IMPACT OF CHANGES IN STANDARDS AT IMPROVING EFFICIENCY OF WORK AND QUALITY OF WORKING PROCESSES IN MARITIME COMPANIES

Goran Vučur
University of Dubrovnik, Croatia
E-mail: goran.vucur@unidu.hr

Ivica Miloslavić
University of Dubrovnik, Croatia
E-mail: ivica.miloslavic@unidu.hr

Maro Bošnjak
Maritime-Technical School Dubrovnik, Croatia
E-mail: marobos77@gmail.com

Abstract

The co-ordination of different business factors in the maritime company implies more detailed understanding of the concept of improving standards in business. In order to improve business of the company, it is necessary to continually increase the level of individual human resources standards related to human resource management. In this context, more detailed research into changes in standards related to the training of employees in maritime affairs, the new administrative rules in business and improvement of the convergence of education system, legal regulations and the actual state of affairs related to maritime companies will be explored. The aim of the paper is to explore the above-mentioned parameters in order to link the improvement of standards with changes in certain segments of the work related to the efficiency of work and the improvement of the quality of work processes. The purpose of the paper is to provide an insight into the state of affairs and changes that have occurred in the domain of standards improvement over the last 5 years and to discover their impact on mentioned parameters in a truly limited environment. Since these indicators are impossible to evaluate on the basis of measurable data, the survey is based on assessing seafarer's estimates. The research methodology is based on data collection through an on-line questionnaire fills by seafarers. The processing of collected data will be based on statistical analysis using correlation and various descriptive statistical methods. Since research is based on the period of the last 5 years, the analysis of the theoretical bases found that no similar research has been carried out so far. The aforesaid issues were explored solely on a theoretical basis, therefore practical research considers interesting to scientific and professional public. The conclusion of the paper gives a cross-section of the continuous process of standardization and explains its impact on the business in the domain of marine logistics.

Key words: standards, working processes, enterprise, maritime affairs

1. INTRODUCTION

Observing the above mentioned problem is based on the findings that are closely related to changing standards in maritime business operations. The improvement of the standards of maritime enterprise is a continuous process that lasts from the second half of last century to the present. Standards that are to be analyzed in this particular case relate to the STCW Convention which involves a set of standards that directly relate to maritime affairs and refers to human potentials. The standards were set by the International Maritime Organization (IMO). The Convention prescribes minimum standards related to training, certification of employees and compliance of business-related systems. The amendment of the standard was adopted in 2010 and the application was foreseen for the period from 2012 to 2017. It is precisely the period in the focus of this research. Systematic and controlled improvement of the standards aims to increase the level of training of the employees in the maritime company while simultaneously raising the level of health control, conditions, quality of work and environmental standards. At the same time, with the above mentioned process, the goal is to harmonize legal and educational system that will implement these standards in a way that incorporates them into the real sector. Implementation includes all participants that can be divided into four core groups: regulators of rules, regulations and guidelines, maritime companies, maritime workers, and educational institutions. All of the mentioned benchmarking factors should affect the business operations of maritime companies that are required to implement these standards.

It is precisely the aim of the paper to explore individual indicators of business standards that would be linked to improve the efficiency of work and quality of work processes on board. The following standard research study is divided into three areas related to seafarer's ability, administrative business factors, and compliance with all business-related systems. In accordance with the above facts it is possible to form following hypothesis:

H1: The change of seafarer's qualification standards has had an impact on the improvement of work and work processes on board.

H2: Changing the administrative standards on board had an impact on improving the work and work processes of the maritime company.

H3: Changing the compliance of all system factors affected the enhancement of work and work processes on board.

H4: Changing standards related to seafarer's competence has influenced the efficiency of operation on board.

H5: Changing the administrative standards on board had an impact on the efficiency of the work on board.

H6: Changing the consistency of all system factors influenced the efficiency of the work on board.

Following the presented hypothesis, the research should analyze in detail the individual segments of standards in maritime business that should directly affect the efficiency of work and improvement of work processes in maritime companies.

2. CONTROL OF OPERATIONS

The control process, as one of the management functions, is closely related to standardization. Business standardization is one of the key parts of the control process, which can be divided into four steps. The first step is to set standards. That is followed by performance measurements that compares with those standards, then performance evaluation, and in the end taking specific actions for correcting and improving standards. Standards are set as targeted values to compare the actual or expected effect. It is a set of benchmarks or criteria to evaluate the achievement of the goal. Well-established standards can point to the fact that the process deviates from the predicted frameworks during the process itself (Buble, 2006, p. 383-384). The reaction after the performance evaluation can be done in three ways, one of which is maintaining an existing state, then correcting the performance or changing the set standards (Buble, 2006, p. 387). According to Griffin, controlling is the supervision of organizational progress towards set goals and as such represents the final stage of the management process (Griffin, 2005, p. 12).

In order for certain targeted performance elements to be within the acceptable limits, control and regulation of business activities is carried out. Otherwise, the company would have no indication as to how much their performance deviates from the set goals. Control provides direction of adapting to changes in the environment, limiting the accumulation of errors, carrying organizational complexity and reducing costs (Griffin, 2005, p. 652-653). The precondition for carrying out the control is to express the goals. When setting goals, a series of segments related to: market position, profitability, innovation, success, management development, production, performance, employee attitudes, physical and financial resources, and social responsibility as a whole should be taken into account (Drucker, 1954, p. 8). The most commonly used principle for goal defining is SMART (Domijan-Arneri, 2014; p. 207):

- S (*specific*),
- M (*measurable*),
- A (*achievable*),
- R (*resource bond*),
- T (*time bound*).

Bureaucratic control can be distinguished from group control (Table 1). According to Buble, bureaucratic control is a formal and structured arrangement of individual and group behavior in the enterprise, and is regulated by a complex system of rules that include action, budget, and standards management. Group control is informal arrangement of individual or group behavior within an enterprise. Behavior in group control is regulated by group norms, corporate culture and self-control (Buble, 2006, p. 392).

