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Effectiveness of Use of Ecdis on Navigation Safety: A Qualitative Study in Kl. Sultan Hasanuddin

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Abstract

Maritime is a dynamic, ever-evolving world that demands innovative technology to improve shipping safety. The maritime world is facing significant changes rapidly, especially in the development and implementation of navigation technology. ECDIS or "Electronic Chart Display and Information System" is a tool whose function and system can provide information about navigation. The type of research carried out is descriptive qualitative research. This method is used to find knowledge about the research object. The type of research used is field research (field research), that is, researchers go directly into the field to search for and collect data. research location in KL. Sultan Hasanuddin. Determining the subjects of this research was purposive, and the data source chosen was the crew of the Kl ship. Sultan Hasanuddin PIP Makassar. The research results significantly increase shipping safety because digital maps have been prepared and reduced the workload of ship crews in making shipping routes. It is recommended that ships routinely update software and digital maps to ensure system accuracy and function, as well as provide training to ship crews every time there is a feature update on ECDIS

Keywords: *ECDIS,Shipping Safety, Effectiveness of Use of Ecdis, Technology*

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1. Introduction

Maritime is a dynamic, ever-evolving world that demands innovative technology to improve shipping safety. The maritime world is facing significant changes rapidly, especially in the development and implementation of navigation technology. One very vital technology integration is a digital-based navigation system. Electronic navigation systems have been at the forefront of changes in ship navigation systems. The navigation system is an important aspect of shipping because it is related to determining the position, route and course of the ship, as well as preventing collisions, grounding or other accidents. With technological developments, the navigation system has modernized from initially using paper maps to electronic maps. One of the electronic navigation tools that is currently widely used isElectronic Chart Display and Information System (ECDIS). Along with advances in computer technology and information systems in the shipping sector, the Electronic Chart Display and Information System (ECDIS) has been introduced as a new way of navigating at sea which can help improve navigation safety (Rudiana, 2021).

Since its first introduction in the 1990s, ECDIS has changed the paradigm of ship navigation by replacing the use of conventional paper charts. ECDIS provides an interactive digital map that allows sailors to monitor the ship's position in real time real time,plan routes, and access other important information. However, despite its rapid development, the question of the extent to which ECDIS can make a real contribution to shipping safety, especially on training vessels, remains a crucial research focus. According to (Kendek Meti et al., 2017) ECDIS plays an important role in supporting navigation security and shipping security because ECDIS users are able to make shipping plans and are able to monitor the depths of the sea.

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ECDIS is a navigation technology that replaces paper nautical charts with digital displays, offering various advantages such as higher accuracy, real-time data updates, and integration with other navigation systems. In the midst of the rapid development of maritime technology, the use of technology is an effective solution in improving maritime security (Heppi, 2023). ECDIS implementation is crucial for reducing the risk of maritime accidents caused by human error or inaccurate conventional maps. This study tries to reveal the extent of the effectiveness of ECDIS in ensuring shipping safety, especially in the operational context of the Sultan Hasanuddin Ship.

The selection of the Sultan Hasanuddin Ship as the research object was based on its reputation as one of the training ships of the Makassar Maritime Science Polytechnic. This ship is often used for various important missions, including logistics transportation and as a place for students to get to know the world of shipping, so it demands a high level of safety. Additionally, the implementation of ECDIS on these vessels offers an opportunity to evaluate the effectiveness of this technology in real operational conditions. The importance of maintaining shipping safety in the context of technological evolution, and training ships play a major role in forming a generation of competent and reliable sailors. Therefore, the use of ECDIS on training vessels raises critical questions regarding the effectiveness and efficiency of this technology in supporting seafarer learning and safety.

a. ECDIS (Electronic Chart Display and Information System)

ECDIS or “Electronic Chart Display and Information System” is a tool whose function and system can provide information about navigation (Amirullah et al., 2022). Back up existing equipment, so that it can be accepted and considered to meet the requirements determined according to rules V/19 & V/27 of the 1974 SOLAS convention & its amendments (Amirullah et al., 2022), therefore this ECDIS equipment must meet the performance standard criteria (Performance Standards) from IMO according to Chapter V Solas 1974. Actually, there is another equipment with the same function called ECS (Electronic Chart System) which can also be used for navigation but does not meet the requirements required by IMO, although it meets ISO requirements. ECDIS is a new technology of modern shipping navigation which aims to ensure navigation safety, and improve work efficiency. Ship collision avoidance system is one of the important research subjects in modern navigation technology, in preventing ship collision accidents, to ensure safety, so ship navigation plays a vital role (He Jincan, Feng Maoyan, 2015).

