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PARTICIPATION-BASED MODEL OF SHIP CREW MANAGEMENT

ABSTRACT

This paper analyses the participation-based model on board ship as possibly optimal leadership model existing in the shipping industry with accent on decision-making process. In the paper the authors have tried to define master's behaviour model and management style identifying drawbacks and disadvantages of vertical, pyramidal organization with master on top. The paper describes the efficiency of decision making within team organization and optimization of a ship organisation by introducing teamwork on board ship. Three examples of ship accidents are studied and evaluated through "Leader-participation" model. The model of participation-based management as a model of the teamwork has been applied in studying the cause-and-effect of accidents with the critical review of the communication and managing the human resources on a ship. The results have showed that the cause of all three accidents is the autocratic behaviour of the leaders and the lack of communication within teams.

KEY WORDS

ship organization; crew members; "leader-participation" model; teamwork; decision making; accident; master;

1. INTRODUCTION

The pyramidal structure with the master on top can be clearly noticed when analysing the ship organization throughout history. The master's power throughout history is still present in the title of the "master" which is still used as the official name for this position on board the ship.

However, contemporary trends in the development of technological systems of ships require new organizational working frames of the crew. Traditional working hierarchy and management have been converted into new working and communicational relations based on the teamwork and synergy of all the crewmembers. The master's role has become more and more indirect whereas some of their traditional duties have been redirected to the shipping companies on shore. Such a course of events in the organizational network has changed their traditional role from masters to ship managers. They have become coordinators and specialists in managing the ship crew. Authoritarian hierarchy has lost its vertical component and has become a horizontal one based on consultations and coordination within teamwork.

The officers and crew members have to change the existing traditional relations onboard the ship in order to optimize the organization of the work through teamwork. Through increased initiative they have to express the possible disagreement with the master's decision. Precisely the change of communicational relations and the acceptance of the master as a team leader who coordinates and maximizes crew resources are the conditions of effective application of the "leader-participation" model.

Crew members are expected to be well educated and trained as well as more specialised when the technology of a ship they are serving on is concerned. Teamwork has been introduced in order to satisfy the increasing demands for more efficient and safer performance. The new requirements of efficient crew management are therefore the subject matter of this paper.

2. TEAM ORGANIZATION

Team organization enables a level of decentralization of non-flexible organizations as such. Even though thorough elimination of the hierarchy on board ship is not possible, it is essential to include elements of the team organization in the existing hierarchical structure on board the ship.

