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## **ANALYSIS OF APPROACHES TO FORMING TEAMS IN PROJECT MANAGEMENT ON THE EXAMPLE OF MARINE SHIP CREW**

**Abstract.** In the article, the authors examined the problematic aspects of project management; the study focuses on the optimization of the crew of the vessel — the project team based on the concept method.

Within the framework of the approach proposed by the authors, a model has been developed for the formation of the crew of the vessel — the project team, which allows one to identify its composition, the most suitable and stable (balanced) for managing a specific project in terms of its competence, complementarity of crew members on the vessel (synergism) and its psychological characteristics.

The use of the project management system implies the creation of a special group, the crew of a ships (project team), which becomes an independent participant of the project and manages the process of sending and forming the crew of the vessel within the project being implemented.

This group is created for the period of project implementation and after its completion it is dissolved. Human resource planning — an estimate of the size and composition of human resources in the future.

The project team is the main creative component of creating the end product or service in the projects. The project team is a group of employees who work directly on the project and are subordinate to the project manager.

Unfortunately, there is no adequate model and method that would allow simultaneous optimization of the composition of personnel, teams, crew.

The use of deterministic models and methods in solving our problem is ineffective, since there is an inability to predict the entire list of works when planning teams of projects, crews.

**Keywords:** ship's crew, economic models, methods, project resource management, project management methodology.

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## АНАЛІЗ ПІДХОДІВ ДО ФОРМУВАННЯ КОМАНДИ УПРАВЛІННЯ ПРОЕКТАМИ НА ПРИКЛАДІ ЕКІПАЖІВ МОРСЬКИХ СУДЕН

**Анотація.** Розглянуто проблемні аспекти управління проектами, досліджено питання оптимізації екіпажу судна — команди проекту на базисі концептуального методу.

У рамках запропонованого підходу розроблено модель формування екіпажу судна — проектної команди, що дозволяє виявити її склад, найбільш придатний і стійкий (збалансований) для управління конкретним проектом щодо його компетентності, взаємодоповнюваності членів екіпажу на судні (синергізму) та його психологічних особливостей.

Використання системи управління проектами передбачає створення спеціальної групи, екіпажу (команди проекту), яка стає самостійним учасником проекту і управляє процесом відправлення та формування екіпажу судна в рамках проекту, що реалізується. Ця група створюється на період реалізації проекту і після його завершення її розпускають.

Планування людських (трудова) ресурсів (human resource planning) — оцінка розмірів і складу людських ресурсів у майбутньому.

Проектна команда — основний креативний компонент створення кінцевого продукту або послуги у проектах. Команда проекту (project team) — група співробітників, які безпосередньо працюють над здійсненням проекту і підлеглі керівникові проекту.

На жаль, адекватної моделі та методу, які б дозволили одночасно проводити комплексну оптимізацію складу персоналу, команд, екіпажу, на сьогодні не існує. Застосування детермінованих моделей і способів при вирішенні нашого завдання неефективне, оскільки неможливо передбачити весь перелік робіт при плануванні команд проектів, екіпажів суден.

**Ключові слова:** екіпаж судна; методи; економічні моделі; управління ресурсами проектів; методологія управління проектами.

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## **АНАЛИЗ ПОДХОДОВ ПРИ ФОРМИРОВАНИИ КОМАНДЫ УПРАВЛЕНИЯ ПРОЕКТАМИ НА ПРИМЕРЕ ЭКИПАЖЕЙ МОРСКИХ СУДОВ**

**Аннотация.** Рассмотрены проблемные аспекты управления проектами, исследование посвящено вопросам оптимизации экипажа судна — команды проекта на базе концептуального метода.

В рамках предложенного подхода разработана модель формирования экипажа судна — проектной команды, которая позволяет выявить её состав, наиболее подходящий и устойчивый (сбалансированный) для управления конкретным проектом с точки зрения его компетентности, взаимодополняемости членов экипажа на судне (синергизма) и его психологических особенностей.

Использование системы управления проектам предусматривает создание специальной группы, экипажа (команды проекта), которая становится самостоятельным участником проекта и управляет процессом отправления и формирования экипажа судна в рамках проекта реализуемой продукции.