Table 1. Differences between two basic types of control in the organization

BUREAUCRATIC CONTROL	DIMENSION	GROUP CONTROL
Employee Compliance	**Goal of control approach**	Employee commitment
Strict rules, formal controls, rigid hierarcy	**Degree of formality**	Group norms, culture, self-control
Directed toward minimum levels of acceptable performance	**Performance expectations**	Directed toward enhanced performance above and beyond the minimum
Tall structure, top-down influence	**Organization design**	Flat structure, shared influence
Directed at individual performance	**Reward system**	Directed at group performance
Limited and formal	**Participation**	Extended and informal

Source: Griffin, 2005, p. 668.

In general terms, control within an enterprise can be divided into operational control (orientation to converting resources into products or services), financial control (refers to cost control), structural control (deals with organization of structure elements), and strategy control (focus on effectiveness of all segments of business in relation to the set goals). The first step in establishing control is defining standards (Griffin, 2005, p. 656).

Operational control involves, among other things, quality control. Quality implies features of products or services that meet the customer needs, ensure their satisfaction and release of mistakes that would cause the business to repeat or could result in failure (Juran, 1998, p. 2.1-2.2). Quality management is carried out using the process known as "Juran's trilogy", which includes:

- Quality planning,
- Quality control,
- Improvement of quality (Juran, 1998, p. 2.5.).

ISO 9001 is the most widely used international standard that sets requirements for the establishment and maintenance of a total quality management (ISO Quality, 2015, p. 2). When it comes to maritime companies, emphasis is put on the quality of services that can be classified into six groups as follows:

- Quality in relation to resources (physical, financial, equipment, infrastructure, ...)
- Quality in relation to the results (product or service received by the customer)
- Quality in relation to the process (interaction between employee and customer)
- Quality in relation to management (effective selection and use of resources, employee professionalism, feedback, ...)

- Quality in relation to brand / reputation (customer perception of the company)
- Quality in relation to social responsibility (ethical perception of enterprises) (Thai, 2007, p. 495, 500.).

The implementation of a total quality management in the operations of maritime companies and continuous control is carried out with the aim of increasing business safety, i.e. reducing accidents and environmental pollution.

3. STANDARDIZATION SYSTEM FOR SEAFARERS - STCW (CHANGES IN MANILA 2010)

STCW Convention (The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) is a set of standards of international value adopted in London in 1978 for seafarers on merchant ships. The convention was brought by IMO (International Maritime Organization), and came into force in 1984. The first significant amendment to the Convention was 1995. The Convention prescribes minimum standards in relation to training, certification and watchkeeping for seafarers (Dirks, 2001, p. 2). The next major change was in Manila on June 25, 2010, which prescribed the beginning of the transition period from January 1, 2012 to full implementation as of January 1, 2017. These are amendments to the existing STCW convention, where existing rules and regulations have been updated in line with the development and forecasts of future problems[1]. Manila's amendments consist of eight chapters and 43 regulations, of which 15 refer to general provisions, five on nautical departments, seven on mechanical engineering and two on radio communications. Other regulations relate to special training requirements for seafarers (3), rescue, occupational safety, health and emergency (6), alternative certification (3) and watchkeeping (2)[2]. All of these changes relate to certain stakeholders that directly or indirectly participate in maritime business operations (Table 2).

Table 2. The most important activities grouped by stakeholders

PARTY	ACTION
Regulator	Promotion and awareness Amendment of rules, regulations and guidelines New certificates: Electro-Technical Officer, Able seafarer Review quality systems Review MOUs (M*emorandum of Understanding)* and create new ones (near coastal voyages)
Shipowners	Ensure health, training (include re-training) and qualifications of crew Manning levels to meet hours of rest requirements Prepare training funds

[1] Ahmad, marine21.marine.gov.my, p. 2
[2] Ibidem, p. 3

Seafarers	Awareness of new requirements, especially on training and certification
Training institutions	Training programmes in place Restructuring of training courses Re-training of trainers Review quality systems

Source: Ahmad, Mohammad[3]

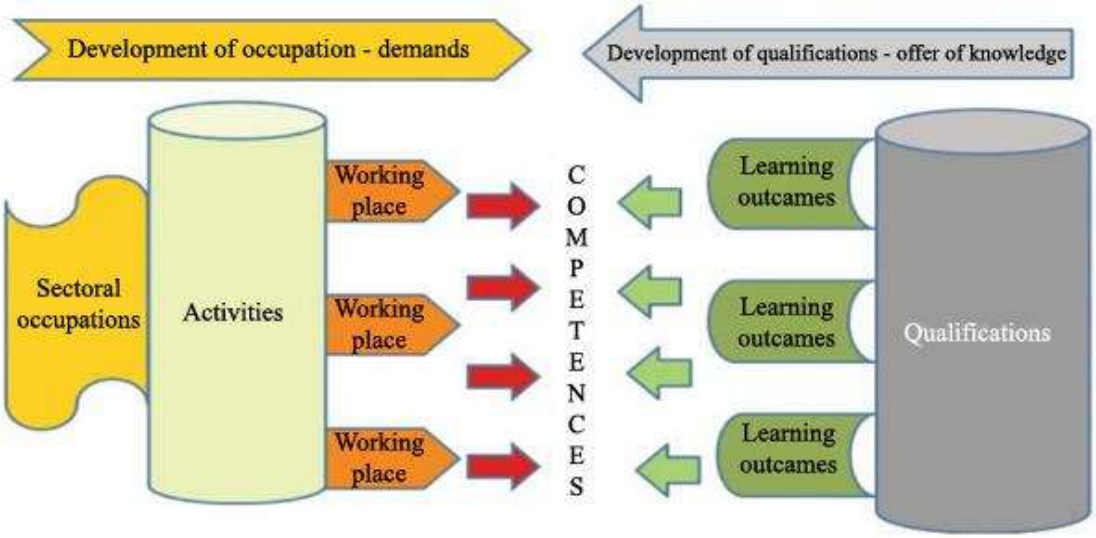
Changes from Manila, as well as the STCW Convention itself, place greater emphasis on seafarer's training. Successful execution of specific and complex tasks within the work process is not possible if employees have not previously acquired appropriate work habits, skills and knowledge. Professional training should result in increased efficiency of work and raising performance quality of work processes. Reaching a certain standards is achieved by introducing systematic and controlled training (Kiperaš, 1998, p. 50). Thus, due to the advancement of technology and changes in maritime conditions, Manila has adopted several amendments to new training programs or new requirements under the existing ones. Some of the changes are:

