

Fig. 4. The sensory-analytical-effector process for the defined nautical anomaly within the framework of the IMAP.

Source: the Author's own work

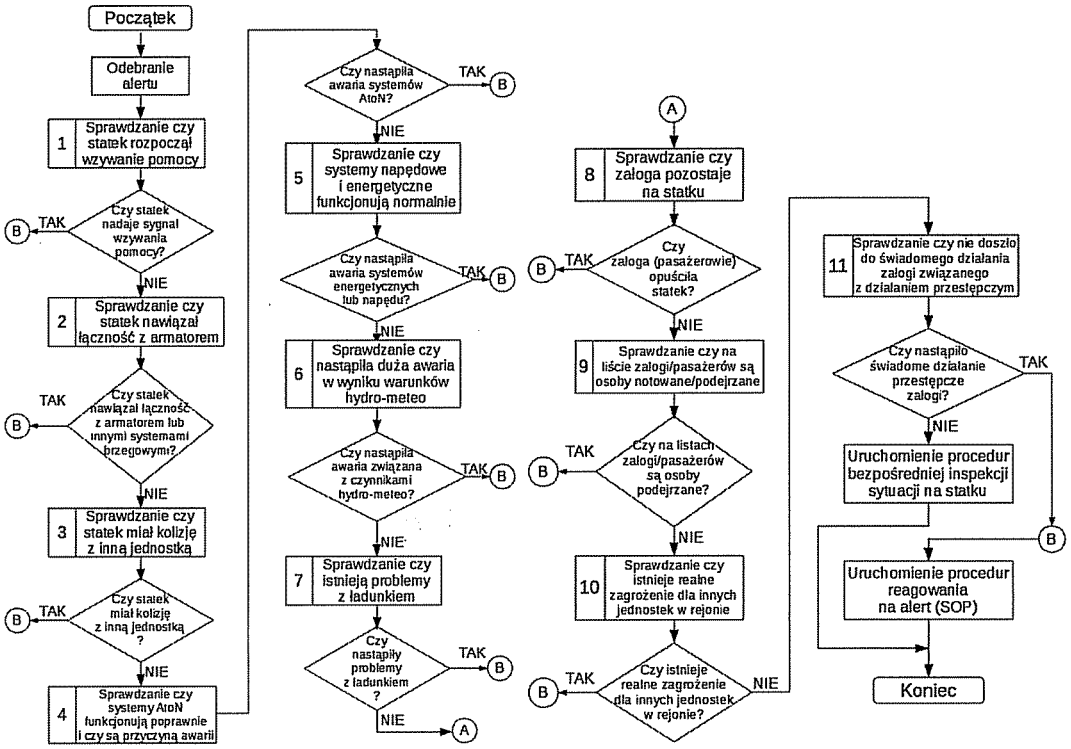

Fig. 5. The algorithmic sensory-analytical-effector process for the defined nautical anomaly for the IMAP.