Another piece of equipment used in conjunction with ECDIS is ENC (Electronic Navigational Charts). This ENC is an database which is standardised Both the content, structure and format are adapted for use with ECDIS, but must have approval from the IHO (International Hydrographic Office). Likewise with RCDS (Raster Chart Display System), whose function is almost the same as ECDIS and has even been approved by IMO and IHO, but the only difference is that ECDIS is equipped with an alarm that is directly connected to the map used if the position or course used is incorrect. Meanwhile, RCDS or RNC is equipped with map paper (Charts Paper)which ECDIS does not have, where ECDIS only uses a display almost the same as a map. The specifications and uses of the two types are almost the same.

b. Shipping Safety

Shipping safety is very important and occupies a central position in all aspects of the shipping world. Aspects inherent in shipping safety include characteristics of attitudes, values and activities regarding the importance of fulfilling safety and security requirements relating to transportation in waters and ports. (Hendrawan, 2019) PERMENHUB Number 20 of 2015 regulates shipping safety as a series of actions, procedures and principles designed to protect human life, property and the environment while at sea. It covers all safety aspects related to ship operations, including navigation, accident prevention, fire control, evacuation procedures, environmental protection, and risk management. A strong safety culture on ships and throughout the maritime industry is a key factor in preventing accidents and ensuring safe operations. This involves effective communication, ongoing training, and a commitment to

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prioritizing safety in every aspect of vessel operations. International organizations such as the International Maritime Organization (IMO) set safety standards that all member countries must comply with. These regulations cover various aspects of shipping safety, from ship equipment and equipment requirements to operational procedures and crew training.

2. Methods

The type of research carried out is descriptive qualitative research. This method is used to find knowledge about the research object Sugiyono (2017). As for The type of research used is field research (field research),that is, researchers go directly into the field to search for and collect data. This research will be carried out from February to November 2024, with the research location in KL. Sultan Hasanuddin. Determining the subjects of this research was purposive, and the data source chosen was the crew of the KL ship. Sultan Hasanuddin PIP Makassar.

The type of research applied is field research. In field research, researchers are directly involved in the environment or research location to collect data directly from the source. This research aims to obtain authentic and relevant data by going directly to the scene. This research is planned to take place from February to November 2024. The research location was set at KL. Sultan Hasanuddin, which is the ship that is the focus of the study. The determination of the research subject was carried out purposively, meaning that the researcher selected data sources that were considered the most relevant and appropriate for the research objectives. In this case, the crew members of KL. Sultan Hasanuddin PIP Makassar became the main source of data to be collected and analyzed. This purposive approach helps researchers to focus on individuals who have knowledge or experience relevant to the research topic.

3. Results And Discussion

a. Effectiveness of Using ECDIS

The Sultan Hasanuddin PIP Makassar ship has been equipped with features Electronic Chart Display and Information System (ECDIS)this technology has been used since 2023. The use of the Electronic Chart Display and Information System (ECDIS) on ships offers various significant advantages that have a direct impact on safety and operational efficiency. First, ECDIS provides digital map displays that are much more accurate and detailed than conventional paper maps, allowing for more precise navigation. This system also allows real-time data updates, including information regarding weather conditions, danger warnings and necessary route changes, thereby reducing the risk of accidents at sea. In addition, ECDIS is integrated with other navigation systems such as the Automatic Identification System (AIS) and radar, providing wider visibility and continuous monitoring of the position of the ship and other vessels in the vicinity. The use of ECDIS also reduces the workload of ship crews by simplifying the navigation and route planning process, allowing them to focus more on other critical aspects of ship operations. Overall, ECDIS implementation increases efficiency, safety and compliance with international regulations in the world of shipping. implementation of the new standard in ECDIS is designed to significantly reduce maritime navigation risks. ECDIS is expected to prevent incidents and improve shipping safety (Ojode & Hogwei, 2020).

The main advantages of useElectronic Chart Display and Information System (ECDIS) compared to traditional methods is increased accuracy and efficiency in navigation. By improving operational efficiency and ensuring compliance with international regulations, ECDIS also helps in saving operational and fuel costs. Overall, ECDIS offers significant improvements in safety, efficiency, and navigation accuracy compared to traditional methods. ECDIS is very helpful in saving fuel when sailing with a bowPassage Planwith detailed route planning for the ship's journey from one point to another. This process involves analyzing and selecting the optimal route by considering various factors, including weather conditions, ocean currents, water depth, and potential navigation hazards. Passage plans usually start with selecting a basic route based on nautical charts and available navigation information, then complemented by determining waypoints, distance between waypoints, and estimated travel

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time. During planning, the crew must also consider factors such as shipping zones, shipping restrictions, and the need to avoid dangerous areas (Sofia, 2019).