- New requirements for training in modern technology (ECDIS)
- New requirements for management, leadership and teamwork
- New requirements for security training including "piracy awareness"
- New requirements for marine environment awareness training
- Training for Electrical Engineers
- High voltage training
- A new training for able seafarers
- Introduction of modern training methodology (web-based learning)
- Improved measures to prevent fraudulent practices associated with certificates[4].

Specific training is also prescribed depending on the type of boat. Thus, there are minimum requirements for training on passenger and RO-RO ships, oil tankers, liquefied gas tankers and chemicals (STCW Convention Familiarization with 2010 Manila Amendments, 2014). In addition to the training program, an important part of the seafarer's preparation for life and work on board is the educational process. Maritime Studies Programs in Croatia are aligned with the STCW Convention and are subjected to certification by the Ministry of Science, Education and Sports and the Ministry of Maritime Affairs, Transport and Infrastructure. The competences gained by such an education system make space for seafarers in the labor market because they meet the standards of maritime enterprises (Figure 1). Nevertheless, the radical changes to the STCW Convention in Manila, 2010 have failed to take into account the latest trends in education set by the Bologna Process, which has brought about some changes in the way of acquiring knowledge that differ from the STCW convention (Marušić, 2010, p. 13).

[3] Ibidem, p. 9-10
[4] www.warsashsuperyachtacademy.com

Figure 1. Competences - a common goal of the education system and the demand system in the labor market in maritime affairs



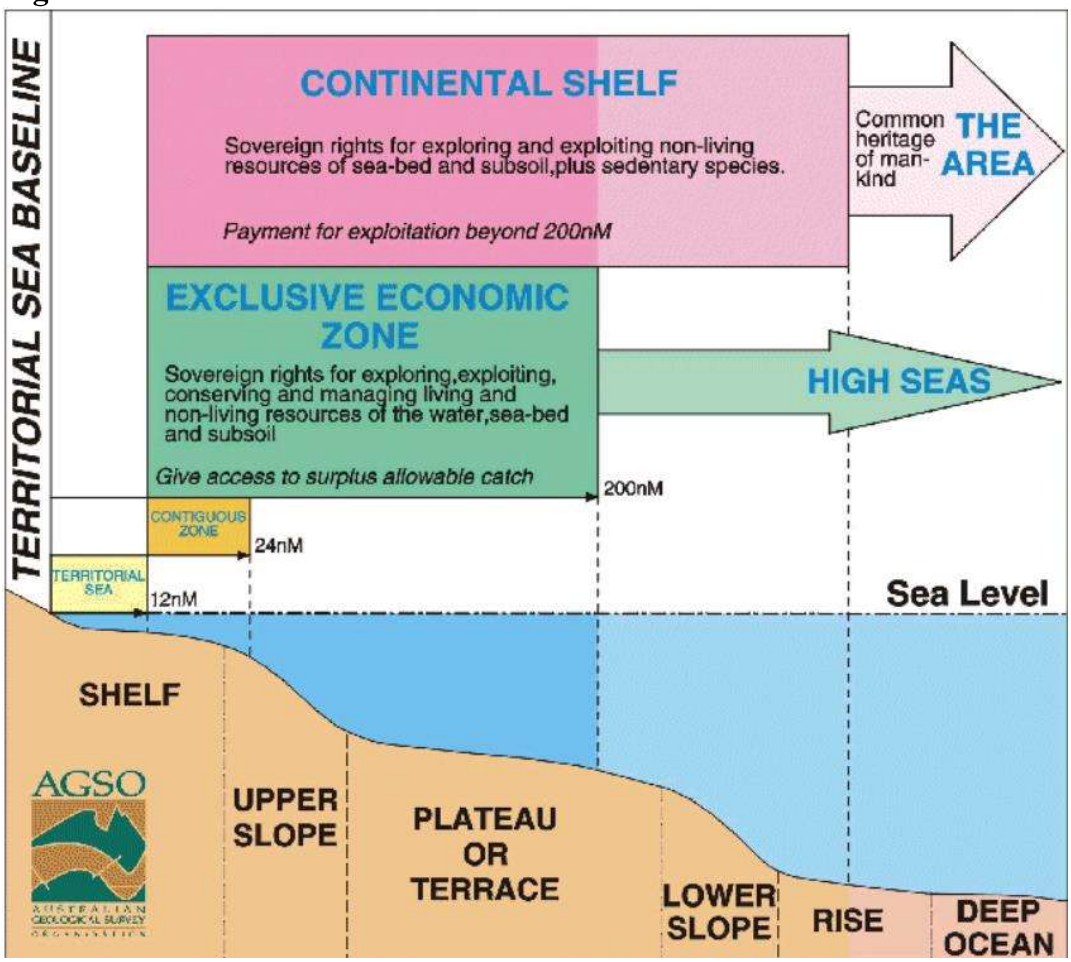
Source: Weiss et all; 2012, p. 12.

Training certificates are necessary when a seafarer departs at a ship, and are acquired by attending and passing seafarer's training programs after graduating from a secondary maritime school. Certification is done according to the STCW Convention. In Chapter VII, Rule VII / 2 on Certification of Seafarers states the following: "Every seafarer performing a function or a series of functions specified in the tables in chapters II, III and IV (chapters intended for deck officers, machines and radio communications) of the STCW Convention, will receive a certificate of competency or a certificate of proficiency"[5].