Source: the Author's own work

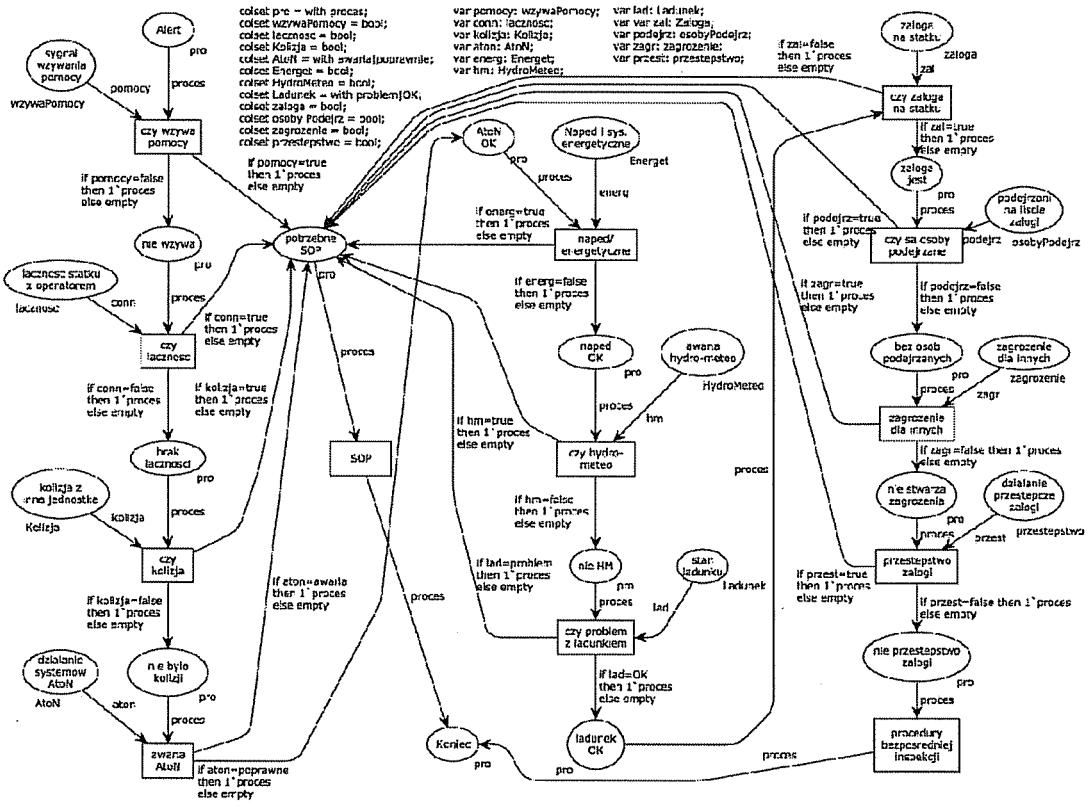

Fig. 6. The coloured Petri net of the sensory-analytical-effector process for the defined nautical anomaly in the recommended model of the integrated monitoring system of maritime safety in the subsystem PS_1 SAFETY for the IMAP.

Source: the Author's own work

The algebraic notation of the suggested IMSMTS model ends the considerations presented in the fourth chapter. I present the model as a ordered quadruple in the following form:

$$M_{ZSMBTM} = <S, E, Q, Z> \quad (5)$$

where:

M IMSMTS – the model of the integrated monitoring system of maritime transport safety

S – the structure of the system

E – the set of characteristics and attributes (A) of the elements of the system

Q – the size of tasks which the system is supposed to realise

Z – the way of the task realisation performed by the system

Consequently, this notation has allowed me to proceed with further decomposition of the model in the algebraic notation. The presented model is of an open character. It is a deterministic model, and it has been presented with the use of a wide spectrum of notations (block, algorithmic, Petri net, algebraic).

Summing up, the value of scientific significance presented in this chapter is:

- in terms of methodological aspects, the adaptation of the Petri net and the system theory for the research and modelling of the processes of maritime transport safety;
- in terms of theoretical aspects, the construction of the IMSMTS model, and its graphic and algebraic notation;
- in terms of empirical aspects, algorithmisation of the main IMSMTS processes and preparation for their application in expert systems.

The next step is an attempt at defining the rationality of the suggested IMSMTS model implementation by identifying its potential benefits (operational, economic benefits, limiting the scale of external and social costs, possibilities of commercialisation of some standards assumed in the model). The best way to find appropriate argumentation for further research and implementation of the suggested IMSMTS model was the identification of the economisation potential of the conceptual model defined in such a way. was the identification of the economisation potential of the conceptual model defined in such a way. Therefore, the fifth chapter comes as a logical continuation of the programmed sequence of the research operations. First of all, the notion of economisation needs to be defined and placed in the praxeological paradigm. Another important methodological step I take in this is the indication of the factors which determine the economisation process of safety systems in maritime transport. Here I apply the concept of Gartner Hype Cycle (GHC) for the IT projects, with the construction of an original GHC for the IMSMTS.