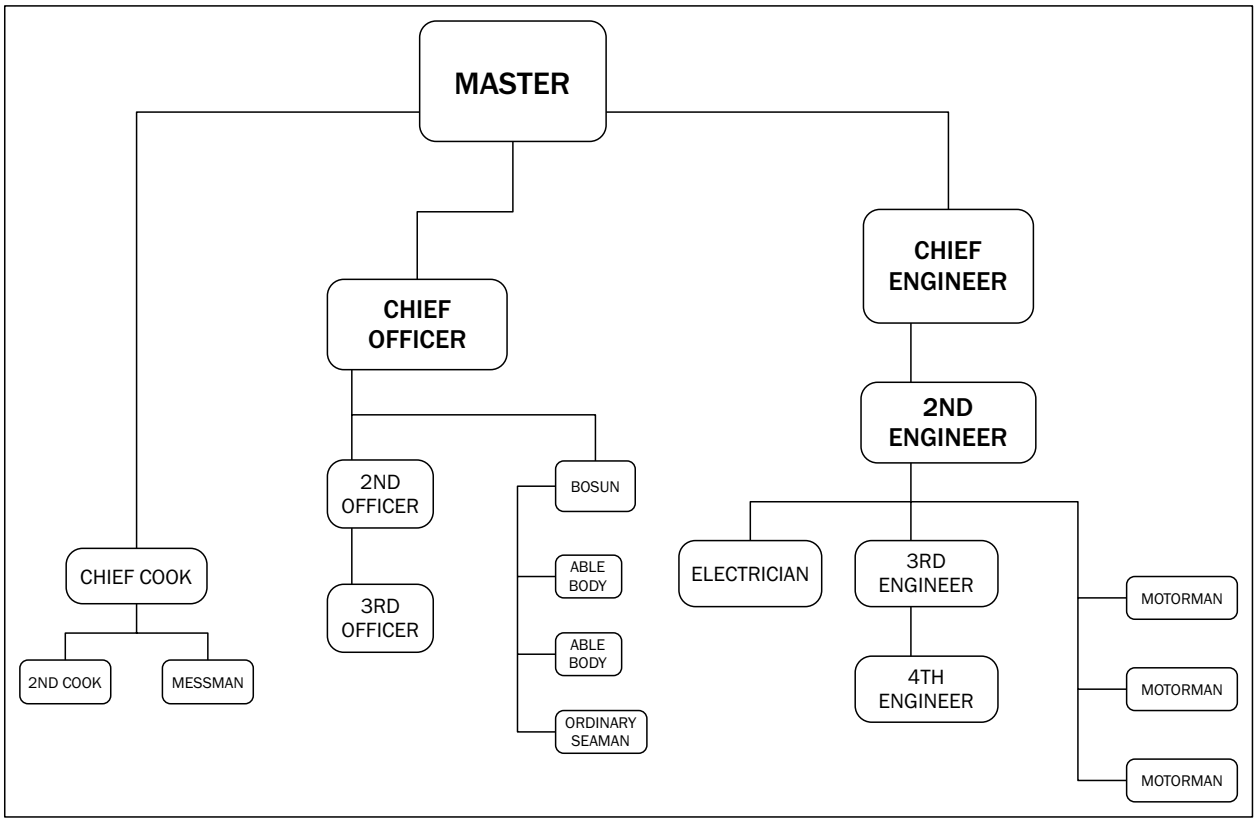

Figure 1 – Ship's crew organization

The team brings dynamics and team organization eliminates rigidity of the classical organizations [1].

The elements of the team organization should eliminate communicational barriers, whereas members of the team should be more competent and more prepared for changes and actions under standard and emergency circumstances.

In order to achieve the maximum of expectations, a team needs a period of time to adjust itself. A highly efficient team needs three to five years to adjust itself [2]. However, when taking into consideration a specific working environment, a ship team needs less time to adjust.

Team organization on board the ship can be noticed in the division of working tasks when deck or engine-room crew solve tasks as a team, which has clear goals and precise duties.

The ship's master manages the officers as a team (within a team organization) and faces consequences for their work. At the same time he enables the optimal control of a situation and of all the conditions during the navigation and ship exploitation. Thus, teamwork and the role of the master as a formal and true leader of a team are mutually conditioned. Even though master's formal leadership is clear by the law, his real component as a leader is far more important for the team. In order to achieve more efficient realization and decision-making within a team it is necessary to apply a certain style of management. When taking into consideration a demanding communication whose realization is the basis of teamwork, the style of management is crucial for the efficient use of communication postulates. Although the formal leadership of a master is defined by his role itself, the only way to get and keep the authority as a team leader is through his knowledge, experience and capability in managing the vessel.

3. SHIP ORGANIZATIONS BY INTRODUCING TEAMWORK

Organization of ship's crew based on teamwork ensures the efficiency of the crew, thus significantly reducing the possibility of the conditions for the development of emergency situations. In order for this organizational model to function it is necessary to develop teamwork in everyday practice. It is a process that requires the change of certain acquired habits of seafarers and the introduction of young officers in the ship organization so as to fit the principles of teamwork.