Among the necessary certifications, seafarers also receive a certificate of environmental protection for which they are trained on a special training program. The marine environment problem is covered by the MARPOL Convention (International Convention on the Prevention of Pollution from Ships), and training is controlled by the STCW Convention. MARPOL handles all types of pollution including, for example, grease, oil, noxious liquid substances, harmful substances in packaged form, sewage, or garbage from ships, aircraft and platform carriers (Philipsen & Rigamonti, 2015, 7). In addition to this pollution, ships also have other adverse impacts on the environment, such as noise pollution, negative impact on marine flora and fauna damaging habitats, underwater and seabed by anchoring, propellers and hulls, pollution by antifouling paint or crossing of roads and collisions with sea mammals and turtles (Abdulla & Linden, 2008, p. 12-13, 22, 27, 33).

[5] cil.nus.edu.sg, p. 41

Figure 2. Classification of sea and undersea



Source: Townsend, 2015, p. 8.

Different levels of protection, through different laws and regulations, apply to different parts of the sea and the ocean (Figure 2). In accordance with the foregoing, maritime companies are obliged to comply with prescribed standards and act in accordance with the legal framework applicable in different conditions and areas.

4. EFFICIENCY OF PERFORMING WORKING PROCESSES ON BOARD

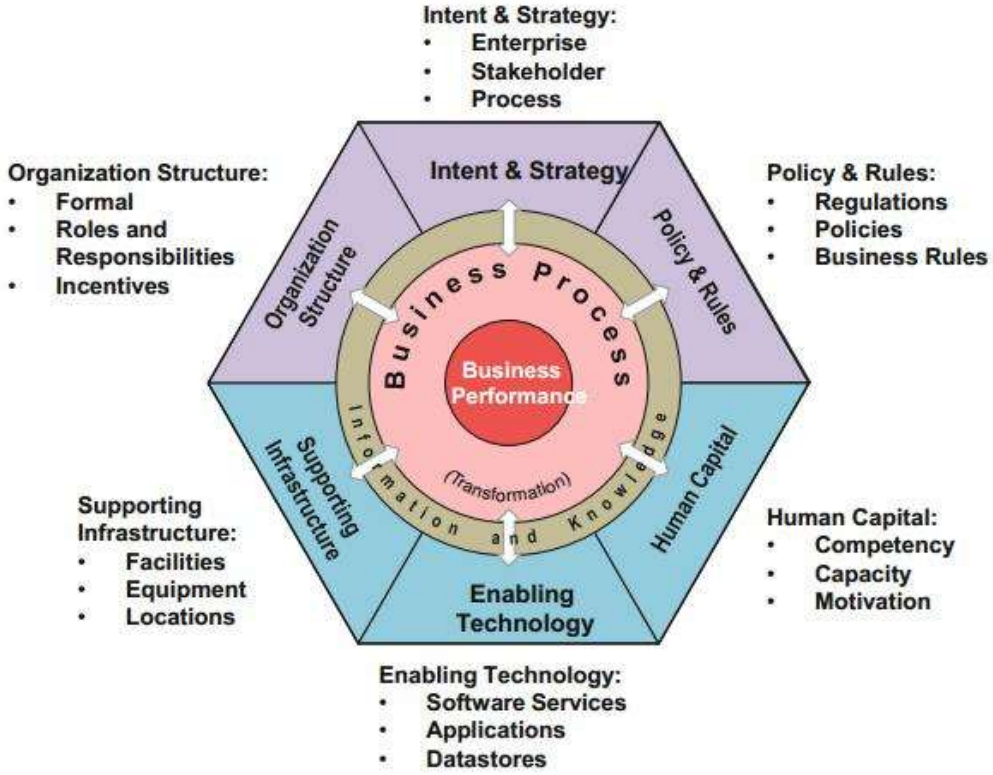
All the above-mentioned regulations and rules are brought and improved in order to increase the efficiency of the work on board and the safety of seafarers and passengers as well as increase of profits. The question that almost all business managers are asking today is how to reconcile the demands of all stakeholders, how to be and remain successful, and which techniques or methods to apply. Part of the answer lies in standard improvements. There are no unified definitions of standard improvements, but almost all agrees in one: standard improvements represent changes to the better, all that is shift from the current state, and brings financial or functional savings (Pipunić & Grubišić, 2014, p. 542). By combining two improvement models, Lean and Six Sigma, the overall process can be improved by reducing the number of

steps (Lean) and reducing the variation and eliminating errors within each business process (Six Sigma) (Skorikova, 2014, p. 170).

Business management, in a way to continuously improve work processes is part of the business organization (Figure 3). In addition, employee selection management has a certain impact on the performance of work processes. Some research related to individual human resource management segments confirmed that seafarers were partly negatively assessing the employee education segment, while assessing leadership as neutral (Vučur et al, 2016, p. 74). The established indicators point to the fact that there are a lot of possibilities for improvement the standards, that is duty of the company`s managers that must have the knowledge and skills needed to improve work and work processes. Setting up activities to be performed, requires the definition of necessary knowledge and skills for which standards need to be precisely defined. In case of coordinated activities, operations of all participants must be described (Harmon, 2016, p. 18). Business function consists on related and similar interrelated jobs. They need to be performed with the purpose, in a way to link business tasks (Sikavica, 2011, p. 569).

Coordinated jobs require teamwork based on interlaced knowledge, but also raises the level of motivation and participation in work (Hanzu-Pazara et al, 2012, p. 319). In such an environment, capable seafarers are those that are well-trained, accept low levels of risk and are responsible for their work and the marine environment (Barsan et al, 2012, p. 89).

