

# STCW-CONVENTION AND FUTURE OF JOINT CURRICULUMS FOR AUTONOMOUS AND REMOTELY OPERATED VESSELS IN MARITIME EDUCATION AND TRAINING (MET)

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## **Abstract:**

*The article describes UAS and University co-operation between Nordic and European Maritime educational institutions in promoting common syllabus work relating to autonomous shipping in Bachelor level STCW Convention based education and examines possibilities for co-operative use of test beds in STCW convention determined topics in selected parts of Europe where test areas have already been established. Content development in existing Master education syllabus in UAS SAMK Finland for the benefit of autonomous and remotely operated shipping in following issues: 1) international treaty obligations, 2) risk management and marine insurance, 3) charter parties and shipbroking. One of the aims is connecting the Finnish and foreign students and their employers/shipowners to future of MET in relation to IAMU (International Association of Maritime Universities) defined "Global Maritime Professional" is described and analyzed.*

*Technological advancement in the area is progressing fast and need for development of seafarers' education needs to adjust in this development. Professional targets/standards, determining the research targets and needs for development projects in the field of autonomous and remotely operated seafaring in future co-operation between Universities in Master of Maritime Management programs is analyzed. Bachelor level education for persons working at sea (Captains and Chief engineers) is closely regulated in STCW-convention. In addition to this, MET will need to add resources and focus to the change in the working environment of seafarers. Analysis how this work should be addressed to both bachelor and master level education is presented.*

## **Keywords:**

*autonomous vessels, joint curriculums, STCW, MET.*

## **INTRODUCTION**

The global maritime trade has reached amount of 11 billion tons by the year 2018 with the fleet capacity of 1,97 billion dead-weight tons. It is predicted by UNCTAD that international maritime trade will continue growing with the rate of 3.5 per cent over the 2019-2024 period even though there are certain risk factors that may have influence on predicted growth. [1]

Technical development and innovations have gone hand in hand with the transport development and have benefit the industrialization and globalization. The growing global maritime trade and developing world economy are continuously trying to find improvements for economic benefits, efficiency in operations, improvements in safety and lately, acknowledging the environmental issues. Nowadays a quicker flow of information is now possible and provides actual situation awareness to various operators at sea and onshore thanks to improved communication equipment and technical solutions.

A new innovations and development of logistics at sea and ashore changes inevitably the nature of work and requires new skill for the people and will change the working routines. [2] However, the various stages of development of countries and different developmental needs have an influence how new technologies are implemented and what kind of priorities there are from investment perspective in the near future. [3]

Despite of increasing technology and variable level of automation, human resources are needed onboard the ships until further notice. The developing maritime industry requires educated and skilful work force for its needs also in the future. Currently, maritime sector and maritime education and training institutions are estimating the direction for future education and what skills are vital for modern mariners. As a result of this, a joint project called Global Maritime Professional (GMP) Body of Knowledge which was published by the Nippon Foundation and the International Association of Maritime Universities (IAMU) in 2019. Also, a lot of other projects and research which are related to maritime technological development and innovation ecosystems/entities are active at the moment. One example of these research projects is Research Alliance for Autonomous Systems (RAAS) which aims to find best possible scientific knowhow and innovation ecosystems among autonomous maritime industry.

### **1. DEVELOPMENT OF MARITIME INDUSTRY**

The worldwide shipping has developed enormously during the decades due to trends of globalized production and markets as well as logistic chain requirements of just-in-time deliveries (JIT). This logistic strategy has brought reduced costs at receiver's end when need for warehousing is decreased. On the other hand, this leads to increased requirements of lower shipping expenses and need for monitoring the continuously the planned production processes. Transport costs have lowed with the influence of economic scale in the ship size and due to the trend where traders prefer to buy transported goods timely instead of paying for inventory holding. Also, the containerization of goods has had a revolutionary impact on more fluent shipments and cost savings. [4]

In the area of technology and automation, the progress of shipping has continued quickly. Innovations of automation can be seen already all around in everyday life, like drones, self-

driving cars and in various solutions of autonomously operated cargo handling systems. Currently, maritime stakeholders' interests have wakened by the first vessels which can be remotely controlled, and the level of automation is highly developed. However, even though the maritime industry has got the first tastes of modern technological solutions, the implementation of these innovations in maritime transport have proceeded quite slow steps thanks to various obstacles and regulative limitations. [2] Like earlier mentioned, also different developmental needs in every country have an impact on technological progress globally. A new business models and economic advantages are looked for with help of different levels of automation and implementation of new technologies but in the other hand, the high expenses at the beginning of technological development can slow down the willingness to invest into these systems. In the ports, infrastructure systems for controlling and supervising will demand new structures which also requires high investments and anew kind of shore-side support. [2]

## **2. RESEARCH ALLIANCE FOR AUTONOMOUS SYSTEMS (RAAS)**

Autonomous systems are one of the most important industrial application sites for artificial intelligence and robotics. Their research and development combine a number of rapidly evolving technology areas and industries. The market for autonomous systems is growing rapidly, creating growth opportunities for both technology producers and providers of global systems. Many Finnish companies and research institutes are at the head of development related to among the others, maritime transport, automation of ports, automated cargo handling machinery and with various automated processes in logistic chain. There a wide range of export companies which are committed to regional development. However, the international competition requires accelerating the development and commercialization of the results and the full exploitation of synergies between different operator in the industry. [5]

To create an innovation ecosystem, a research alliance for autonomous systems (RAAS) has been build up in Finland which purpose is to be internationally recognized network for industry, research and educational institutes. The different interest groups have recognized the importance of enhancing synergies between the autonomous solutions of various application sectors in terms of accelerating innovations. The best international scientific experts, the innovative company partners and public authorities are gathered by RAAS to boost the development and implementation of modern technological ideas. The aim is to significantly improve RAAS alliance's scientific excellence and possibilities to help the stakeholder groups. [5]

