Computer Science within the Academic Curriculum Used in Maritime Training

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Abstract

In our study we underline the need that academic curriculum used in maritime training must be in resonance with the achievements in the Computer Science and Information Technology fields.

Starting from the fact that the primary role of maritime transport is to ensure the economic link between production and consumption, we connect it with the development in computer related domains.

In our days, computers ar utilized in nearly each facet of our lives. The computer industry is one among the quickest growing segments of our economy. Computer professionals in maritime field might find themselves in a variety of situations. To maintain a competitive edge, the maritime industry should continue to make creative scientific and engineering advances in order to provide the most effective possible technological assets and information systems. This can be achieved by the connection to the computer science curriculum which can be adapted to the needs of the maritime domain.

Key words: academic curriculum, maritime training, economic link, Computer Science
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1. Introduction

Maritime transport is a complex economic activity that has developed with the world economy, closely following upward developments as well as downward developments in world trade. At the same time, shipping has contributed in a way significant development of the world economy, (Dragomir *et al*, 2015, p.238) being one of the main factors of global economic cooperation. The primary role of maritime transport is to ensure the link between production and consumption, especially to ensure a continuous flow of raw materials to the productive industry (Bussow e*t al*, 2013, p.12) and to move the finished products to the markets and consumers in good time.

Table no. 1 Short Sea Shipping (SSS) of goods by reporting country and direction, 2010-2015 (gross weight of goods in Mio tones)

Country	2010	2011	2012	2013	2014	2015
Belgium	130,059	125,620	123,928	126,632	134,328	131,176
Bulgaria	18,872	21,240	22,111	24,124	21,950	21,451
Denmark	66,830	67,748	66,185	66,267	66,591	73,055
Germany	157,703	168,314	170,372	171,892	176,969	174,050
Estonia	28,325	31,236	25,459	28,318	29,850	23,673

Ireland	37,062	36,092	37,007	37,076	36,789	40,005
Greece	81,507	78,047	90,517	94,571	95,971	98,158
Spain	176,841	186,987	191,110	186,037	196,322	196,668
France	194,162	194,267	170,971	166,647	171,901	169,279
Croatia	15,526	13,181	12,120	12,130	10,384	11,863
Italy	310,669	298,715	285,475	272,295	262,481	272,172
Cyprus	2,649	4,441	5,676	6,680	6,720	6,929
Latvia	46,965	53,425	60,969	56,302	58,160	56,187
Lithuania	28,281	32,155	32,391	31,315	30,680	31,348
Malta	3,465	2,950	3,045	2,756	2,921	3,409
Netherlands	275,906	256,839	262,935	261,224	272,552	286,231
Poland	49,482	48,068	48,755	51,998	54,165	55,789
Portugal	35,431	35,681	34,663	39,229	41,723	44,909
Romania	23,954	24,645	23,908	26,354	31,264	31,285
Slovenia	7,832	7,904	8,809	9,191	9,837	11,336
Finland	91,158	94,680	87,984	90,168	89,593	85,492
Sweden	148,673	148,032	142,110	145,828	149,912	151,101
United Kingdom	316,253	320,074	310,995	306,880	315,734	313,498
Norway	140,084	145,377	147,360	152,279	150,292	160,418
Turkey	242,603	256,949	254,590	264,001	258,547	268,491

Source: http://appsso.eurostat.ec.europa.eu/nui/show.do

Table no. 2 Country level - passengers embarked and disembarked in all ports, by direction 2010-2015