К сожалению, адекватной модели и метода, позволяющих одновременно проводить комплексную оптимизацию состава персонала, команды, экипажа, на сегодня не существует.

Применение детерминированных моделей и способов при решении нашей задачи неэффективно, поскольку является невозможность предусмотреть весь перечень работ при планировании команд проектов, экипажей судов.

**Ключевые слова:** экипаж судна, методы, экономические модели, управление ресурсами проектов, методология управления проектами.

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**Introduction.** Relevance of the research topic. The main reason for obtaining an unsatisfactory result in the implementation of most projects are errors in the formation of project teams. Thus, more than 70% of accidents in the fleet are due to «human factor» — a wide range of psychological and psychophysiological qualities of the person, which in some way affect the result of its operations.

Statistics of major ship accidents in recent decades show that not a single element of the shipping system is aloof from them. That is, ship crews, shipowners, charterers, consignees, classification societies and other organizations associated with maritime transportation form a «chain» of risk.

Deficiencies in identifying, managing and reducing risks in any part of this «chain» will undoubtedly appear in other places. Therefore, everyone involved in the maritime enterprise, from personnel on board the ship to the director of the shipping company and the management of the national maritime administration, is responsible for the safety of navigation and must take the necessary measures to minimize the risks of existing threats.

Despite such collective responsibility for ensuring the safety of navigation, the main reason for most incidents at sea is the human factor — a multi-valued term that describes the possibility of a person making erroneous or illogical decisions in specific situations. The correct combination of human abilities and machine capabilities significantly increases the efficiency of the «person —

machine» systems and determines the optimal use by a person of technical means for their intended purpose.

Unfortunately, an adequate model that would allow both quantitative and qualitative optimization of the project team, especially in conditions of incomplete determination of the volume of work, today does not exist. In addition, the existing methods do not take into account the specifics of the formation and conditions for the implementation of projects by such teams as the ship's crew, namely the increased level of danger, the inability to make replacements during the voyage, the international composition, the language barrier, etc. And taking into account the catastrophic consequences of the erroneous actions of almost every crew member, the proposed study can be considered relevant.

**Analysis of research and problem statement.** In particular, Busheyev S.D. and Morozov V.V. uses a trendy socionic approach today in the West. Avdeev V.V. offers another approach that also uses (but from another point of view) socionics. Belbin R.M. offers a role-playing approach [6, 7]. Which is most optimal for the formation of crews in crewing companies. The article is a retrospective cycle of research on personnel management and the formation of a project team — ship crew.

**The aim of the study** is to develop methodological approaches for the quantitative and qualitative composition of project teams, as a variable component of the project team on the example of crews of marine vessels.

**Statement of the main research material.** About project teams in project management. In accordance with the theory of project management, a project can be defined as a set of actions in which human, material and financial resources are organized to perform a unique set of work of a certain content in conditions of limited cost and time. The project has a life cycle within which the necessary changes take place in accordance with established quantitative and qualitative goals.

A project is an action in a limited amount of time and money, aimed at achieving a certain complex of end products (objectives of the project are predetermined his plan) in accordance with standards and requirements for the quality of work performed [1].

A project is a certain task with specific input data and expected results (goals) that determine the method and its solutions [2]. Various studies can be found and other definitions of the project [1], but they all point out the features common to all projects:

- clear goals that are achieved by simultaneously fulfilling a combination of technical, economic, financial, organizational and other requirements;
- internal and external relationships of operations, tasks and resources, which require coordination in the process of project implementation;
- clearly defined deadlines for the start and end of the project;
- limited resources;
- uniqueness of the conditions of implementation;
- the inevitability of various kinds of conflicts.