Figure 7 presents an original GHC graph for the model of the integrated monitoring system of maritime transport safety (IMSMTS), with the diffusion since 2014.

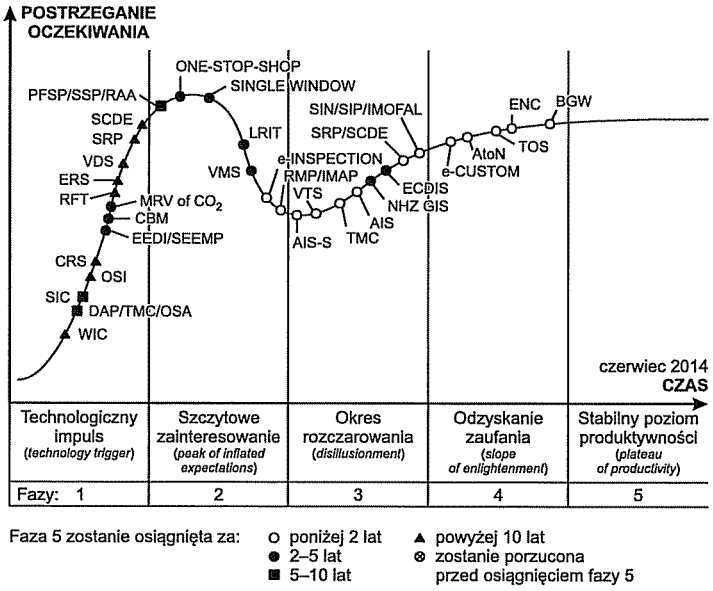

Fig. 7. The Gartner Hype Cycle for the IMSMTS with the diffusion since 2014.

Source: the Author's own work

Subsequently, it has allowed me to indicate and to define two clusters of economisation mechanisms. The first cluster assumes the possibility of achieving economisation of the IMSMTS by cost reduction. Here I determine two types of mechanisms: quantitative and qualitative ones. The second cluster indicates the economisation potential with the use of mechanisms increasing benefits. In this case, using terminology of the system theory, I indicate the extensive and intensive attributes of the IMSMTS economisation.

To obtain full credibility of the presented considerations on the problems referring to the IMSMTS economisation, and in accordance with the assumption that the measure of economisation is the relation of all the results useful for all the costs, apart from direct costs and effects, I have decided to consider the external (social) costs and effects in determination of factors which define the potential of the IMSMTS economisation. The external effects (TSB/TSC) in the pragmatics of maritime transport are very strongly manifested, first of all as the elements of broadly understood safety and the results pertaining to the anthropogenic impact of maritime transport and potential life loss at sea.

The chart (Fig. 8) presents the macro-economic effect which refers to the internalisation of external costs in maritime transport.

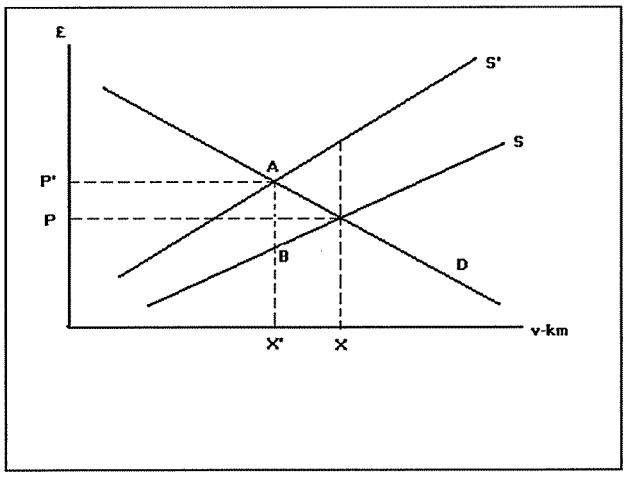

Fig. 8. Internalisation of external cost in maritime transport

Source: the Author's own work based on the EC Raport Calculation of external transport costs; EP Publications, Brussels 2009, pp. 23-26