Figure 3. Hexagonal business process management



Source: Burlton; 2001, p.73

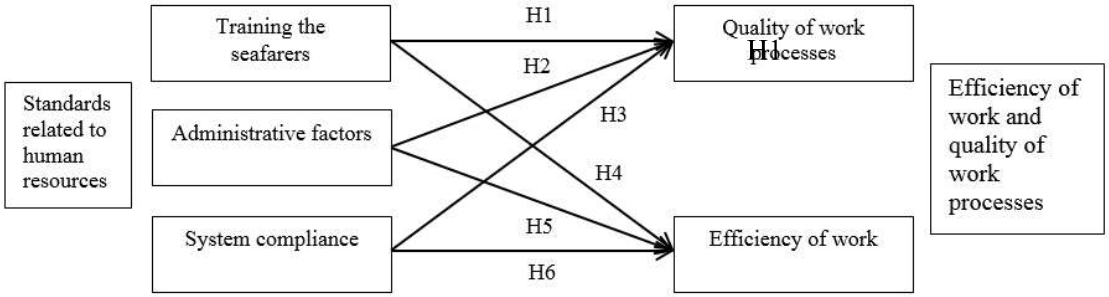
There are three types of job management: management processes that affect other processes, support processes that meet the internal needs (the needs of employees or need to carry out production-service processes) and central processes aimed to meet customer needs (von Rosing, Scheer & von Scheel, 2015, p. 439). All critical parts of the work process should be measurable. Process efficiency measures represent specific attributes of values and attributes of each product or service (Tenner & DeToro, 1996, p. 77). Measurement of business processes can be based on quantitative or qualitative indicators. In the case of quantitative indicators, it should be noted that the measurement principle is to take into account certain numerical values that can be expressed in financial or non-financial indicators. In the case of qualitative indicators, measurements are carried out on the basis of estimated values.

This research is based on the estimated values of seafarers due to the fact that the location of business processes is physically remote and as such is not suitable for access to information that are usually confidential.

5. RESEARCH METODOLOGY

The research methodology was based on a perceptive view of seafarers that was expressed through an on-line questionnaire that was available to them over a period of 15 days in April, 2017. The survey questionnaire contained a total of 19 closed-type questions in which for a part of the question was offered a Likert scale of 7 degrees intensity ranging from a completely negative to fully positive trend of movement of each indicator. The questionnaire compiled a total of 154 seafarers from the Republic of Croatia. Linking indicators related to maritime business standards, which have experienced changes in the observed period over the past 5 years, and indicators related to the efficiency of work and improvement of work processes, research model was formed (Figure 4).

Figure 4. Research model



Source: Own production

The questions that will be answered in the following are: "Does improvement of standards affect the quality of work processes?", "Does compliance of standards affect work efficiency?" and finally "Which segments of standards are improved?".

Statistical data processing was carried out using Microsoft Excel 2010 data processing software and IBM SPSS Statistics 20. The testing of the offered hypothesis

is based on a correlation analysis, and the tests were conducted at a level of significance of 5%.

Also, through the descriptive statistics parameters, the survey includes indicators related to the characteristics of seafarers who participated in the research, as well as analyzed trends in the movement of individual segments of business.

6. RESEARCH RESULTS

6.1. Sample characteristics

The analysis of the sample according to the basic features presents the characteristics of seafarers who participated in the research. The sample encompassed a total of 154 seafarers currently on board or were on board in the observed period, which will be analyzed for age, navigation, level of education, occupation and work position on board.

If the age of seafarers in the survey is considered, 1/3 of seafarers were between 36 and 45 years, 1/3 between 26 and 35 years, while 1/3 included all others.

If the navigation time is observed, it can be said that the pattern was somewhat different, so 36.4% of seafarers in the survey had up to 5 years of navigation, 16.9% between 6 and 10, 18.2% between 11 and 15 years, while the same percentage was applied to seafarers that had between 16 and 20 years of navigation. More than 20 years of navigation have had more than 10% of seafarers.

Considering the level of education, it can be concluded that 44.1% of seafarers had completed a higher school (bacc.), 28.6% secondary school, 20.8% high school (mag.), and 6.5% ended in an accelerated course or a special training program.

If calling of seafarers involved in the survey is analyzed, it is necessary to state that more than half of seafarers were nautical directions, about 30% of the sample referred to engineers, 10% to electricians, while the rest was the other crew on board.

Looking at the position on board, the survey included 23.4% captains or chief engineers, 22% I. officers, 24.7% II. officers, 13% III. officers, and 16.9% of other crews.

6.2. Hypothesis testing

Due to the above-mentioned facts, survey model and features related to seafarers involved in the research, set hypothesis should be tested. The hypothesis testing is based on linking these indicators to obtain correlation test results based on which judgments will be made and to form concluding exploratory considerations. Since research involves sequential (ordinal) variables for hypothesis testing, a nonparametric correlation coefficient of rank correlation was used, showing the direction, intensity, and statistical significance of the relationship between the observed variables.

Overview of all used indicators in hypothesis testing:
WWP - Assess the quality of work and work processes on board

CHF - Assess the trend of control of the health and fitness of seafarers on board
QTC - Assess the quality of seafarer training on the basis of a larger number of courses
TEM - Assess the quality of seafarer's training on the equipment and materials used at the courses
LC - Assess the quality of the lecturers at the courses
EST - Estimate the encouraging to seafarer training by the company
NR - Estimate the number of rules, regulations and guidelines on board
ISO - Estimate ISO quality system on board
ECO - Assess the changes in ecological standards in the working environment on board
ACO - Assess the compliance of the actual condition on board with the prescribed STCW standards
STCW - Assess your knowledge of STCW standards
SHE - Assess changes in work efficiency on board
EDU - Assess the compliance of the education system with the prescribed STCW standards

H1: The change of seafarer's qualification standards has had an impact on the improvement of maritime labor and work processes.

Seafarer's abilities in the hypothesis test are presented through indicators related to health and fitness training, training through a number of courses, equipment and materials used at the courses, the quality of the lecturers, and encouraging training by companies. These indicators are related to the level of quality of work and work processes of a company in maritime affairs.