Project management, as a type of professional activity, includes planning, organization, monitoring and control of all aspects of the project in the process of continuous achievement of its goals [5]. The definition of «project management» also does not have the same interpretation in the countries that are the founders of project management:

- project management (PM) is the art of managing and coordinating human and material resources throughout the project life cycle by applying modern management methods and techniques to achieve specific results in the project in terms of scope and scope of work, cost of time, quality and satisfaction project participants [7];
- project management is the management task of completing the project on time, within the established budget and in accordance with technical specifications and requirements;
- project management — in accordance with P2M is the combination of science and art that are used in the professional areas of the project to create a project product that would satisfy the mission of the project by organizing a reliable project team that effectively combines technical and managerial methods creates the greatest value and demonstrates effective results of [4];
- project management — the unity of management tasks, organization, equipment and tools for the implementation of the project [6].

The project team is a specific organizational structure led by a leader, which is created for the duration of the project in order to effectively achieve its goals and objectives, and when it is completed, is dissolved.

A team in this case is defined as a group of people complementing and interchanging each other in the course of achieving their goals [7].

It is conditionally possible to define three types of teams (groups), classified by the content of their work, which are most often formed explicitly or implicitly in the practical activities of companies and enterprises:

- teams creating something new for the organization or performing work that has not previously been carried out;
- teams that deal with problems, goals and objectives in the enterprise through analysis, control and recommendations;
- teams that are not special, but are a constant part of organizational development and carry out the production process and perform repetitive work (processes) [8].

Two types of teams can be distinguished in the organizational structure of complex projects and in their management: a project team and a project management team [1].

The project team is the organizational structure created for the period of the project or one of the phases of its life cycle to carry out work on the project.

Project Management Team — the organizational structure of the project, including individuals who are directly involved in project management, including representatives of the project team. In some small projects, project management teams include almost all members of the project team [5; 8].

Significant impact on the results of the project have its stakeholders — individuals or organizations whose interests may be affected both positively and negatively in the course of or as a result of completion of the project. The project management team should identify all stakeholders of the project in order to accurately determine the requirements for the project.

In *Fig. 1*, shows the relationship between the Project Team, the Project Management Team and other project stakeholders.

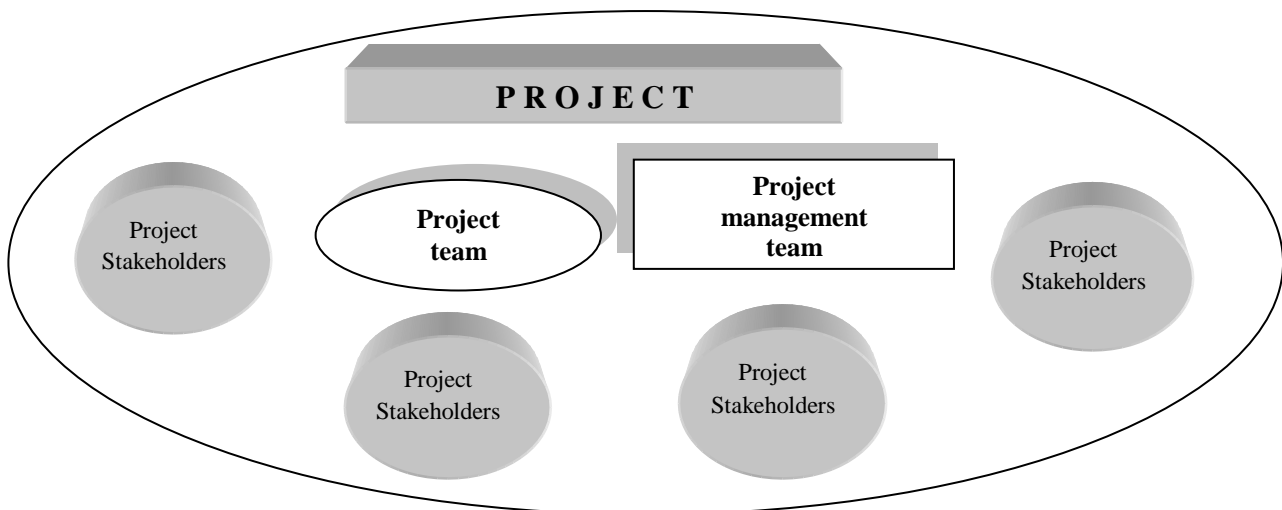


Fig. 1. Project Stakeholders

In most cases, the theory of project management pays attention to the formation of a project management team. Thus, the content and taxonomy of SNCB Version 4.1 are designed to provide a comprehensive professional assessment of the level of training of project managers [3]. At the same time, insufficient attention has been paid to the formation of the project team in the literature. Today, when forming project management teams, this problem is solved in conditions of incomplete information, often on an intuitive level.