D is the curve representing the demand for maritime transport services, S represents the curve of the (perceived) private marginal costs (PMC), the balance appears at the interception of the D and S curves. It also determines the price of the balance P, for the maritime transport services and, at the same time, the optimal volume of transport services (the optimal transport intensity) X. For each transport unit there is also an external marginal cost (EMC), which is usually not perceived by the maritime transport operator, but it is incurred by the society. After such costs have been added to the defined private marginal costs of maritime transport at each level of the operation, an S curve appears, which also considers the external costs. The distance between the S and the S' represents the external marginal costs which are generated by the previously defined external effects. The socially optimal volume of maritime transport X' refers to the A point, in which the sales price of the transport service P' takes the private marginal cost (the BX' section) and the external marginal cost (the BA section) into consideration, representing the social marginal cost (SMC). Hence, the following condition appears here:

$$P' = SMC = PMC + EMC \tag{6}$$

This condition can be met through imposing a tax which equals the AB section, and which allows the prices in maritime transport services to achieve the level considering the external marginal costs.

Therefore, it becomes obvious that in the process of improving maritime transport efficiency, apart from some factors of highly economic nature (achieved by optimization of operational logistic and transport processes), the factors connected with the range of external effects, which refer to the wide spectrum of maritime transport safety, become extremely significant. Such factors include:

- lowering the risk in the field of safety (accidents and failures at sea caused by some nautical reasons which result in the loss of life and economic consequences),
- lowering the risk in the field of security (maritime security of coastal countries, which result in massive expenses for the maintenance of the assumed security level),
- lowering the risk for the ecological factor (limiting high costs of potential ecological losses and rescue operations, the consequences of the GHG emissions and other pollution).

Summing up, the values of scientific significance presented in this chapter are:

- in terms of methodological aspects, adaptation of the GHC solutions to assess the IT solutions applied in monitoring systems of maritime transport safety and a proposition of completed methodology of calculating costs connected with oil derivatives spills and costs connected with piracy in maritime transport;
- in terms of theoretical aspects, a proposition referring to the operationalization of the notion: the external cost of maritime transport in the context of the economisation of safety processes;
- in terms of empirical aspects, the estimative calculation of costs and benefits connected with the implementation of the selected systemic solution in the field of maritime transport safety, the identification of the IMSMTS operational benefits, the development of an original GHC cycle for the IMSMTS.

Having presented the potential of economisation, the conclusions referring to this stage have allowed me to move into further systemic considerations connected with the identification and adaptation of the optimal variant of economisation strategy of the integrated monitoring system of maritime transport safety. In the sixth chapter which ends the considerations of my post-doctoral dissertation, I present the problems of the IMSMTS economisation strategies, starting with placing them as such in the paradigm of strategic rationality. In consequence, it has allowed

me to identify the role and the place of the strategies in the field of maritime safety problems (including maritime transport). Identifying strategic realities of the implementation of semi-integrated monitoring solutions (systems) of maritime transport safety (for the real implementations at the national level – Poland and the European level PO_1EUROPE) has indicated the determinants of strategic aims in the context of potential costs and benefits. This, in turn, has allowed me to provide further analysis of the economisation process referring to the suggested IMSMTS model. Considering the complicated character of the model, some simplifications have become unavoidable. They allow us to identify the IMSMTS economisation strategies which may be applied only at the national level (for example KSBM in Poland), and at the sub-regional level of the IMSMTS PO_1EUROPE (for example CISE).

In the case of the KSBM, considering the growing exploitation costs, the necessity of indispensable modernisation, current depreciation of fixed assets (elements of the morphological structure of the system) and highly probable limitations in the EU co-financing of investments in the subsequent financial perspective, it is necessary to consider seriously the question of internalisation of such costs and the strategy of transferring the costs of current maintenance of the system to the end-users of the KSBM system. I have assumed three strategic options:

- Internalisation limited only to the operational costs which result from the exploitation of the KSBM system – the strategy of the limited cost internalisation;
- Internalisation of depreciation costs and planned modernisation of the KSBM system – the strategy of indirect (partial) cost internalisation;
- Internalisation of all the costs referring to the maintenance of the system after the EU financing for the KSBM has ended (costs of exploitation+depreciation+modernisation) – the strategy of full cost internalisation.