In a system like this, positive motivation of team members, in this case, officers and crew on board the ship, is an important factor. The level of motivation of team members can be a key factor to success and effectiveness of the team. Teamwork assumes that individual skills in every team have to be recognized as well as weaknesses and areas of excellence

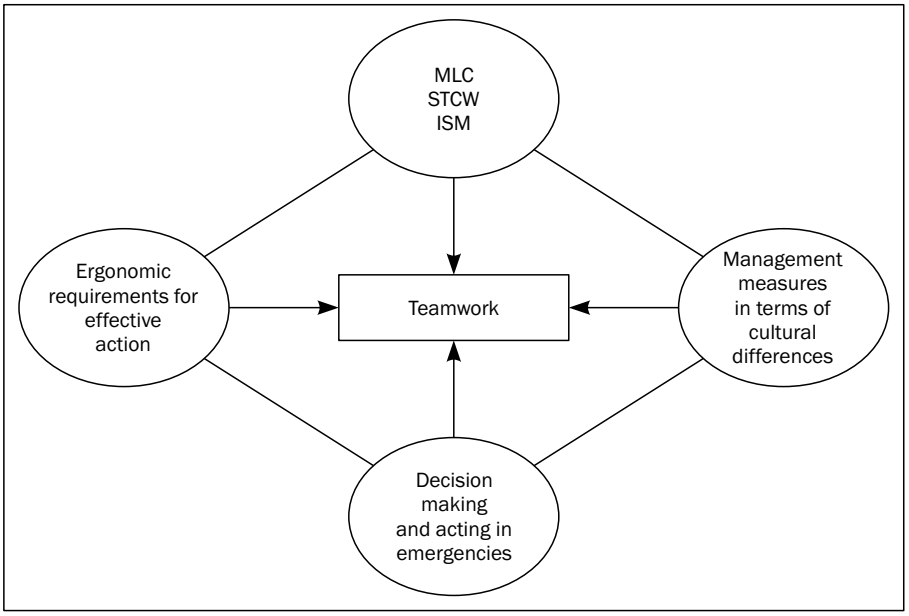

Figure 2 - Optimal organizational model of ship's crew management

Source: [3]

of every member of the team. Thus, the organization and task planning can take advantage of their full potential.

In order to obtain optimum possibilities in managing the vessel, the following conditions must be met: (*Figure 2*)

- Standards of Maritime Labour Convention, 2006 (MLC), the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) and the International Safety Management Code (ISM) which define professional qualifications, authority, standard operational procedures, communication, owner's liability based on safety of the ship and duties on board the ship;
- Procedures and management measures in terms of cultural differences;
- Decision-making and acting in emergencies which imply organizational, communication and psychological measures and procedures for acting in emergencies;
- Ergonomic requirements for effective actions which define relationship between machines and team members who use them. [3]

All the relevant factors that form the functional organization of teamwork are contained within these four components that enable effective prediction and prevention of possible emergency situations, and in the case of their occurrence, the optimal operation of the ship and return to the normal situation.

4. PARTICIPATIVE LEADERSHIP MODEL

Participative leadership behaviour assumes the application of style in which the leader consults his subordinates and uses their suggestions before making a decision.

"Leader-participation" model provides more alternatives in the direction of selecting an effective management style of the master or a team leader. In fact, the advantage of this model is reflected in the possibility of defining certain behaviours of a ship's master or a team leader in relation to the variety of circumstances. Furthermore, the model suggests a way to analyze the problem by using eight contingency questions, on the basis of which the master can predict the most desirable behaviour when making a decision. In this sense, the model defines five possible behaviours in relation to various circumstances [4]:

- AI – You solve the problem on your own or you make a decision by using all the information available at some point.
- AII – You receive all the necessary information from your subordinate employees and then you decide for yourself how to solve the problem. You may or may not tell your subordinates about the problem when asking for the information. The role played by your subordinates in decision-making is clear: to provide all the necessary information, rather than to initiate or evaluate the alternative solutions.
- CI – You share your problem with the appropriate subordinate employees separately by asking for their ideas and suggestions without bringing them together as a group. Then you make a decision that may or may not reflect the influence of your subordinate employees.
- CII – You share your problem with your subordinate employees as a group, searching for their

ideas and suggestions within the group. Then you make a decision that may or may not reflect their influence.