The project management identified a number of key stages of the functioning of the project teams: the formation, creation, development, transformation and disbanding.

The formation and creation of a project team is a process of purposefully «building» a special way of people interacting in a group, which allows them to effectively realize their professional, intellectual and creative potential in accordance with strategic goals [7; 9].

The main task at the formation stage is to determine the quantitative and qualitative composition of the project team. Most of the models and methods for calculating the size of the project team are based on the condition of minimizing its number, which reduces operating costs for the implementation of the project.

In the theory of management, the Ringelmann effect is known — a formula that provides the ability to quantify and optimize the parameters of the project team. This formula has the form:

$$C = 100 - 7 \cdot (N - 1), \quad (1)$$

where  $C$  is the average individual contribution of a person to the work of the team, calculated as a percentage of the average productivity of a separately working person;

$N$  is the number of team members.

The formula shows that the productivity of each participant in the project decreases with an increase in the number of persons.

The productivity of the team as a whole initially grows, and then decreases, despite the fact that each person works with a 100% load. Just to increase the size of the project team, all the great efforts and time spent on coordination of actions within the team. If each member of the team must necessarily coordinate their actions with all other participants, the total number of unproductive contacts will be:

$$S = \frac{N \cdot (N - 1)}{2} \quad (2)$$

Moreover, the duration of a single communication between two persons does not exceed the value that can be calculated by the formula:

$$T = 480 \cdot \frac{(100 - C)}{100} \cdot S. \quad (3)$$

In this equation, 480 is the duration of an 8-hour working day in minutes, and  $(100 - C)$  is the fraction of the time that remains for communication if a person's labor productivity is  $C$ .

The graph of the calculation results is presented in Fig. 2, which shows that teams with a quantitative composition of more than 15 people are counterproductive, and the highest group productivity is achieved with eight members of the project team.