A possible implementation of one of the presented solutions will require significant legislative changes which would allow the exploitation costs of the KSBM system to be transferred (internalisation) onto its end-users (ship owners) in the form of an additional port charges (following the example of the charges for the ISPS security system – *the security surcharge*) and detailed calculation of such a surcharge for one of three strategical options. The amount of such a surcharge (the suggested name is the safety surcharge – the *S-surcharge*) should be calculated for the subsequent year, based on the data from the previous year, with the consideration of the following formula:

$$\text{S-surcharge} = \sum_{i-n} \frac{W_n}{N} \tag{7}$$

where:

W_n – amount of costs: 1) exploitation 2) depreciation+modernisation 3) exploitation+depreciation+modernisation in the previous time period (the previous year), where modernisation costs should be apportioned to the whole time interval between the subsequent stages (in the 5-year and 10-year cycles).

N – the number of vessels handled at all Polish seaports in the previous time period (previous year).

Considering the data referring to the exploitation costs and the planned modernisation of the KSBM system (prices from 2007) and the statistical data presenting the number of calls at Polish seaports, it is possible to calculate the amount of the S-surcharge for 2014 (data from 2013), using the formula presented above. For the respective strategical options it will be as follows[11]:

- approximately 140 PLN/vessel for the option of the limited cost internalisation
- approximately 238 PLN/vessel for the option of indirect (partial) cost internalisation
- approximately 297 PLN/vessel for the option of full cost internalisation

In spite of the fact that the amount of such charges (as the recommended S-surcharge) seems to be relatively low[12], it is necessary, however, to consider its influence on the competitiveness of Polish seaports, especially in terms of other overlapping potential determinants which limit such competitiveness (e.g. SECA established for the Baltic Sea Region) and multiplication of costs for ferry owners and ship owners who operate Baltic line connections. Considering all these facts, the possible decision about the implementation of the S-surcharge should be made based on the comprehensive profit and loss analysis.

Considering the economisation strategies for the integrated monitoring system of maritime transport safety at the regional and global level, I have made three assumptions to simplify the systems analysis:

[11] According to the data provided by the Central Statistical Office, in 2013 there were about 18.5 thousand calls of commercial vessels at Polish ports (excluding passenger vessels) – the Author's note

[12] To illustrate the suggested amount of the S-surcharge, it is possible to compare it with the tonnage fee; in the Port of Gdańsk, such a fee for a tanker over 38 000 GT is 0.64 EUR per GT, so it means 38 000 x 0.64 x 4.00 (the assumed exchange rate of EUR/PLN = 97 280 PLN; more information at http://www.portgdansk.pl/zegluga/taryfy-portowe - the Author's note

- the IMSMTS model for PO_1EUROPE will be analysed (based on the research results obtained by the Gartner company: Sustainability and Efficiency of Visions for CISE, Report for European Commission- Directorate General Maritime Affairs, 330012909— Version 1.0, with the consideration of the correction coefficient W_k =1,6),

- the analysis of the IMSMTS as "a product" in the IT area will consider the principles of behaviour presented by projects of this type on the market, defined by the Gartner Hype Cycle methodology for the implementation sphere of information technologies (presented in Chapter 5).

- in the suggested strategical options (concepts) I have not considered the zero option (that is namely: the lack of any integration activities in the field of maritime transport monitoring, leaving it at the current level of disaggregation) as it would contradict the assumed hypothesis.