Country	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Belgium	829	824	850	859	821	844
Bulgaria	1	1	1	2	1	2
Denmark	41,993	41,527	40,965	41,266	41,353	41,647
Germany	28,780	29,233	29,481	29,848	30,780	30,087
Estonia	11,186	11,846	12,654	13,146	13,654	14,164
Ireland	3,089	2,906	2,758	2,747	2,755	2,751
Greece	86,189	79,183	72,899	72,918	66,533	65,680
Spain	21,518	21,868	21,629	22,871	23,486	24,522
France	27,218	25,552	24,815	25,634	26,638	26,133
Croatia	25,124	26,947	26,706	27,355	23,523	27,271
Italy	87,658	81,895	76,735	73,238	72,225	70,268
Cyprus	107	92	91	99	76	68
Latvia	720	844	885	932	862	661
Lithuania	251	281	286	280	280	286
Malta	8,300	8,621	8,535	9,170	9,669	9,910
Netherlands	1,994	1,770	1,706	1,738	1,819	1,910
Poland	2,601	2,528	2,358	2,201	2,224	2,421
Portugal	701	677	565	555	551	583
Romania	0	0	0	0	1	1
Slovenia	39	36	34	28	27	34
Finland	17,867	18,074	18,264	18,524	18,487	18,884
Sweden	30,185	30,094	29,471	29,146	29,244	29,500
United Kingdom	28,824	28,002	26,516	27,472	28,135	27,805

Iceland	638	404	710	751	723	737
Norway	5,876	6,130	6,003	7,898	7,908	7,311
Montenegro	:	:	319	184	108	99
Turkey	1,577	1,842	1,828	2,058	2,150	2,233

Source: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mp_aa_cphd&lang=en

At Community level, maritime transport is of particular importance, representing the main mode of transport through which imports and exports are made. Approximately 40% of goods for domestic trade and 70% of goods for external trade are transported by sea. The importance of maritime transport is recognized at Community level and in the light of the many jobs created both directly and indirectly in related economic sectors, but also due to the important revenues brought by this sector to the national budgets of the states.

2. Computer Science

In our days, computers ar utilized in nearly each facet of our lives: at home and work, in microwave ovens, watches, automobile engines, video games, telephones, desktops mainframe computers in business and government, supercomputers are pushing out the frontiers of science and technology. The computer industry is one among the quickest growing segments of our economy which growth guarantees to continue well into the new decades.

As the main asset of social development, (Drăgănescu, 2001, p.3) education should adapt its new technological advancements to the advantage of the citizens and their desires by taking into consideration the building of a contemporary society that's supported by knowledge. Technology becomes the foremost applicable technical support, given the new challenges (Manole *et al*, 2016, p.89) of the knowledge society.

CS (Computer Science) is the traditional computing field and contains algorithms, graphics, robotics, and artificial intelligence. IT (Information Technology) has a more applied computing degree and contains databases, internet technology, and PC (personal computer) security. Each of these fields give a powerful computing foundation for technical maritime domain or management responsibilities and/or graduate study.

The worldwide proliferation of refined aircraft, maritime transport of individuals or merchandise, and surface platforms requiers a better level of knowledge of advanced computer systems unexceeded in maritime history. During this multi-threat setting, time essential, management of multiple computer systems and also the fast integration, analysis and dissemination of data is important to the existence of maritime systems. To maintain a competitive edge, the maritime industry should continue to make creative scientific and engineering advances in order to provide the most effective possible technological assets and information systems. More than ever, there is a requirement for officers with the scientific and technical training necessary to perform effectively on the given tasks.

The evolution of transmissions has also had effects in the naval field, perhaps more than in others. The necessity of permanently assuring communications with the landing gear either operating as a command point or at the headquarters of a shipping company operating that ship is the essential element in navigation, both sea and river.

Vessel-specific communication services are provided by simple, easy-to-operate, easy-to-operate radio and satellite communications systems and equipment available globally. Services are provided by radio equipment operating in VHF / UHF / HF bands or satellites that use frequencies in specific bands. These systems provide the need for voice and data services such as Internet access, e-mail, access to weather-hydrological services, ship management, naval traffic monitoring, life-saving, social services, etc. All of these services typically have centralized link management systems, in a unitary architecture, generally geared to IP technologies.

3. Academic curriculum and the maritime training

The information services implemented and assured in extended computer networks facilitate the exchange and accuracy of information circulated in the system. The purpose of implementing these IT services is to make the order act more efficient.