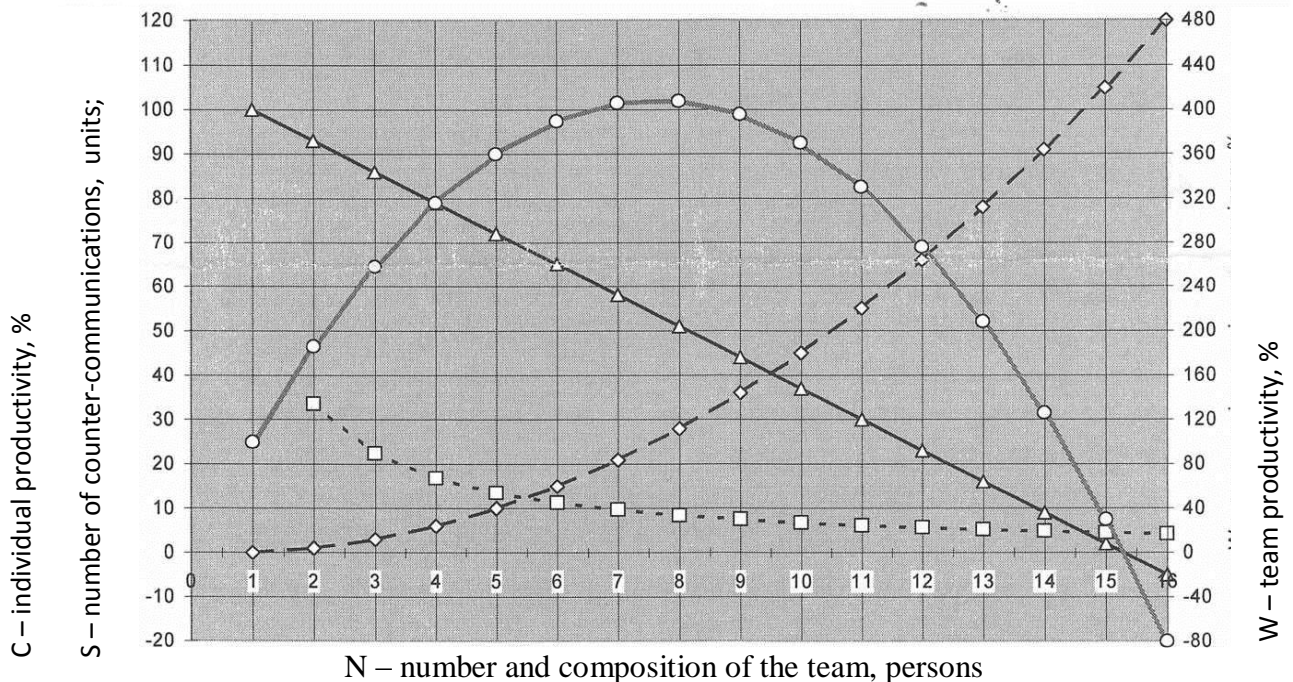


Fig. 2. Ringelmann effect for the team and related phenomena

However, even in this case, 50% of the time is spent on maintaining internal team communications, as the team is forced to maintain 28 oncoming communications. Therefore, eight people also cannot be considered the optimal solution for the quantitative optimization of the project team. Therefore, most authors are of the opinion that the optimal project team consists of  $7 \pm 2$  people [5; 7].

The crew of the ship as a project team

In recent years, the global maritime community has developed the view that the safety of maritime operations can be significantly improved when ships, ports and other enterprises serving the process of transporting goods and passengers form such production and social conditions that are referred to as the «safety culture». The problem lies in the development of the system of the international division of labor, which has led the Navy or shipping to create an increasing number of international crews. A different level of training, combined with a language barrier, psychophysical features, specific national customs and traditions dramatically reduce the manageability of this team, especially in extreme situations. Crew selection is carried out by crewing companies, which far from always prioritize the quality of their work, that is, the total level of training and crew coordination [18].

Today, experts in the field of project management and the marine industry do not have a clear answer to the question: can be considered a project — a vessel's voyage. Therefore, we analyze several definitions. Ship's voyage — the length of the working period of a marine ship from the moment it is loaded for loading at the port of departure until the end of unloading at the port of destination or until the same moment when it is returned to the port of departure [5; 13; 17].

Based on this definition, a vessel's voyage can be considered a project for the following reasons.

Firstly, any project is always aimed at achieving a specific goal, in our case, the ship's voyage is aimed at transporting goods, passengers unharmed from port A to port B.

Secondly, the main part of the project is directed actions that must be carried out and coordinated by someone, in our case, the ship's voyage is coordinated by the management of the shipping company (shipowner, cargoowner, supervisor) through the appointed person on the ship — the master/captain who performs the mission, and controls the crew during the voyage.

Thirdly, the project is always limited in time. The duration of the vessel's voyage can be from 1 (one) day to several months, and in some cases even six months, however, the life cycle of the project is strictly indicated by the voyage assignment.

Fourth, there are no identical projects, just like there are no identical ship's voyage, each voyage will have its own peculiarities and differences, in particular: grade, type of transported cargo, different weather conditions and navigation areas, detentions, arrests, accidents, repairs, crew rotation vessel in ports, etc. Thus, a voyage, like any project, is unique and inimitable. Therefore, each ship's voyage can be considered as a separate project.

Crew of a ship as a project team? There is still no consensus among experts in the field of project management and merchant shipping in answering the question: is it possible to consider the crew of the vessel as a project team or is it a temporary organizational structure that implements some processes. Let's try to put all the points on (i) in this question.

Crew is a group of people united in an ordered hierarchical structure in order to carry out joint work or joint tasks on a moving vehicle. It is worth noting that the word «crew» comes from the practice of navigation, where people performing various functions on ships were united in a team to jointly manage the ship, namely the personnel of vehicles, offshore and merchant vessel is called the «team» (headed by the master (captain)) [9; 10].