Table 3. Correlation between seafarer training indicators and improvement of work and work processes in maritime company

Correlations			WWP	CHF	QTC	TEM	LC	ENC
Spearman's rho	WWP	Correlation Coefficient	1,000	,435**	,511**	,070	,250**	,358**
		Sig. (1-tailed)	.	,000	,000	,194	,001	,000
		N	154	154	154	154	154	154
	CHF	Correlation Coefficient	,435**	1,000	,332**	,275**	,177*	,169*
		Sig. (1-tailed)	,000	.	,000	,000	,014	,018
		N	154	154	154	154	154	154
	QTC	Correlation Coefficient	,511**	,332**	1,000	,459**	,343**	,421**
		Sig. (1-tailed)	,000	,000	.	,000	,000	,000
		N	154	154	154	154	154	154
	TEM	Correlation Coefficient	,070	,275**	,459**	1,000	,419**	,312**
		Sig. (1-tailed)	,194	,000	,000	.	,000	,000
		N	154	154	154	154	154	154

	LC	Correlation Coefficient	,250**	,177*	,343**	,419**	1,000	,184*
		Sig. (1-tailed)	,001	,014	,000	,000	.	,011
		N	154	154	154	154	154	154
	ENC	Correlation Coefficient	,358**	,169*	,421**	,312**	,184*	1,000
		Sig. (1-tailed)	,000	,018	,000	,000	,011	.
		N	154	154	154	154	154	154

**. Correlation is significant at the 0.01 level (1-tailed).
*. Correlation is significant at the 0.05 level (1-tailed).
Source: Own production using SPSS

From the presented results (Table 3) it can be concluded that there is a positive, significant and intense correlation between the majority of seafarer's qualification indicators and the level of labor quality and work processes of the maritime enterprise. The impact was not recorded only in the segment related to the use of equipment and materials at courses that cannot be directly related to the quality of work and work processes of the maritime company. Hypothesis H1 is accepted.

H2: Changing the administrative standards on board had an impact on improving the work and work processes of the maritime company.

The change of the administrative standards on board were based on the tendency of raising the number of rules, regulations and guidelines on board, and on the ISO system of quality and ecological standards of maritime business operations. These indicators are related to the level of quality of work and work processes of a company in maritime affairs.

Table 4. Correlation between the indicators of administrative standards and the improvement of work and work processes of enterprises in maritime affairs

Correlations			WWP	NR	ISO	ECO
Spearman's rho	WWP	Correlation Coefficient	1,000	,049	,581**	,441**
		Sig. (1-tailed)	.	,273	,000	,000
		N	154	154	154	154
	NR	Correlation Coefficient	,049	1,000	,223**	,289**
		Sig. (1-tailed)	,273	.	,003	,000
		N	154	154	154	154
	ISO	Correlation Coefficient	,581**	,223**	1,000	,416**
		Sig. (1-tailed)	,000	,003	.	,000
		N	154	154	154	154
	ECO	Correlation Coefficient	,441**	,289**	,416**	1,000
		Sig. (1-tailed)	,000	,000	,000	.
		N	154	154	154	154

**. Correlation is significant at the 0.01 level (1-tailed).
Source: Own production using SPSS

From the Table 4, it can be seen that most of the indicators related to administrative factors have a significant, positive and intense impact on the quality of work and work processes of a company in maritime affairs. The impact on the quality of work and work processes wasn`t noticed only in relation to the number of rules, regulations and guidelines on board. Hypothesis H2 is accepted.

H3: Changing the compliance of all system factors affected the enhancement of maritime work and work processes.

In accordance with the above-mentioned system factors involved in standards implementation, indicators relating to the compliance of the education system with the STCW standards, the compliance of the ship's actual status with the STCW standards, and the knowledge of STCW standards by seafarers have been explored. These indicators are related to the level of quality of work and work processes of a company in maritime affairs.

Table 5. Correlation between the compliance of all system factors and the improvement of work and work processes of enterprises in maritime affairs

Correlations			WWP	EDU	ACO	STCW
Spearman's rho	WWP	Correlation Coefficient	1,000	,252**	,398**	,101
		Sig. (1-tailed)	.	,001	,000	,106
		N	154	154	154	154
	EDU	Correlation Coefficient	,252**	1,000	,491**	,151*
		Sig. (1-tailed)	,001	.	,000	,031
		N	154	154	154	154
	ACO	Correlation Coefficient	,398**	,491**	1,000	,278**
		Sig. (1-tailed)	,000	,000	.	,000
		N	154	154	154	154
	STCW	Correlation Coefficient	,101	,151*	,278**	1,000
		Sig. (1-tailed)	,106	,031	,000	.
		N	154	154	154	154

**. Correlation is significant at the 0.01 level (1-tailed).
*. Correlation is significant at the 0.05 level (1-tailed).
Source: Own production using SPSS

Considering the presented results from Table 5, it can be concluded that there is a positive, intensive and significant impact of the compliance of the education system with the STCW standards and the compliance of the ship's actual status with the STCW standards to the quality of work and work processes of the maritime enterprise. The impact of knowing STCW standards by seafarers about quality of work and work processes has not been noted. Hypothesis H3 is accepted.

H4: Changing of standards related to seafarer's competence has influenced the efficiency of work on board.

Seafarer's competence in this hypothesis test is presented through indicators related to health and fitness training, the quality of education through a greater number of courses, the equipment and materials used in the courses, the quality of the lecturers, and the encouraging for training by the company. These indicators are related to the level of efficiency of the on board operations.