While identifying possible economisation strategies in the concept of IMSMTS, and considering the diversification of such factors as the elements of the organisational and management structure, integration of equipment and systems or the inclusiveness of regional initiatives (EU), I have assumed five strategical options:

- Basic strategy – it refers exclusively to the implementation of integration solutions at the level of the particular countries (many users at the national level) and the implementation of regional solutions (EU) without any indication of the integrator and the entity which should manage the system;
- Vertical strategy – it refers to the implementation of integration solutions at the level of particular countries (for many independent users at the national level) and the implementation of regional solutions (EU) with an indication of the system integrators, which should be international user communities.
- Horizontal strategy – it refers to the implementation of integration solutions at the level of particular countries (for many independent users at the national level) and the implementation of regional solutions (EU) with an indication of the system integrators, which should be organisations (of maritime administration) of the member states which are involved in the realisation of the project.

- Unification strategy – it refers to the implementation of integration solutions at the level of particular countries (represented by one user of the integrated system at the national level) and the implementation of regional solutions (EU) without any indication of a central integrator of the system;
- Hybrid strategy – it joins the solutions typical for all the previous strategical options, that is namely: it considers the implementation of integration solutions at the level of particular countries (for many independent users at the national level) and the implementation of regional solutions (EU) with an indication of the system integrators, which should be organisations (of maritime administration) of the member states which are involved in the realisation of the project, as well as international user communities.

In accordance with the Gartner methodology, should they be realised, the identified strategies involve different weight of total costs of ownership (TCO), which comprise the costs of investments in IT and new system solutions (defined as CapEx – Capital Investment), and costs of operational use and exploitation of the systems (defined as OpEx – Operating Expenses). In Figure 9 I present the structure of the cost drivers in the suggested IMSMTS model.

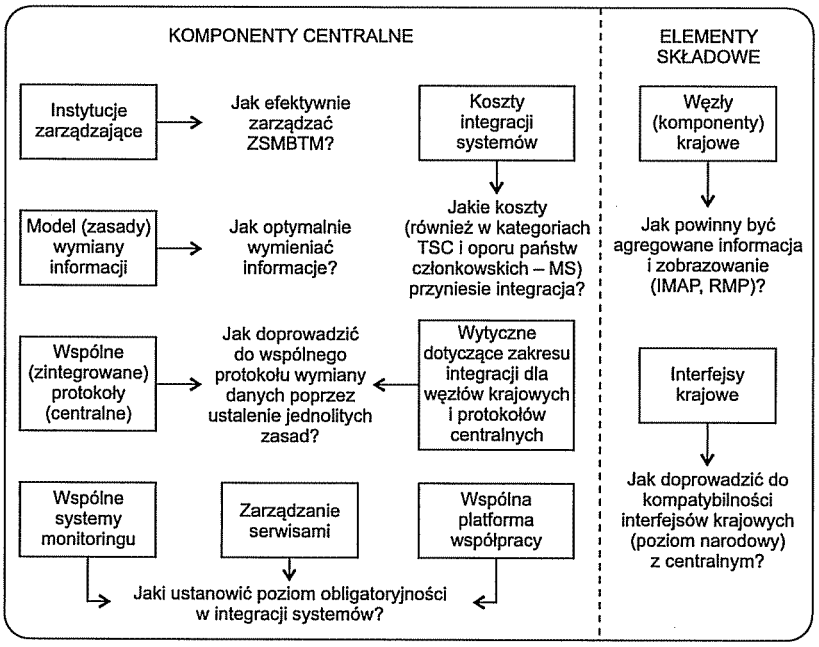

Fig. 9. The structure of the cost drivers in the suggested IMSMTS model.

Source: the Author's own work based on the ITKMD Gartner methodology

In Fig. 10 I present the identified cost components of the CapEx and OpEx for all the strategic options for the IMSMTS economisation.