Ship crews unite people in a hierarchical structure, in which one can distinguish a manager — the master (captain) of the vessel, his assistants: chief officer, chief engineer (deputies), junior commanders and performers — sailors and motorman's, and other. This definition confirms that the ship's crew contains the characteristics of the project team:

- unity of purpose;
- team work;
- consistency of interests;

- autonomy of activity;
- collective and mutual responsibility for the results of joint activities;
- specialization and complementarity of roles;
- team sustainability.

Thus, crews of marine vessels fully fall under the above definitions of the project team, which allows us to prove the possibility of applying the methodology of project-oriented management of the team in the formation of ship crews [5; 9; 16].

Such an approach has led to the emergence of a number of problems that shipowners and officers and rank-and-file crews of marine vessels face every day, namely:

- shortcomings in the system of training, professional development and certification of seafarers in accordance with the requirements of international conventions and resolutions of the International Maritime Organization and the International Labor Organization: SOLAS 1974, the STCW-78/95, CONMARKON 2006 [5; 14];

- in effective system of monitoring the health of seafarers — medical commissions are increasingly turning into a formality, which leads to serious consequences during the voyage;

- an international crew is formed without any regard to national and ethnic traditions that give rise to conflict situations, the language barrier often prevents well-coordinated work, especially in emergency situations;

- in case of violation by the shipowner of the terms of the employment contract, the sailor remains socially and legally unprotected.

The minimum crew is determined by Rule 13 of chapter V of the International Convention for the Safety of Life at Sea (SOLAS-74), according to which a vessel engaged in international voyages should be equipped with safe crew in terms of protecting human life at sea and have a certificate of minimum safe crew issued by the government of the state, under the flag of which the ship has the right to voyage [14].

The globalization processes of recent decades have led to the development of an international division of labor system, as a result of which ship owning companies have concentrated in economically developed countries, and mainly citizens of the Third World countries become sailors.

Large shipping corporations «Maersk», «CMA CGM», «MSC», «NYK Line» form a single structure which includes: a shipping company, supervisor, marine brokers, a forwarding company, a crewing company, an agent company, ship chandlers for the supply of a vessel, etc. [5; 11; 12; 19]. Such corporations independently solve the problem of selecting qualified specialists from all over the world to their vessels.

Smaller shipping companies that cannot afford the above approach, practice a less costly approach to crew formation on board a offshore ship's. Such an approach is as follows: the shipowner enters into an agreement with one or a number of crewing companies to recruit the crew of the offshore vessel. Practice shows that as a result of applying this approach to manning the ship's crew, the ship owner's expenses are reduced, but the process of reducing the competence and cohesion of the ship's crew also occurs [15].

Despite the fact that, according to international law, crewing companies are responsible to the ship owner for the «quality» of work performed, in practice their function is limited to formal verification of all necessary diplomas, documents and certificates presented by sailors [17].

In the implementation of merchant shipping projects, one cannot ignore the opinions of other interested parties to the project: state and international control bodies, classification societies, cargo owners, supervisor, port authorities, administrations, etc. In general, the structure of interaction of various stakeholders of shipping projects is presented below in *Fig. 3*.

Thus, it is necessary to ensure that the crewing company has entered into an employment contract with the sailor on its own behalf. And there are such companies — these are, as a rule, divisions of large shipowners / operators, examples of such were given above, but they are rare [18].

