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Application of Fuzzy Extended AHP methodology for selection of ideal ship for oceangoing watchkeeping officers

Özkan Uğurlu*

Karadeniz Technical University, Department of Maritime Transportation and Management Engineering, Sürmene, Trabzon, Turkey

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ABSTRACT

One of the primary concerns of the modern-day maritime transportation is the concept of qualified seafarer. Among these seafarers, watchkeeping officers have particular importance. Because wrong decisions made by the watchkeeping officers regarding management of the ship might have negative impact on the ship, crew and its surroundings. Improving qualification standards of watchkeeping officers is possible by ensuring professional continuity. Wrong ship choices of oceangoing watchkeeping officer candidates might also have negative impact on their professional continuity. To that end, this study ranked the ideal types of ship for oceangoing watchkeeping officer candidates. Fuzzy Extended Analytic Hierarchy Process (FEAHP) method, which is one of the multi-criteria decision making methods used frequently, is used for determining the order of ideal ship types for oceangoing watchkeeping officers. The study concluded that the order of ideal ship types for oceangoing watchkeeping officers is: bulk carrier & general cargo ships, tankers, container ships and RoRo&RoPax ships.

Relevance to industry: This study focuses on the concept of ideal ship type selection for oceangoing watchkeeping officer candidates on merchant fleet. Oceangoing watchkeeping officer candidates can easily determine the order of ship type ideal for them by using this method and taking into consideration the available criteria.

1. Introduction

Seafaring profession is a high-risk job involving several inherent dangers (Hansen, 1996) and the concept of safety at sea is a crucial matter which concerns seafarers, ship owners, flag states and other authorities (ILO, 1996). One of the basic tasks in shipping is to ensure safe navigation of vessels (Pietrzykowski and Uriasz, 2009). In maritime transportation, teamwork is required for ensuring safe navigation of the ship. The watchkeeping officers are one of the most important members of this team. The watchkeeping officers are subject to training liabilities for serving as an officer on board. Standards of these trainings are regulated by the STCW (Standards of Training, Certification and Watchkeeping) convention. As per this convention, watchkeeping officer candidates should successfully complete A-II/1 training of the STCW convention for being qualified to work on merchant ships. After completing this training, the watchkeeping officers can freely work on merchant ships, without any restrictions of ship type, but each type of ship offers advantages and disadvantages to these watchkeeping officers. Sometimes, the watchkeeping officer candidates have difficulty in choosing the type of ship ideal for them after completing their training. Generally, their preferences are not fit to the purpose. A wrong choice made by the watching keeping officers is one of the significant issues having impact of their professional lives. The wrong choice of ship can lower the quality of service provided by a watchkeeping officer, and may sometimes cause them to end their seafaring life at an earlier time than initially planned.

Watchkeeping officer candidates work on merchant ships after completing their trainings. Merchant ships are classified according to type of cargo onboard or type of service. Cargo operations, cargo equipment and deck equipment of each type of ship are different. This study examined merchant ships in 7 main groups. These are;

- Bulk carrier & General cargo,
- Tanker,
- Container
- Ro/Ro (Roll-on/roll-off vessels designed for transport of wheeled cargo.) & RoPax (Ro-Ro vessels designed for cargo and passengers),

* Corresponding author. Tel.: +90 5058179839.
E-mail address: ougurlu@ktu.edu.tr.

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- Cruise ships
- Tugs
- Other ships (specialized cargo ships, offshore vessels, service ships).

The review on 2011 merchant shipping data confirmed that total number ships on the world's merchant fleet is 79,074.26631 (33.7%) of these ships are bulk carriers and general cargo ships whereas 14,068 (17.8%) are tankers, 4974 (6.3%) are containerships, 2566 (3.2%) are RoRo and RoPax ships, 1575 are (1.9%) are cruise ships (Equasis, 2012; ISL, 2012). Cruise ships are disregarded from the ranking of preferences in this study because; bearing in mind the world merchant fleets, the number of cruise ships is insignificant in comparison to the other ship types. This study focuses on 4 types of ship generally preferred by watchkeeping officer candidates. These are bulk carrier & general cargo ships, tanker, container and ro-ro&ropax ships.

There are past and present problems closely related to the qualifications and number of seafarers. As a result of economical and technological developments achieved in the globalizing world, countries' demand of raw materials, processed products and products such as electronics and petroleum has increased and, in parallel with this increase, the number of ships has also increased. Review of last five-year merchant shipping data revealed that the 5 year growth ratio of ship fleets is approximately 10% (Equasis, 2008, 2012). The increased number of ships in the world merchant fleets caused certain problems suffered by shipping companies while hiring seafarers for their ships. To that end, the concept of manpower has become a focus of interest in the maritime transportation sector for a very long time (Obando-Rojas, 1999).