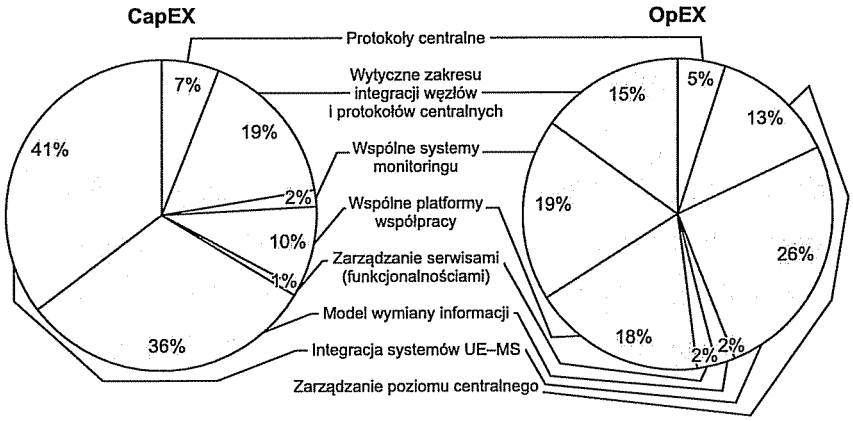

Fig. 10. The cost components of the CapEx and OpEx for all the strategic options for the IMSMTS economisation.

Source: the Author's own work based on Sustainability and Efficiency of Visions for CISE, Report for European Commission- Directorate General Maritime Affairs, 330012909—Version 1.0, pp.45-46

Considering the identified economisation strategies at the national level, the author recommends the strategy of the full internalisation of costs joined with the implementation of an additional cost at the level of port operations (Safety Surcharge). Considering the regional level, the hybrid strategy is recommended which combines the economisation potential with more freedom in making decisions by the member states concerning the rate, the character and the size of incurred expenses). In conclusion, it is possible to state that: understood as a process of raising economic efficiency of the system, despite the fact that it is burdened with some limitation mechanisms (such as budgeting, lack of competitiveness, maritime safety seen as state responsibility), economisation of the IMSMTS can become a real and efficient process, if it is considered in the broadest (holistic) aspect with the consideration of external costs and benefits (social TSC/TSB).

Summing up, the values of scientific significance presented in this chapter are:

- in terms of methodological aspects, identified methodology referring to the implementation of strategies connected with maritime safety at the regional and sub-regional levels;
- in terms of theoretical aspects, implementation of IT sub-strategies to the concept of

business strategies and maritime safety;

- in terms of empirical aspects, providing elements of economic analysis which refers to the projects of monitoring systems of maritime transport safety, and a proposition of the *Safety Surcharge* as a tool of the internalisation of charges connected with infrastructure and functioning of safety systems.

Presented in the dissertation, the integration of monitoring systems of maritime transport safety into one efficient system shall result not only in reducing investment and operational costs, but it shall also allow us to achieve social benefits which can be calculated in millions of EUR. These benefits shall include saving human life at sea and decreasing anthropogenic influence of shipping (as an effect of a decreased number of incidents and accidents at sea) on the waters of the World Ocean.

To describe synthetically the contribution of the dissertation into development of economic sciences, I would like to indicate that its crucial scientific values are:

- in terms of methodological aspects:
    - considering external effect methodology in the economisation processes of maritime transport safety;
    - providing methodology required for the construction of an integrated monitoring system of maritime transport safety;
    - adapting the GCH methods and the Petri net required for describing processes from the field of maritime transport;
- in terms of theoretical aspects:
    - classifying systems of maritime transport safety based on the original dividing criteria;
    - redefining terms applied in the field of maritime transport and safety;
    - constructing the IMSMTS model (which considers the quartile division) and its graphic and algebraic notation;
- in terms of empirical aspects:
    - identifying and providing an „inventory" of currently implemented monitoring systems of maritime transport safety, presenting their considerable diversification;
    - estimating external costs and benefits of maritime transport considered in the

categories of TSC/TSB analysis;

- developing assumptions required for implementation of an additional fee (Safety Surcharge) as an element of internalizing the costs of safety systems in maritime transport.

The elements of the abovementioned contribution indicate epistemological, ontological, and methodological boundaries of the concept referring to the integrated monitoring system of maritime transport safety, in the context of the theory of systems and economics.