It has been thought that RAAS would primarily serve and help with increasing the level of autonomy of mobile machinery and in logistical chain because innovation activities are in that area the fastest. The main idea is to connect RAAS internalization activities with national interests, ecosystems, different kind of platforms and testbeds etc. related to development of autonomous systems in certain application areas of transport and logistics. For these application areas, the goal is to find 1- 3 autonomous innovation ecosystem/entities where innovative solutions are needed and the pressure for change is coming from the international markets and in addition, Finnish companies can open new possibilities for business. [5]

The preparatory team of RAAS has worked on an overall R&D framework for autonomous solutions which consists of seven main topics:

- 1) ethics and acceptability,
- 2) rules, responsibilities and legal issues,
- 3) change of business activities,
- 4) operational planning,
- 5) technical abilities,
- 6) artificial intelligence and data utilization and
- 7) assessment of effectiveness. Most of these levels are divided also into sub-themes.

RAAS, among others, seeks to be a platform that highlights the best talent and competences, irrespective of organizations, and develops the knowledge capital in a long term. RAAS focuses on the systemic, multidisciplinary challenge and its phenomena, rather than on individual technology or business challenges.

Satakunta University of Applied Sciences (SAMK) is actively participating this alliance among the others in legal task force which aims to form a research group and network on legal activities related to autonomous ships and concentrates on resolving the business-related obstacles and challenges particularly in charter parties, risk management and marine insurance.

### **3. MARITIME EDUCATION**

Originally, the careers that have been connected to maritime transport, have developed by on-the-job based learning and also on different extent by shore-based education. In countries where transportation via sea is possible, the combination of shore-based education and practical onboard training has taken place. The International Convention on Standards on Training, Certification and Watchkeeping for Seafarers (STCW) which sets the minimum level for seafarers' education and has guided globally the education of seafarers from 1984 when it entered into force. The Convention and Code have been updated several times after that due to its limitations and the latest revision Manila amendments were adopted in 2010 to enable them to address issues are expected to arise in the near future. [4] There are various different educational system in different countries which makes possible career paths in maritime industry multifold. The curriculums in maritime education and training (MET) institutions are built individually in each country and controlled under local jurisdictions. The education must respond and adapt to the coming changes in the industry and due to that the attention maritime sector stakeholders have engaged the importance of right skills which is needed in the near future in the maritime industry. [6]

Nevertheless, the further education i.e. the master level programs for seafarers improves the possibilities to build the career paths from sea to shore after seafaring period. Often many managerial positions in land-based organizations demand a higher degree from their employers and the further educational systems have offered solutions to industry's needs. [3]

Currently, as part of the legal task force of RAAS, SAMK is the leader in co-operation between the Nordic and European maritime educational institutions in progressing common syllabus development relating to autonomous shipping in Bachelor level STCW Conventions based

education. Also, SAMK master level program is linked into close co-operation with other maritime universities to creating opportunities to put to good use the scientific and industry experts experience and the contents of the master program courses are in connection to autonomous shipping. In existing Master education syllabus in SAMK the content development for the benefit of autonomous and remotely operated shipping is done in following subjects: 1) international treaty obligations, 2) risk management and marine insurance and 3) charter parties and shipbroking.

#### **4. THE FUTURE MARITIME PROFESSIONALS**

It is predicted that technology would increase new high-tech jobs. In the report “ Transport 2040 -Automation Technology Employment – The future work” published by World Maritime University (WMU) and International Transport Worker’s Federation (ITF), it was estimated that highly automated vessel would decrease the growth rate in call of mariners with possible reduction rate 22 per cent by year 2040. This report states that the demand for new types of workers, such as remotely working operators, maintenance crews and mobility-as-a service producers would increase. [2]

In IAMU’s report, Global Maritime Professional, it is intended to meet the envisaged needs of maritime industry and evolve educational and career context while catering for the professional development aspirations of individual seafarers. The information has gathered through a comprehensive survey designed and administered to the membership of IAMU and to the other stakeholders in the maritime industry. [7]

The new concept of a Global Maritime Professional has been defined in the report as:

*” An individual who is a professional in the maritime industry and who is equipped with all the relevant technical competencies relevant to their specific operational role in the industry and as required by international requirements, which high level academic skills including logical and critical thinking and who - in attention to their technical competency - exhibits a high level of professionalism and ethical behavior, human relations skills, emotional intelligence and multicultural/diversity awareness and sensitivity. Such an individual exhibits significant leadership skill and is able to optimally work with teams and also take personal initiative. They additionally exhibit a high sense of environmental consciousness and the need for sustainable practices and have an excellent grasp of contemporary issues affecting the maritime industry.”*  
[8]

#### **5. CONCLUSIONS**

The fourth industrial revolution (4IR) has driven the world towards new ways of doing business and force us to renew our way of operating the systems rather rapidly. This revolution is shaping the operational environment in many sectors worldwide but also in national levels. The maritime industry which has reacted previously quite slowly to changes, is now strongly forced adapt to technological development and change the way of its activities which sets new challenges and but also new opportunities.

It is acknowledged that education of seafarers must adapt to the changing maritime industry even though, the skills we need now, are not disappearing completely, not at least in the next 20-30 years. The most ships that currently are build and designed are still made for traditional shipping. This doesn't still mean that educational institutes should not renew planning of the syllabuses and take into account of industry's needs. MET institutions must have a strategic objective to serve the maritime industry and offer high qualify research to benefit the maritime stakeholders now and in the future so that the maritime transport be executed in safe, secure and efficiently at the same time respecting the nature.

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