GII – You share your problem with your subordinate employees as a group. Then you initiate and evaluate alternatives together trying to reach a consensus about a decision.

The leader can choose one of five models of behaviour when making a decision by answering, positively or negatively, the following questions [4]:

A – If a decision is accepted, is it important to know which course of action is applied?

B – Do I have enough information to make a high-quality decision?

C – Do the subordinate employees have enough background information to make a high-quality decision?

D – Do I know exactly which information I need, where and how to collect it?

E – Is accepting a decision by subordinate employees crucial for effective task realization?

F – If I have to make a decision on my own, will it be accepted by my subordinate employees?

G – Can the subordinate employees be entrusted with giving the basis for the solution of the organizational issues?

H – Is the conflict between the subordinate employees, regarding the most desirable solution, possible?

The model below is suitable for use both in everyday and in ordinary circumstances as well as in urgency situations and a variety of emergency situations, provided that the team has reached maturity in cooperation and communication. The model gives the possibility of transition from one management style to another, e.g. from autocratic to participative, depending on the circumstances.

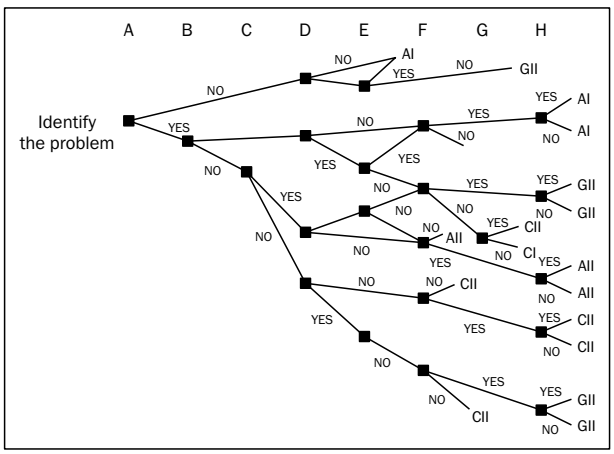

Figure 3 – Leader-participation model

Source: [4]

Three situations in which the lack of coordination and cooperation between team members led to maritime accidents will be studied further below by using the algorithmic "leader-participation" model.

Example 1: "Kariba, Tricolor and Clary"

We will try to get one of five behaviour models in decision-making of a leader, in this case the master, through the algorithmic "leader-participation" model based on well argumented court conclusion in the case of the collision of ships "Tricolor" and "Kariba".

Before that, it is necessary to give a brief overview of the maritime accident in which the ship Tricolor sank after being struck by the ship "Kariba".

"On the morning of 14th December 2002 vessels Kariba, Tricolor and Clary along with several unidentified ships were navigating in a Traffic Separation Scheme (TSS) in the English Channel north of Dunkerque, France. The vessels were operating in restricted visibility due to fog. By approximately 2:05 hrs Kariba and Tricolor were sailing in almost parallel courses in the westbound lane of the "West Hinder" branch of TSS. Both vessels had just made a turn at the "Fair South" buoy and were navigating from way-point to way-point in their planned courses."

"At this same time, the Clary was also proceeding on a steady course in the northbound lane of the intersecting branch of the TSS. Tricolor was in the process of overtaking Kariba approximately half a mile off Kariba's starboard quarter. When Kariba and Clary were just about three miles apart on intersecting courses, Kariba made an abrupt turn to starboard and hit the port side of Tricolor, causing her to capsize and sink along with her cargo". [5]

There were no casualties.