Table 6. Correlation between seafarer training indicators and on board efficiency

Correlations			WEO	CHF	QTC	TEM	LC	ENC
Spearman's rho	WEO	Correlation Coefficient	1,000	,368**	,500**	,126	,340**	,340**
		Sig. (1-tailed)	.	,000	,000	,060	,000	,000
		N	154	154	154	154	154	154
	CHF	Correlation Coefficient	,368**	1,000	,332**	,275**	,177*	,169*
		Sig. (1-tailed)	,000	.	,000	,000	,014	,018
		N	154	154	154	154	154	154
	QTC	Correlation Coefficient	,500**	,332**	1,000	,459**	,343**	,421**
		Sig. (1-tailed)	,000	,000	.	,000	,000	,000
		N	154	154	154	154	154	154
	TEM	Correlation Coefficient	,126	,275**	,459**	1,000	,419**	,312**
		Sig. (1-tailed)	,060	,000	,000	.	,000	,000
		N	154	154	154	154	154	154
	LC	Correlation Coefficient	,340**	,177*	,343**	,419**	1,000	,184*
		Sig. (1-tailed)	,000	,014	,000	,000	.	,011
		N	154	154	154	154	154	154
	ENC	Correlation Coefficient	,340**	,169*	,421**	,312**	,184*	1,000
		Sig. (1-tailed)	,000	,018	,000	,000	,011	.
		N	154	154	154	154	154	154

**. Correlation is significant at the 0.01 level (1-tailed).
*. Correlation is significant at the 0.05 level (1-tailed).
Source: Own production using SPSS

From the presented results (Table 6) it can be concluded that there is a positive, significant and intense correlation between most seafarer training indicators and on board efficiency. The impact is not recorded only in the segment relating to the use of equipment and materials at courses and cannot be directly related to the efficiency of the work on board. Hypothesis H4 is accepted.

H5: Changing the administrative standards on board had an impact on the efficiency of the work on board.

The change of the administrative standards on board was based on the tendency of raising the number of rules, regulations and guidelines on board, and on the ISO system of quality and ecological standards of maritime business operations. These indicators are related to the level of efficiency of the work on board.

Table 7. Correlation between administrative standard indicators and efficiency

Correlations			WEO	NR	ISO	ECO
Spearman's rho	WEO	Correlation Coefficient	1,000	,045	,650**	,385**
		Sig. (1-tailed)	.	,288	,000	,000
		N	154	154	154	154
	NR	Correlation Coefficient	,045	1,000	,223**	,289**
		Sig. (1-tailed)	,288	.	,003	,000
		N	154	154	154	154
	ISO	Correlation Coefficient	,650**	,223**	1,000	,416**
		Sig. (1-tailed)	,000	,003	.	,000
		N	154	154	154	154
	ECO	Correlation Coefficient	,385**	,289**	,416**	1,000
		Sig. (1-tailed)	,000	,000	,000	.
		N	154	154	154	154

**. Correlation is significant at the 0.01 level (1-tailed).

Source: Own production using SPSS

From the Table 7, it is evident that most of the indicators related to administrative factors have a significant, positive and intense impact on the efficiency of the work on board. The impact on work efficiency on board was not recorded only in relation to the number of rules, regulations and guidelines on board. Hypothesis H5 is accepted.

H6: Changing the consistency of all system factors influenced the efficiency of the work on board.

In accordance with the stated participants involved in the implementation of the standards, the indicators related to the compliance of the education system with the STCW standards, the compliance of the actual conditions on board with the STCW standards and the knowledge of the STCW standards by seafarers were explored. These indicators are related to the level of efficiency of the work on board.

Table 8. Correlation between the compliance of all system components and the efficiency of work on board

Correlations			WEO	EDU	ACO	STCW
Spearman's rho	WEO	Correlation Coefficient	1,000	,425**	,424**	,057
		Sig. (1-tailed)	.	,000	,000	,241
		N	154	154	154	154
	EDU	Correlation Coefficient	,425**	1,000	,491**	,151*
		Sig. (1-tailed)	,000	.	,000	,031
		N	154	154	154	154
	ACO	Correlation Coefficient	,424**	,491**	1,000	,278**
		Sig. (1-tailed)	,000	,000	.	,000
		N	154	154	154	154
	STCW	Correlation Coefficient	,057	,151*	,278**	1,000
		Sig. (1-tailed)	,241	,031	,000	.
		N	154	154	154	154

**. Correlation is significant at the 0.01 level (1-tailed).
*. Correlation is significant at the 0.05 level (1-tailed).
Source: Own production using SPSS

Given the presented results from the Table 8, it can be concluded that there is a positive, intense and significant impact of the compliance of the education system with the STCW standards and the compliance of the actual conditions on board with the STCW standards on work efficiency on board. The impact of familiarization with STCW standards by seafarers on the efficiency of work on board has not been noted. Hypothesis H6 is accepted.

7. CONCLUSION

In order to present a complete framework of the research results and make conclusions, it is necessary to observe the human resources standards of maritime business in the last five years, which concerned the implementation of the STCW Marine Business Standard, which has been adapted since 2012.

The standards included the legal regulation of companies in maritime affairs, maritime labor and educational institutions. In accordance with the above mentioned factors, the indicators related to these areas of change were formed. The greatest changes were recorded about increase in the number of rules, regulations and guidelines, which had an impact on increasing oversight and positive quality changes through ISO quality system and ecological standards. In addition to this, the correction and improvement of the standards in maritime affairs concerned the raising of the quality of employees, which required a better level of health and fitness for work. By investing an extra effort from the company, it has resulted in additional encouraging of employees for training through the courses. With the increase in regulations, there has been an increase in the number of courses that employees have to attend, which has led to a mild drop in quality in the training process itself, with less attention being devoted to material resources in education, and more theoretical approach, which

moves the theory away from practice. The consequence is negative deviation that generates mild non-conformance of the education system with STCW standards which results in a further deviation of the actual condition on board from the prescribed STCW standards. It should also be noted that, although legal norms provides for a certain number of hours of rest for each employee, there is still a negative trend in practice because in certain situations on board it is impossible to achieve prescribed standards.