Computer professionals in maritime field might find themselves in a variety of situations: formulating and testing, analyzing new challenges for efficient solutions, using advanced multi-media or communications equipment, working in teams used for development of systems. In the following lines we describe some of the fields of research and vocational areas in computer science (U.S.N.A., 2017, p.1) and information technology which can be used in the academic curriculum in maritime training.

- Artificial Intelligence is a domain in which can be developed computer programs that might simulate human learning and the ability to reason.
- Enterprise Computing is the filed which can design, manage, implement, and modify information systems that support optimally the numerous and changing necessities of organizations.
- Software Engineering is the domain which develops methods for the creation of software systems on time, within a target budget, and with less or no defects.
- Computer Theory investigates the fundamental theories of how computers are solving problems, and apply the obtained results to other fields of computer science.
- Operating Systems and Networks develops the basic software that information systems utilize to administer themselves or to interact with other information systems.
- Software Applications are applying technology and computer science to solve situations or problems outside the computer domain in fields such as medicine or education.
- Modeling and Simulation can construct computer simulations in all the fileds to solve real world problems and improve the art and science of simulation.
- Gaming, Graphics, & Sound endorse realism in entertainment applications or training by achieving gaming mecanisms with captivating sounds and images.
- Computer and Network Security is the field that defends and protects computer systems on all levels against threats domestic or foreign for: networks, desktops, global systems, national systems.
- World Wide Web Design and Support is the field of interactive, informative, and artistic web design followed with dynamic and static content support.
- Databases and Knowledge Management is exploring how modern database and logic systems can help people to exploit and manage the great volume of digital information accessible in our days.

The technology leap made in the field of communications to this day has been a huge one. If we analyze the development of communications systems, from the first telegraph and telephone to mobile communications, radio or satellite, locally or globally today, we can see the multitude of services offered to a wide range of activities of the maritime and not only. The effects of advances in communications technology, especially in the digital era, in economic and social terms, are immeasurable. The technical achievements specific to the information society have also produced effects in the sphere of maritime domain and communications used in this field.

The primary objective of the specialized communication and information structures of the maritime actors is to provide network and system services in accordance with user-specific requirements, with the appropriate characteristics and performance in terms of stability, flexibility, interoperability and security of information, with the use of efficient resources available.

The maritime training and specialization of marine personnel is organized and carried out on the basis of the provisions of the law on education in force, in order to ensure the requirements of the relevant fields and specializations, (Păunescu, 2011, p.58) in compliance with the content standards and the adequate training weights for the basic disciplines in the field, complementary and specialized.

The introduction of broadband platforms in the field of naval communications has lagged behind existing systems and technologies at land-use and which have evolved more rapidly from

short-range broadband communications due to the complexity of the equipment used and, implicitly, its high cost and related services. Lately, progress has been made in this area through the creation of broadband equipment, especially satellite communications. By putting into operation of satellite-based satellite systems installed on board ships we can say that the first steps have been taken towards broadband communications that provide the necessary communication services on board.

4. Conclusions

Maritime transport is seen as a complex economic activity that has developed with the world economy. The link between production and consumption is the primary role of maritime transport, it is ensuring a continuous flow of raw materials to the productive industry and the movement of the finished products to the markets and consumers in optimal time.

The worldwide proliferation of maritime transport of individuals or merchandise, needs a better level of knowledge of advanced computer systems unexceeded in maritime history.

Computer professionals in maritime field have new challenges: formulating and testing, analyzing new challenges for efficient solutions, using advanced multi-media or communications equipment, working in teams (Manole, 2015, p.59) for developing of the systems.

The technology leap made in the field of communications is a huge one. If we analyze the development of communications systems we can see the multitude of services offered to a broad range of activities in the maritime domain.

In our study we described some of the fields of research and vocational areas in computer science and information technology which can be used in the academic curriculum in maritime training and the link with the economic domain. As the primary objective of the specialized communication and information structures of the maritime actors is the providing of network and system services in accordance with user-specific requirements, and with the appropriate characteristics and performance in terms of stability, flexibility, interoperability and security of information, with the use of efficient resources available. This can be done only with a strong training in the domain, for the maximization of the efficiency.

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