District Judge Harold Baer, Jr. of the court in New York concluded in January 2006 that the cause of the collision was the sole and exclusive fault of the "Kariba", where "Tricolor" and "Clary" share no portion of liability for the collision. [5]

The model diagram of the situation based on the given questions:

A - If a decision is accepted, is it important to know which course of action is applied?

YES

It is important to know which course of action is applied in order to make the second officer and a member of the navigational watch choose the course and give the command.

B - Do I have enough information to make a high-quality decision? YES

According to the investigation, all the navigational instruments on the bridge were functional and working whereas visibility was reduced. Therefore, it can be concluded that regarding the distance between the ships and the working condition of the navigation

equipment, Kariba's master had enough information to make a good decision.

D - Do I know exactly which information I need, where and how to collect it? NO

The investigation showed that despite the fact that "Kariba's" master had sent the duty officer to visually check the positions of both ships (first the "Clary", then the "Tricolor"), the master and the officer of the watch did not read the instruction booklet of the new 3 cm radar that was installed on the "Kariba" that very day. Therefore, the answer to the question is: NO.

F - If I have to make a decision on my own, will it be accepted by my subordinate employees?

YES

Given the formal hierarchical organization on board and the fact that at the time of the accident the master was in charge of the bridge, the subordinate crew members (in this case second officer and AB Seaman) would have accepted the decision he made.

H - Is the conflict between the subordinate employees, regarding the most desirable solution, possible? NO

In this very case the second officer and AB on duty were on the bridge and due to the hierarchical structure did not oppose the master's decision.

From the diagram we get the AI model of behaviour:

You solve the problem on your own or you make a decision by using all the information available at some point.

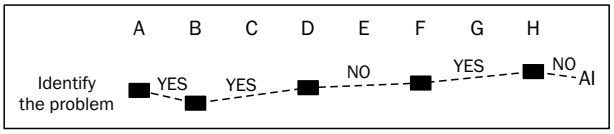

Figure 4 - Leader Participation Model based on the described example of "Tricolor"

Example 2: "Maersk Kendal"

According to the "Report on the investigation of the grounding of the MV "Maersk Kendal" on Monggok Sebarok reef in the Singapore Strait on 16th September 2009": m / v "Maersk Kendal" ran aground on a reef in Monggok Sebarok Singapore passage on 16th September 2009. The vessel had altered her course to starboard to give way to three vessels exiting the Jong Channel. This caused her to head towards the reef with the intention of altering course to port and resuming her original planned track after passing astern of the third vessel. Despite warnings from Singapore Vessel Traffic Information System (VTIS), the vessel did not reduce speed or alter course in time to prevent her from grounding. Substantial damage was sustained to the fore part of the vessel. However, there were no resulting injuries and no pollution."

The MAIB investigation [6] identified a failure of bridge teamwork, which included a lack of comprehensive passage planning, poor position monitoring and ineffective interaction and cooperation of overly complacent bridge team.

Situation diagram based on the given questions:

A - If a decision is accepted, is it important to know which course of action is applied?

YES

It is important to know which course of action is applied since all members on the bridge act according to orders that are the result of a decision made.

B - Do I have enough information to make a high-quality decision? YES

Investigation showed that all the navigational instruments on the bridge were functional, communication with VTIS unhindered, and visibility excellent.

D - Do I know exactly which information I need, where and how to collect it? NO

The investigation showed that the master was not navigating according to the rule relevant for this accident as follows: *"All vessels navigating in the routeing system of the Straits of navigation, shall proceed with caution, and shall be in maximum state of manoeuvring readiness"[7].* It is assumed that the master was not familiar with this rule. Furthermore, he did not perform the trial manoeuvre on ARPA radar that could have offered an optimal solution how to avoid three ships, and he was managing the bridge team in accordance to the "ICS Bridge Procedures Guide" which states: "A bridge team which has a plan that is understood and is well briefed, with all members supporting each other, will have good situational awareness. Its members will then be able to anticipate dangerous situations arising and recognise the development of a chain of errors, thus enabling them to take action to break the sequence." [8]

F - If I have to make a decision on my own, will it be accepted by my subordinate employees?

