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DESIGN OF PROTOTYPE OF LEARNING INFORMATION SYSTEM OF WEB-BASED MODERN SHIP NAVIGATION TOOLS

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ABSTRACT

This paper aims to provide an overview of the process of learning navigational tools on board by making a prototype design of a website-based learning information system for learning modern ship navigation tools. This type of research is descriptive qualitative. Data collection techniques in this writing using observation, interviews, literature studies, and documentation. Interviews were conducted in-depth and structured with the captains of the ships who are also professional lecturers in the Maritime Higher Education Nautics study program. The results include the design of a prototype menu consisting of a sub-menu on principles and navigation devices as well as a sub-menu on the advantages and disadvantages of each navigation device, both modern and conventional navigation devices. The prototype can be implemented on the subject and consists of various navigation devices, functions and uses of modern navigation devices; principles and mechanisms of modern navigation devices; and the strengths and weaknesses of modern navigation tools. The conclusion is that designing a prototype learning information system for modern web-based navigation devices for determining ship locations has a communicative design. The design of the Information System prototype for learning Modern Navigation tools is capable of creating an information system for learning website-based modern navigation tools

***Keywords** : Prototype, Design, Modern navigation tools, Learning Information System, Website.*

ABSTRAK

Tujuan dari penulisan ini adalah untuk memberikan gambaran proses pembelajaran alat navigasi di atas kapal dengan cara membuat desain prototype sistem informasi pembelajaran alat navigasi modern kapal berbasis website. jenis Penelitian ini adalah deskriptif kualitatif. Teknik pengumpulan data dalam penulisan ini menggunakan observasi, interview, studi literatur dan dokumentasi. Interview dilaksanakan secara mendalam dan terstruktur dengan para nakhoda kapal yang juga merupakan dosen profesi di prodi Nautika Perguruan Tinggi Maritim. Hasilnya antara lain Perancangan menu prototipe terdiri dari sub menu tentang prinsip dan perangkat navigasi serta sub menu tentang kelebihan dan kekurangan masing-masing perangkat navigasi baik perangkat navigasi modern maupun konvensional. . Prototipe dapat diimplementasikan pada subjek dan terdiri dari berbagai perangkat navigasi, fungsi dan kegunaan perangkat navigasi modern; prinsip dan mekanisme perangkat navigasi modern; dan kekuatan dan kelemahan alat navigasi modern Kesimpulannya adalah Rancangan prototipe sistem informasi pembelajaran perangkat navigasi modern berbasis web untuk menentukan lokasi kapal memiliki desain yang komunikatif. Desain prototype Sistem Informasi pembelajaran alat Navigasi Modern mampu menciptakan sistem informasi untuk pembelajaran alat navigasi modern berbasis website.

Kata kunci : Prototype, Desain, Alat navigasi modern, Sistem Informasi Pembelajaran, Website

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1. Introduction

The development of communication and information technology, ICT, known as the 4.0 Industrial Revolution, makes fundamental changes in all society's life aspects, including the educational world. The ICT challenges in education deal with the implementation of various potentials to close the digital gaps, foster characters, and transform digital education. The 4.0 industrial revolution encourages Higher Maritime Education to adjust the educational learning system. One of them deals with learning information systems of web-based modern navigation tools to determine the ship's position.

The impact of storms and bad weather is one of the factors causing a decrease in ship operational efficiency. Assessment of conditions during navigation is an important part of ship handling decision making(Antao & Soares, 2008) have stated that 75% to 96% of ship accident victims at sea come from some kind of human error, where human error is still one of the main causes of marine accidents (Soares & Teixeira, 2001). Therefore, whenever navigators can be assisted by monitoring and decision support systems, contributions are made to safety.

Navigation is part of the activity of driving a ship from one place to another. Knowledge of navigational tools is very important to assist a sailor in driving his ship (Penchansky & Thomas, 1981). Early development of onboard systems to assist navigation in inclement weather was primarily concerned with the structural integrity and safety of the equipment. (Lindemann, 2005) developed one such system by measuring the acceleration in six degrees of freedom and the stress in a cross-section. (Hoffman, 1980) considered a ship-to-shore communication system along with charts for routing in heavy weather. The modernization of navigation tools in this developing era facilitates the accuracy of a ship's position on the Earth's surface. This matter leads to economic aspect realizations. The navigation system on the sea covers some primary activities, such as Determining the position of a ship on the Earth's surface, Learning and determining the routes to cover by the ship safely, quickly, securely, and efficiently to reach the destination, Determining the courses between the recognized departing point and arrival point and the distance between the spots, Determining the arrival point based on the unknown starting or departing point

Most modern navigation tools on ships are electronic devices that rely on satellites. However, modern navigation tools may also include conventional or non-electronic devices on certain occasions. The electronic modern navigation tools on ships are useful methods to estimate the ship's position with electronic devices, such as radio navigation, radar, and satellite (Penchansky & Thomas, 1981).