In accordance with the set objectives and purpose of the research, all the above mentioned is necessary to consider in the context of quality of work and work processes, as well as the efficiency of the work on board, which is the goal of improving the standards, i.e. improving the entire business of the company and achieving continuous business success. Based on the presented results, it can be concluded that increasing in number of rules, regulations and guidelines and knowledge of seafarers did not affect the quality of work and work processes and the efficiency of the work on board. There was no impact on the segment involved in the use of material resources in training seafarers at the courses. If the trend of movement of certain indicators is included in the concrete relation, it can be concluded that, despite the fact that some indicators was slightly negative, there is a positive and statistically significant correlation between seafarer's capability, administrative factors and the compatibility of different systems (educational system and business environment) with the quality of work and work processes and the efficiency of the work on board. Based on the above, it can be concluded that changes in business standards have a positive impact at improving the efficiency of the work and quality of the work processes of the maritime company. It should also be noted that the standards included in the observed research imposed by institutions outside the enterprise, which had to be implemented in last 5 years are interesting to observe considering their impact on business segments of the enterprise. As a limitation to the research it can be stated that the survey concerned solely the perceptive opinion of seafarers due to the fact that more specific indicators of business operations are impossible to access and as such impossible to measure because the business is carried out on physically remote ships. Future research should look more closely at certain segments of the business of maritime companies based on legal and administrative factors that often differ depending on national features. Another interesting area concerns training and education through courses, but also to observe the limitations of applying the prescribed standards of business.

8. REFERENCES

Abdulla, A. & Olof, L. (editors) (2008). *Maritime traffic effects on biodiversity in the Mediterranean Sea: Review of impacts, priority areas and mitigation measures*, Malaga. IUCN Centre for Mediterranean Cooperation.

Barsan, E., Surugiu & F. Dragomir, C. (2012). *Factors of Human Resources Competitiveness in Maritime Transport*, International Journal on Marine Navigation and Safety of Sea Transportation, vol. 6, no. 1, Gdynia. Gdynia Maritime University.

Buble, M. (2006). *Osnove menadžmenta*, Zagreb. Sinergija nakladništvo d.o.o.

Burlton, R.T. (2001). *Business Process Management: Profiting from Process*, Indianapolis. Sams. ; Taken from: vom Brocke, Jan & Rosemann, Michael (2010). *Handbook on Business Process Management 2*, Berlin – Heidelberg. Springer-Verlag.

Dirks, J. (2014). *Decision making in the International Maritime Organization – The case of the - STCW 95 Convention*, Research Centre Work – Technology – Environment, Bremen. Bremen University.

Domijan-Arneri, I. (2014). *Poslovanje u morskom brodarstvu*, Split. Redak.

Drucker, P.F. (1954). *The practice of management*, New York. Collins Business.

Griffin, R.W. (2005). *Management*, Texas A&M University, New Delhi, Biztantra.

Hanzu-Pazara, R., Popescu, C. & Varsami, A. (2012). *The role of teamwork abilities and leadership skills for the safety of navigation*, Expanding Frontiers – Challenges and Opportunities in Maritime Education and Training, St. John`s. Fisheries and Marine Institute of Memorial University of Newfoundland.

Juran, J. & Godfrey, B. (1998). *Juran`s Quality Handbook*, New York. McGraw-Hill.

Kiperaš, M. (1998). *Ergologija*, Dubrovnik. Veleučilište u Dubrovniku, Tiskara Pavleković.

Marušić, L. (2010). *STCW Konvencija i Bolonjski proces*, Metodički ogledi, br. 17, Zagreb. Hrvatsko filozofsko društvo.

Philipsen, N. & Rigamonti, A. (2015). *Marine pollution*, Study in the framework of the EFFACE research project, Maastricht. Maastricht University.

Pipunić, A. & Grubišić, D. (2014). *Suvremeni pristupi poboljšanjima poslovnih procesa i poslovna uspješnost*, Ekonomska misao i praksa, god. XXIII. br. 2., Dubrovnik. Sveučilište u Dubrovniku.

Quality management principles (2015), ISO quality, Geneva. ISO Central Secretariat.

Skorikova, E. (2014). *Opportunities for improvement of work process at Novikontas Maritime College*, Information Society Review, vol. 7, no. 1, Riga. ISMA University.

Sikavica, P. (2011). *Organizacija*, Zagreb. Školska knjiga.

STCW Convention Familiarisation with 2010 Manila amendments (2014). Chapter V, Lisbon. EMSA.

Tenner, A.R. & DeToro, I.J. (1996). *Process Redesign: The implementation Guide for Managers*, New Jersey. Prentice Hall.

Thai, V.V. (2007). *Service quality in maritime transport: Conceptual model and empirical evidence*; Asia Pacific Journal of Marketing and Logistics, Vol. 20, Bingley, UK.

Townsend, D. (2015). *The Marine Environment, Marine Living Resources and Marine Biodiversity - International Environmental Law*, Department of Public and International Law Oslo. University of Oslo.

von Rosing, M., Scheer,A.W. & von Scheel, H. *Business Process Model and Notation*, The Complete Business Process Handbook, Amsterdam. Elsevier Inc.

Vučur, G., Miloslavić, I. & Bošnjak, M. (2016). *The analysis of Human Resources Management (HRM) in Maritime affairs*, Ekonomski vjesnik, God. XXIX, Posebno izdanje, Osijek. Sveučilište Josipa Jurja Strossmayera u Osijeku.

Weiss, J. et al (2012). *Promet i logistika*, Agencija za strukovno obrazovanje i obrazovanje odraslih, Zagreb. Printera grupa d.o.o.

1978 International convention on standards of training, certification and watchkeeping for seafarers, as amended by the 2010 Manila amendments to the annex, čl. VII/2 Certificiranje pomoraca, [available at: https://cil.nus.edu.sg/rp/il/pdf/1978%20STCW%20Convention%20Amended%20by%202010%20Manila%20Amendments-pdf.pdf, access April 7, 2017].

Ahmad, M.R.; *The Manila Amendments to the STCW Convention and Code – An Overview*, [available at: http://marine21.marine.gov.my/appl/misc/artikal/manilaamendoverview2011-ver2.pdf , access April 4, 2017].

Harmon, Paul; *The State of Business Process Management 2016*, A BPTrends Report, [available at: http://www.bptrends.com/bpt/wp-content/uploads/2015-BPT-Survey-Report.pdf , access April 10, 2017].

New training requirements under STCW 2010, Warsash Maritime Academy, London, 2015., [available at: http://www.warsashsuperyachtacademy.com/courses/resources/new-training-requirements-under-stcw10.pdf , access April 6, 2017].