YES

The investigation showed that the master and the first officer had sailed together on three occasions on board this ship, and had established mutual respect for each other. The first officer was fully confident in the master's decisions and navigational abilities. Furthermore, the master used to work alone so his possible errors were undetected and unchallenged. He made it clear in his standing orders that the OOW should question his decisions whenever in doubt. However, this order should not have prevented him to discuss his intentions with the navigational watch officer before making a decision. In this case, the first officer assumed that it was not necessary to question the master's intentions and decisions because of the previous experience with the same master. Furthermore, he did not take into consideration the possible danger. The master did not consult him in terms of navigational support and the master appeared to be in control of the situation. The first officer was culturally reluctant to critically challenge the master's intentions and decisions. Also, the

master was annoyed by the first officer's VTIS radio communication. In addition to this, the first officer had not attended the "bridge team management training" course. All the above-mentioned facts show that team members on the bridge accepted decisions made by the master.

H - Is the conflict between the subordinate employees, regarding the most desirable solution, possible? NO

As in the first example, the officer of watch (in this case, the first officer) and AB Seaman were on duty on the bridge of "Maersk Kendal". Knowing the fact that the first officer and AB in charge of watch come from the Asian countries whose societies are traditionally authoritarian and where it is not expected to discuss the problem with subordinates, the possibility to critically examine the team leaders' decisions, and to oppose them, is minimal. By taking into consideration the principle of hierarchical structure on board, the conflict among subordinate employees (members of the navigational watch) about the most desirable solution is not probable; therefore, the master's decision will be respected.

From the diagram we get the AI model behaviour:

You solve the problem on your own or you make a decision by using all the information available at some point.

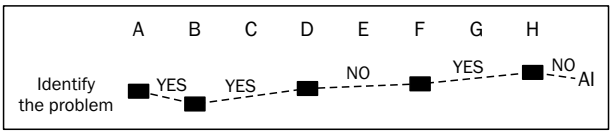

Figure 5 – Leader-Participation Model based on the described example of "Maersk Kendal"

Example 3: "Wah Shan"

As in previous two examples, we will try to get one of five behaviour models in decision-making of the leader, in this case of the second officer who was in charge of the team on the poop deck of "Wah Shan", by using the algorithmic "leader–participation" model and based on the information available from the official report on the incident on board.

Here is an abstract of the accident, in which one of the crew members lost his life, taken from the report made by the MAIB (Marine Accident Investigation Branch).

In the morning of 2nd October 2012, the carpenter on board the bulk carrier, "Wah Shan," suffered a severe blow to his neck by a nylon rope used to haul the steel tow wire from the accompanying tug. The blow was fatal and the emergency team that boarded the vessel 50 minutes later could only confirm the death of the unfortunate crew member. [9]

The investigation revealed that the potential risks in securing the steel tow wire on board were not properly examined. Furthermore, the aft mooring team showed poor seamanship and did not function as an effective team. The configuration of the berth on the aft mooring deck was not designed in a way to secure the obvious and the efficient method of securing and hauling the steel tow wire. So it can be concluded that the crew applied the unsafe method for hauling the tow wire on board, which ultimately resulted in the accident.

Situation diagram of the situation on the poop of the ship, "Wah Shan" based on the given questions:

A - If a decision is accepted, is it important to know which course of action is applied?

NO

The investigation showed that the second officer did not pre-brief team members on the poop deck prior to the operation of hauling the tow wire from the accompanying tug. He did not define the common goal of the task nor did he give clear instructions to each member of the team. So the team did not foresee the potential risks or how to eliminate or reduce them. Therefore, a common plan did not exist at all. All the above-mentioned facts prevented the crew members to supervise and support each other, i.e. to act as a team. Therefore, it is fair to say that the decision-making process did not start at all, so no decision could have been made or accepted.