Navigation may be implemented with dead reckoning, DR, or without an electronic device. This method requires sailors to estimate the ship's location based on the previous positions and calculate the ship's direction and speed. In this case, the new position of the ship is called DR. Once the DR position has been corrected by considering some aspects, such as the effects of the wave current, the steering direction error, and the wind effect, this corrected position is called as estimated position, EP (Leonard & Bahr, 2016) Besides that, if a ship can see any land, the sailors on the ship can apply the pilotage method. This method estimates the ship's position with frequency, visualization, and geographical and hydro-graphical feature relativeness. Eventually, modern navigation without electronic devices should be applied celestially. In this case, the estimation of a ship's position should be based on the objects in the sky, such as the sun, the moon, the stars, and the planet, assisted with the trigonometry table and almanac. Heretofore, studies discussions about modern navigation devices are limited. This limitation makes the cadets of Higher Education of Maritime have difficulties applying the compulsory theories about modern navigation, especially the ship's position. The needs for open learning access are important in this advanced information technology development.

Previous research which became the basis of this research was research conducted by (Safi'i, 2017) entitled Design of Lecture Journal Information Systems as an Effort to Monitor and Evaluate the Learning Process (Case Study: Industrial Engineering Study Program, Faculty of Engineering, Kadiri University), where the results of the research show that the learning process

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in the Industrial Engineering Study Program, Faculty of Engineering, University of Kadiri, is more effective and efficient because it is carried out with the support of information technology. This underlies this research to design an online learning to make it easier for students/cadets to participate in online learning through online learning media. The results of (Hariadi, 2009) research entitled Web-Based Learning Information Systems with the Cooperative Learning Method are also the basis for this on-line navigation learning research. (Hariadi, 2009) stated the results of his research that the learning system was created based on the process of designing and developing applications as well as the results of trials that have been carried out, so that it becomes a web-based learning application that can manage material, assignments, tests, can carry out discussions online and provide a final assessment of the results. Study. The application is built based on the process of analysis and system design that is made, so that web-based learning applications with cooperative learning methods can be used for learning organizational behavior that is not bound by time and place (online). This paper aims to provide an overview of the process of learning navigational tools on board by making a prototype design of a website-based learning information system for learning modern ship navigation tools.

2. Methods

The applied method was a descriptive qualitative method. The researchers collected the data through interviews, observation, literature study, and documentation. On the other hand, the data analysis method included data reduction presentation and conclusion. On the other hand, the researchers applied various perspectives to check and determine the data validity, for example by promoting data triangulation, expert triangulation, and theoretical triangulation. Then, the researchers promoted the research with this procedure.