The conclusions drawn from the dissertation open a way for further research on a new theory of maritime transport safety (the current paradigm of maritime safety should be completed – or modernised – with definitions of new hazards and new forms and tools of counteraction. All that should be presented in one, coherent, holistic form) and studies connected with using the experiment theory and modelling to create expert systems. Expert systems could be applied for the analysis of the selected processes of maritime transport safety (as a continuation of the studies started in this post-doctoral (habilitation) dissertation and connected with modelling processes of maritime transport safety with the use of the Petri net). These are the problems and research fields that I intend to study while continuing my further scientific and research work and my next publications.

6. Abridged presentation of scientific and research achievements of the candidate for the post-doctoral degree (habilitation)

The abridged presentation of my scientific and research achievements defined in accordance with the statutory regulations is displayed in the following table (Table 2):

Table 2. The abridged presentation of scientific and research achievements of the candidate for the post-doctoral degree (habilitation)

I	The list of publications indicated as scientific achievements, as defined by the article 16 (2) of the Act
1	Ryszard K. Miler, ***Monitoring of Maritime Transport Safety – Modelling of Systems – Strategies of Economization,*** UG Press, Gdańsk 2015 (a monograph)
II	**The list of other scientific publications (not included in the achievement defined in the item 1) and indicators of scientific achievements**

No.	Scientific work	The number of publications
1	Monographs	**1**
2	Chapters in monographs and reviewed joint publications (totally/in Polish/in English)	(**24**/16/8)
3	Publications in scientific periodicals and journals (totally/in Polish/in English)	(**28**/18/11)
4	Editing of joint publications (totally/in Polish/in English)	(**5**/4/1)
5	Publications in the field of science popularisation	**7**
	Totally	**65**

Other criteria of the assessment referring to the scientific and research achievements of the post-doctoral degree (habilitation)candidate	
Criterion	**Result**
Summary impact factor according to the list of Journal Citation Reports (JCR) and the year of publication	-
The number of citations after the publications, in accordance with the Web of Science (WoS) database (Harzing's Publish or Perish, Google Scholar) up to 2015, totally.....	-/9/15
The Hirsch index in accordance with the Web of Science (WoS), (Harzing's Publish or Perish, Google Scholar) up to 2015, totally.....	-/1/2
Total number of points in the MNiSW (Ministry of Science and Higher Education) scale	338
Management of international and national scientific research projects, participation in such projects	3 (1as a manager, 2 as a participant)
International and national awards for academic performance	3 (1award of the ministerial level and 2 awards at the academic level – granted by the Rector)

Scientific papers presented at international and national thematic conferences: totally, national and international, foreign	24/22/2
III. Achievements in teaching and science popularisation. Information about the international cooperation of the Candidate for the Post-doctoral degree (habilitation)	
Participation in European programmes and other international and national programmes	2
Active participation in international and national scientific conferences – announcements and poster sessions (totally) national/international	10/7/3
Participation in organising committees of international and national scientific conferences	2
Management of projects realised in the cooperation with scientists from other Polish and foreign centres and in the cooperation with entrepreneurs:	2
Participation in editorial boards and committees of scientific periodicals	1 foreign
Membership in international and national organisations and scientific associations	1
Achievements in teaching and popularisation of science and art.; original programmes (for BA and MA study courses) for major study courses in: Logistics Original study programmes for post-graduate study courses Original syllabi for the courses run (totally/in Polish/in English)	 2 2 14/10/4
□ Scientific guidance and supervision over students promoter of BA theses promoter of MA theses	 164 43
Scientific guidance and supervision over candidates for the doctoral degrees as a scientific tutor or an auxiliary promoter	2
Internships at foreign and Polish scientific or academic centres	5 at foreign centres
Expert opinions or other studies provided for the military contracts of	

classified character	2
Participation in expert panels and jury committees	3 (1 national, 2 international)
Reviews of publications in international and national periodicals	1 (the „A“ list)

Source: the Author's own work