Once the basic route is established, the passage plan is then evaluated and adjusted to optimize travel safety and efficiency. This process involves trip simulation, fuel calculations, and preparing backup plans in case of changing conditions or an emergency. A well-thought-out passage plan not only guides the crew in proper navigation, but also ensures compliance with applicable international regulations and safety standards. Implementation of this plan, both manually and with the help of technology such as the Electronic Chart Display and Information System (ECDIS), allows ships to travel safely, efficiently and in accordance with established regulations (Burak, 2017),.

b. The Role of ECDIS in Shipping Safety

The use of the Electronic Chart Display and Information System (ECDIS) significantly improves navigation safety by providing various sophisticated and accurate navigation features. ECDIS replaces traditional paper nautical charts with easily updated digital charts, reducing the risk of navigation errors that often occur due to outdated or inaccurate charts. The system offers a real-time view of the ship's position, weather conditions and potential hazards, allowing the crew to make faster and more informed decisions. The integration of ECDIS with other technologies such as the Automatic Identification System (AIS) and radar increases the visibility of the situation around the ship, providing early warning of danger or other ships nearby. Additionally, automation features in ECDIS, such as route planning and navigation alarms, help in monitoring compliance with the itinerary and reduce the crew's manual workload (Wright, 2019).

With all these features, ECDIS plays an important role in reducing the risk of accidents, ensuring safer navigation and improving overall performance shipping security. By using ECDIS we can find out the Closest Point of Approach (CPA) and Time to the Closest Point of Approach (TCPA) when a ship passes another ship, we can take advantage of various features available in the Electronic Chart Display and Information System (ECDIS) and navigation systems other. CPA is the closest point between two ships on their journey, while TCPA is the time remaining until the ship reaches that closest point. ECDIS, together with the Automatic Identification System (AIS), allows accurate monitoring and analysis of the position of other vessels in the vicinity. With ECDIS, information about CPA and TCPA can be accessed in real-time through integrated data from AIS and radar. The system displays the movement path of other vessels and automatically calculates CPA and TCPA, providing an early warning if there is a potential risk or too close a distance. This allows the crew to take appropriate precautions, such as changing route or speed, to avoid collisions and ensure safe navigation.

Today, the Electronic Chart Display and Information System (ECDIS) is a very useful navigation technology and meets most of the needs of modern shipping. With its ability to provide accurate and up-to-date digital maps, as well as integration with navigation systems such as the Automatic Identification System (AIS) and radar, ECDIS is very effective in detecting and managing potential dangers at sea. Features such as automatic alerts, route analysis and real-time updates make it an essential tool in improving shipping safety and efficiency. Although this technology continues to develop, ECDIS is currently quite comprehensive and adequate, and does not require additional new technology for its main functions. With this system, ships can rely on one integrated tool for various aspects of navigation, ensuring that navigation occurs safely and efficiently without the need for additional complex solutions**.**

4. Conclusion

This research has evaluated the effectiveness of using the Electronic Chart Display and Information System (ECDIS) in the context of shipping safety on the Sultan Hasanuddin Ship. Based on data obtained through interviews with ship crew and analysis of operational documents, it can be concluded that ECDIS significantly improves shipping safety in several main ways, namely: 1.First, ECDIS provides more accurate and up-to-date digital maps, which

minimizes the risk of navigation errors that often occur with conventional paper maps. Automatic warning features and real-time updates on weather conditions and potential hazards also play an important role in mitigating the risk of accidents. The integration of ECDIS with other navigation systems such as the Automatic Identification System (AIS) and radar enables broader monitoring and faster response to emergency situations, increasing visibility and control over the situation around the ship. 2.Second, the use of ECDIS reduces the workload of ship crews by simplifying the route planning and navigation process. This allows them to focus on other critical aspects of ship operations, as well as improving overall efficiency.

Overall, this research shows that ECDIS has met expectations in terms of improving shipping safety in KL. Sultan Hasanuddin PIP Makassar, and this system has proven to be an effective and important navigation tool in the context of modern shipping. Although this technology continues to develop, current implementations are sufficient to ensure safe and efficient shipping. In using Electronic Chart Display and Information System(ECDIS), it is recommended that ships regularly update software and digital charts to ensure system accuracy and functionality. Continuous training of crew members in the use of ECDIS is essential to maximize its benefits and reduce the possibility of operational errors. In addition, the integration of ECDIS with other navigation technologies, such as Automatic Identification System (AIS) and radar, must be optimized to expand the monitoring range and improve response to emergency situations. It is also important to carry out regular evaluations and simulations to deal with various hazard scenarios and emergency situations in a controlled environment. By implementing these suggestions, ECDIS can be used effectively to improve safety, efficiency and compliance in shipping operations.

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