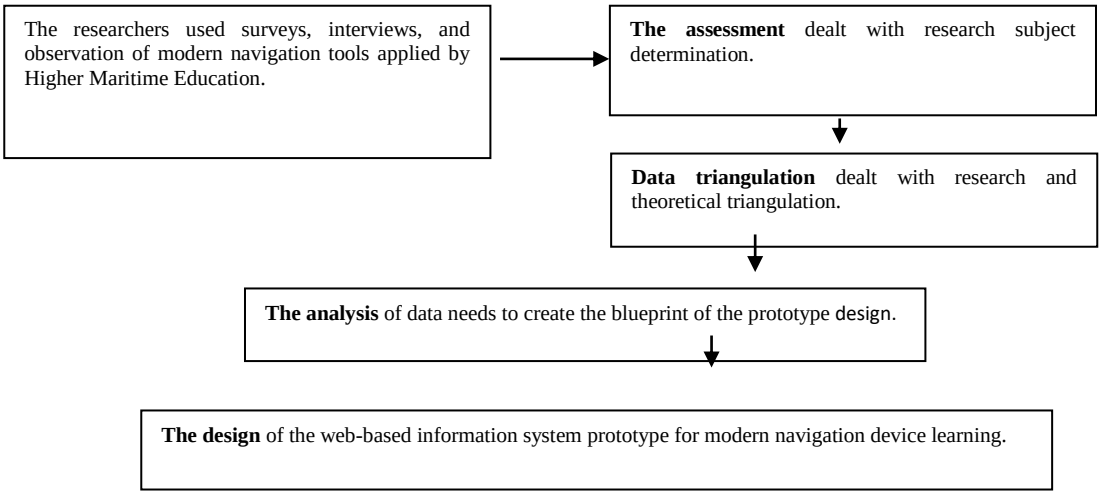

Figure 1. Prototype Design Development Flow

The prototype design process flow chart begins with: Implementation: This stage is the stage of implementing the prototype design that has been designed in accordance with the results of surveys, interviews and analysis of the needs of maritime college cadets, in this case cadets of the UNIMAR AMNI nautical study program; Evaluation: After the implementation phase has been passed, the next process is to evaluate the results of implementing the prototype design. Is the design in accordance with the flow expected by the Nautika study program to learn modern navigation tools online, or does it still require additional menus for learning modern navigation tools. If appropriate, the process will enter the Development stage, but if it is felt that it still requires additions to each menu, the process will return to the evaluation stage; Development: If in the evaluation stage it is stated that the design meets the learning needs of cadets, then the prototype design will become a reference design for making a prototype learning information

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system for modern navigation tools to become a prototype Web-based information system; Verification: This stage is the final stage of making a prototype design, where the design results have been verified to make a prototype Information System for learning Modern Navigation Tools. This prototype will become a web-based information system that maritime university cadets can use in studying modern web-based navigation tools.

2. Results And Discussion

The prototype of a web-based modern navigation device learning information system to determine a vessel's position could facilitate lecturers to deliver the materials and the cadets to observe the visualizations of the devices directly for navigation purposes. The system design could also meet the needs of modern navigation material understanding, the cadets' competencies of Higher Maritime Education and the capability and understanding to operate the modern navigation device. With the developed application, the students would understand better the Modern Navigation Tool because they did not only get the concept but also the real implementation of the navigation tool.

a. The Display of the Web-Navigation Design
The home display of the prototype of the navigation device learning information system was modest to facilitate the users, both the cadets and the lecturers, to operate the prototype. The home display covers all required menus by the cadets to learn about navigation devices.

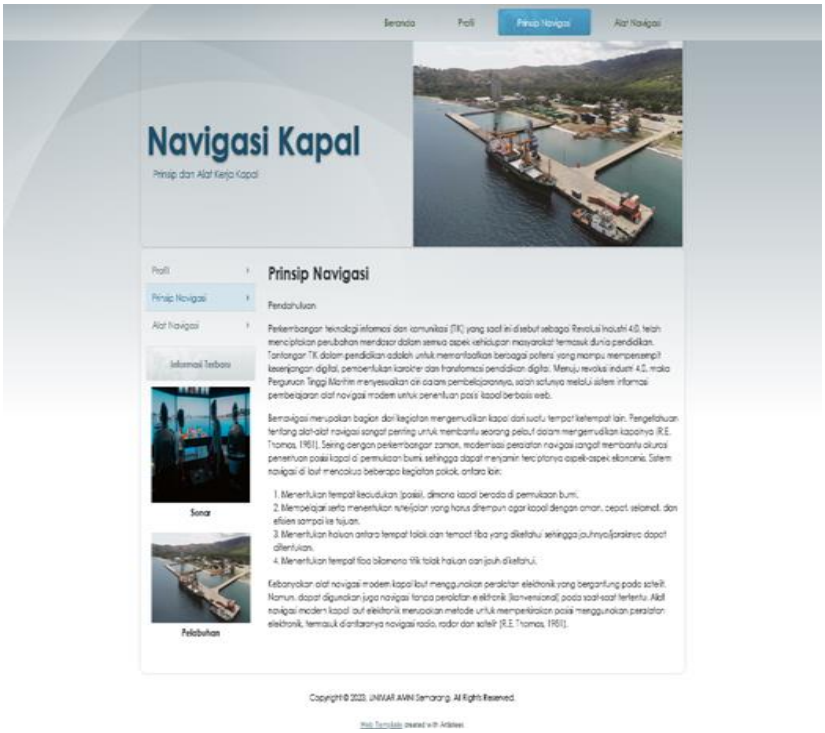

Figure 2. The Display of the Web-Design Prototype

Conventional and Modern Navigation Tools consist of: (1). Introduction, A brief explanation of why understanding navigation is important in the world of maritime or aviation. (2) Conventional Navigation Devices, (3). Comparison between conventional and modern navigation devices. (4). Practical Exercises, (5)Conclusion. importance of understanding and mastering both types of navigation devices. Emphasis on the importance of flexibility and adaptability in dealing with various navigational situations.