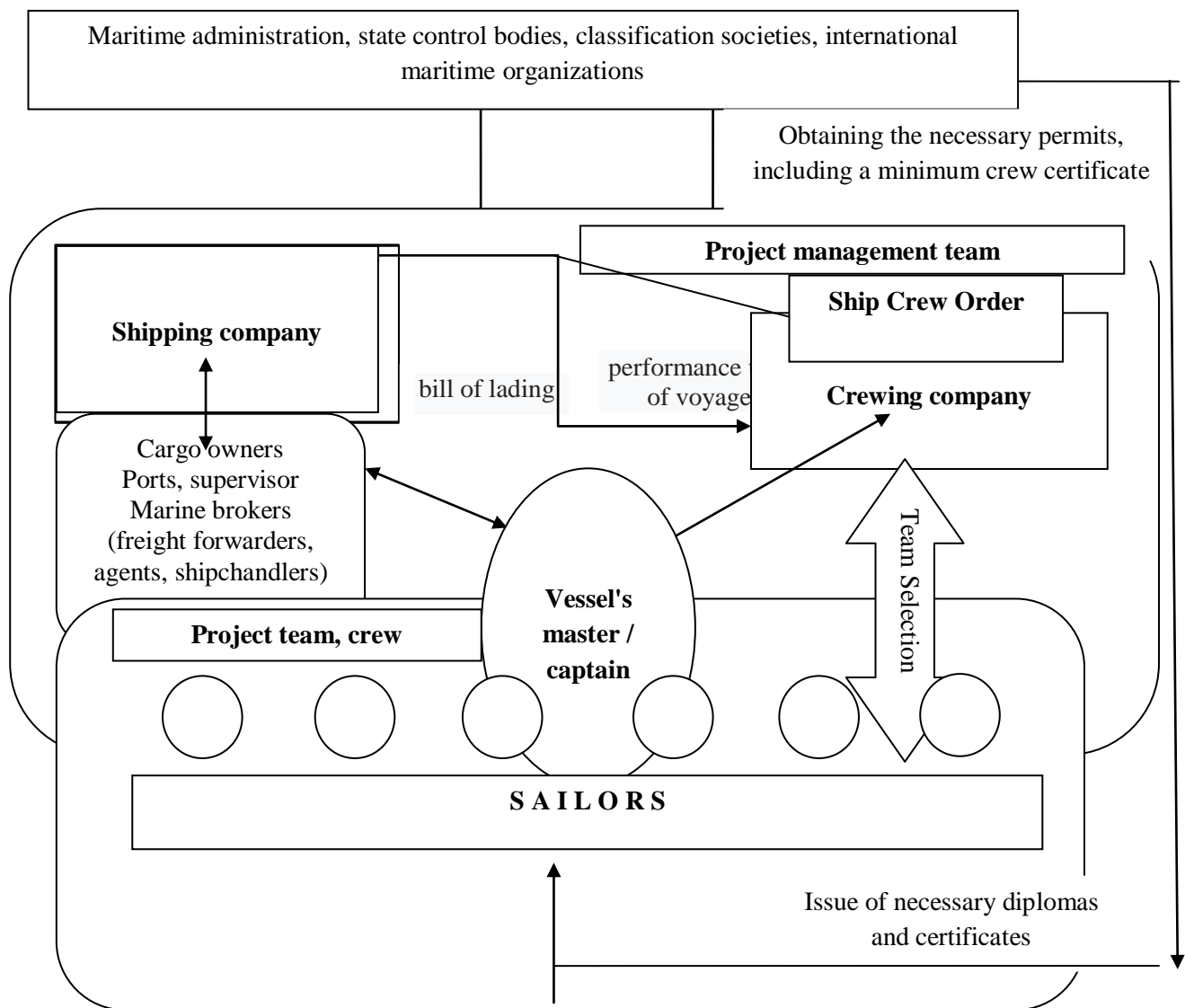


Fig. 3. An example of the composition of the project management team in the Merchant Shipping

**Conclusions.** In this work, the authors analyzed existing international and national regulatory documents, definitions governing the project team, project management team, ship's crew.

Despite the quite correct conclusion that the minimum crew of the vessel shall be based on the conditions for ensuring the safe operation of all ship systems and mechanisms.

Analysis of project management theory allowed to prove the possibility of the project approach and a common methodology for project management to solve the problem of forming the optimal crew of a vessel depending on its type, technical condition, age, features of planned voyages, etc.

One of the basic concepts in project management is the concept of «team» in the project, and in project management — the human resources management of the project, which includes the processes of planning, forming and creating a team, its development and support activities, transformation or disbandment of the team. Despite the great attention paid to the formation of project management teams, existing studies do not take into account the specifics and features in the conditions of work of the ship's crew.

It was further developed: the terminological base of project management by more clearly defining the concepts of «project team» and «project management team», organization of crewing company recruitment system to work on ships.

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