D - Do I know exactly which information I need, where and how to collect it? NO

The second officer clearly demonstrated the lack of ability to lead the team, which should have assumed giving clear instructions to the individuals, coordinating work of individuals towards a common goal and involving them in the process of planning the task. Insufficient knowledge of the mooring details resulted in the second officer's lack of authority as a team leader. Because of that he could not have efficiently and in time prevented and stopped the unsafe acts and thus interrupt the chain of errors that led to the accident.

From the diagram we get the AI model of this behaviour:

You solve the problem on your own or you make a decision by using all the information available at some point.

The second officer showed poor team managing skills and he did not establish himself as a team leader. He did not understand or predict the possible risks related to the task, and despite all clear indications that the task was not progressing well, he did nothing to prevent the chain of errors. He had all the necessary certificates of competence for a position of the second officer and in the period preceding the accident his workload was in accordance with the rules and regulations. Besides, he did not suffer from fatigue that could have affected his working abilities and decision-making. Moreover, he demonstrated obvious ignorance and poor management of the team.

After analyzing the results of the above three examples included in the "leader-participation" model, it is obvious that the root cause of all three accidents was the lack of teamwork and autocratic behaviour of the team leaders while making decisions. If the teams had tried to critically challenge the decisions made by the team leader and point out their obvious shortcomings, or if they had suggested a different option, the accidents would probably not have happened.

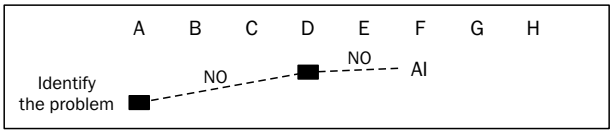

Figure 6 – Leader-Participation Model based on the described example of "Wah Shan"

5. CONCLUSION

Actual trends in the development and management of ship's technological systems demand new communicational as well as working relations. From this aspect, the role of the ship's master is going to be transformed into the function of the team leader or crew manager. In order to achieve synergy among crew members, in accordance with the demands of new communication methods and team work principles, the ship's master needs to apply a specific style of management. The optimal implementation of the principles of team work and new communicational methods requires four conditions described by *Figure 2* above. These four components or conditions fully enable the application of participative leadership model. However, the optimal implementation of the model in practice requires previous change of existing habits of professional seafarers and an open communication. The accidents studied show appearance of negative impacts of the company, leadership and individuals' oversights. The shortcomings of the vertical ship organization have been noticed in the above examples of maritime accidents, as well as the possibility of applying the model in order to avoid the occurrence of accidents.

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SAŽETAK

MODEL PARTICIPATIVNOG UPRAVLJANJA BRODOM

Ovaj rad analizira model participativnog upravljanja na brodu kao moguće optimalnog modela upravljanja koji egzistira danas u brodarstvu, s naglaskom na proces donošenja odluka. U radu autori pokušavaju utvrditi model ponašanja zapovjednika i stil upravljanja identificirajući nedostatke i mane vertikalne, piramidalne organizacije sa zapovjednikom na vrhu.

Rad opisuje učinkovitost donošenja odluka unutar timske organizacije i optimizacije brodske organizacije uvođenjem timskog rada na brodu. Tri primjera brodskih nezgoda proučena su i evaluirana kroz model "vođa-participacija". Model participativnog upravljanja kao model timskog rada primijenjen je pri proučavanju nezgoda na bazi uzrok-efekt s kritičkim osvrtom na komunikaciju i upravljanje ljudskim resursima na brodu. Rezultati su pokazali da su autokratsko ponašanje vođa timova i nedostatak komunikacije unutar tima uzrok sve tri nesreće.

KLJUČNE RIJEČI

brodska organizacija; posada; "vođa-participacija" model; timski rad; donošenje odluke; nesreća; zapovjednik;

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