In their study on workforce of seafarers, (Lin et al., 2001) estimated the annual ocean deck officer demand in Taiwan by using the grey theory model (Deng, 1988). The researchers concluded that there is an imbalance between the supply and demand of officers in Taiwan, and that this imbalance is worsening with each passing year. In addition, they found that most deck officers graduating from marine technology and marine universities in Taiwan are unwilling to work at sea, and thus provided several recommendations to increase the occupational continuity of watchkeeping officers at sea.

Glen's (2008) study on seafarers offered estimates of the number of seafarers working on world merchant fleets. The study confirmed that there are 1.3 million seafarers at best and 440,000 of these are deck officers, engineering officers, other officers and trainees. Besides, the study set forth the age profile of deck and engineering officers on the basis of data provided by UK Maritime and Coastguard Agency. The study revealed that there are significant differences between the age profile of officers working in wealthy, developed countries and developing, transition countries.

A study in 2004 (Leggate, 2004) discussed whether or not the number of seafarer will be reduced in the future. For this purpose, the study compared the current number of seafarers in classic seafaring countries with the number of seafarers in OECD (Organization for Economic Cooperation and Development) countries. The study determined that the number of seafarers in seafaring countries has been drastically decreasing whereas the number of seafarers in OECD countries has been increasing. The study underlined that the data about number of world seafarers is limited and thus the number of seafarers all around the world should be confirmed for determining whether or not there is a shortage of seafarers. Besides, the study highlighted that policies implemented by countries such as Denmark for the purpose of increasing the number of seafarers should set an example for seafaring countries trying the prevent the decrease in the number of seafarers.

Of course, the demand for seafarers is of major importance for determining a potential shortage. Demand predictions have been provided by the BIMCO/ISF (Baltic and International Maritime Council/International Shipping Federation) based on the expected increases in the world fleet, recruitment and wastage levels, age structures, and manning scales (Leggate, 2004). In light of the studies conducted by Leggate (2004) and Glen (2008), it is possible to observe that the demand for officers increased by 56,000 between 2000 and 2005, while ratings decreased by 13,000 during the same period. Despite an increase of 15.4% in the number of officers in marine transportation during this five year period, there was still a deficit of 10,000 officers by 2005. The total demand for seafarers in 2010 was calculated as 1.384 million, consisting of 637,000 officers and 747,000 ratings. The worldwide supply of these two groups was estimated at 624,000 and 747,000, respectively, signalling an apparent demand for officers and an excess supply of ratings (BIMCO/ISF, 2010). Based on the above data, it is apparent that maritime trade fleets have, in the past and at present, always suffered from a lack of officers. Although the number of officers increased from 207,000 to 624,000 between 2000 and 2010, the current number of officers is still unable to meet the demand. In addition, not all seafarers work at sea because many choose to end their seafaring life earlier than expected due to difficult working conditions.

The working conditions of seafarers are important elements having impact on the professional life. In literature, there are several studies about the working conditions of seafarers (Baulk and Reyner, 2002; Bloor et al., 2004; Louie and Doolen, 2007; McNamara et al., 2000; Miller et al., 2011; Mitroussi, 2008; Pik, 2007; Robert, 2007; Andresen et al., 2007; Leung et al., 2006; Orosa et al., 2011; Uğurlu et al., 2012). These studies discuss problems of seafarers, inconvenient working conditions, inconvenient environmental conditions, work and rest hours, insufficient social opportunities, fatigue and the relationship between fatigue and marine accidents. IMO (International Maritime Organisation) is aware of the problems experienced by the seafarers. To that end, at the 2010 Manila Meeting, IMO advised the shipping companies, IMO-member states to make the seafaring profession attractive for new recruits, trainees, female officers and other seafarers of this sector. Some of these recommendations included (IMO, 2011):

- improving the training standards for seafarers
- ensuring sufficient and proper living conditions for seafarers
- offering convenient working conditions
- improving social facilities onboard
- offering equal opportunities to female crew members at sea
- providing moral and material support to young officers

Seafaring is a difficult and tough profession. In this line of work, watchkeeping officers have duties such as ensuring safety of the ship, crew and cargo, controlling the ship, cargo operations, preparing the ship for cargo, preparing the ship for navigation, preparations before inspections, dry docking, scheduled maintenance, drills, tests and controls, providing provisions, and supplying bunker fuel/water. While performing these duties, watchkeeping officers face inconvenient situations such as rough seas, wind, storm, inconvenient working conditions, insufficient working and rest hours, heavy traffic, hiring minimum crew for ships, oppression from the company and charterer, frequent inspections and risk of life safety (Bloor et al., 2004; Phillips, 2000; Arslan and Er, 2008; McNamara et al., 2000; Jones et al., 2005; Uğurlu et al., 2012). These professional obstacles shorten the seafaring life. Professional and qualified seafarer concept will be possible by ensuring professional continuity of seafarers. Each type of ship has its own advantages and disadvantages. In order to retain officers in the maritime sector,