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b. The Display of the Web-Navigation Design

The menu design of the prototype consisted of a sub-menu about the principles and navigation devices and a sub-menu about the strength and the drawback of each navigation device - both modern and conventional navigation devices. The sub-menu about the strength and drawbacks of modern and conventional navigation devices allowed the cadets to compare and learn about the devices.

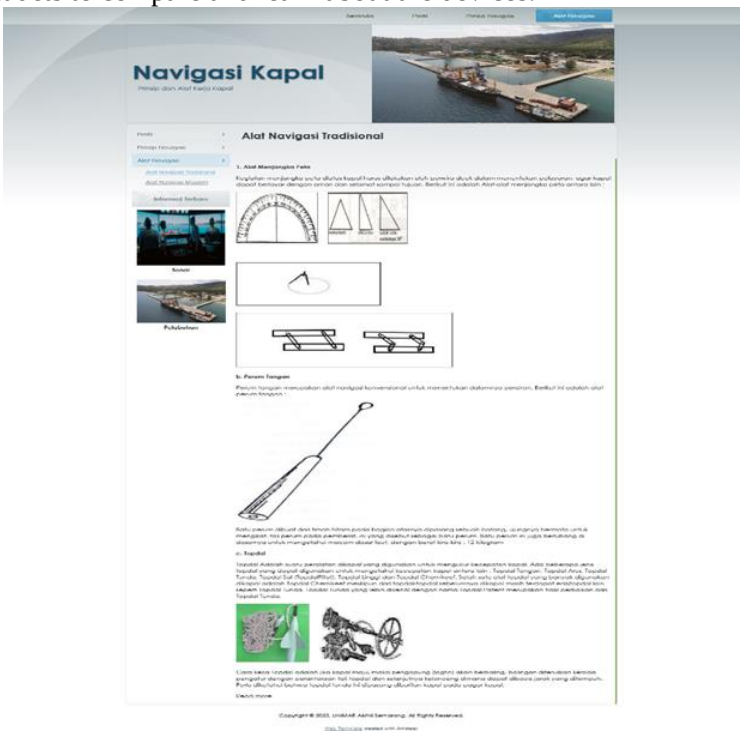

Figure 3. The Strength and The Drawbacks of The Web Sub-Menu Design

The display of the web-navigation design for the submenu "Perangkat Navigasi Konvensional dan Modern" is crucial to ensure an engaging and user-friendly learning experience. Here's how you might structure and design the display: Main Submenu Page, Section for Perangkat Navigasi Konvensional, Section for Perangkat Navigasi Modern, Section for Perbandingan dan Integrasi, Interactive Learning Activities, Conclusion and Takeaways, Navigation and Visual Elements, Responsive Design.

c. The Display of the Design

The design of the principle and navigation device sub-menu included two sub-menu discussions. The first sub-menu dealt with conventional and modern navigation devices for the cadets to learn visually and practice.

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Figure 4. The Web Design of Principle and Navigation Device Sub Menu

Sub-Menu 1: Perangkat Navigasi Konvensional consist of: Title: "Perangkat Navigasi Konvensional", Introduction: Briefly explain the importance and historical context of conventional navigation devices, List of Devices: Provide a visual grid with icons/images of devices like compasses, sextants, hourglasses, etc. Clickable Icons: Users can click on each device to access detailed information, Device Details: Display images, descriptions, and usage scenarios for each device, Advantages and Limitations: Present bullet points or icons for the pros and cons of conventional devices, Practical Demonstration: Include videos, animations, or interactive modules showing how to use these devices.

Sub-Menu 2: Perangkat Navigasi Modern consist of: Title: "Perangkat Navigasi Modern", Introduction: Explain the role of modern navigation devices in today's navigation practices, List of Devices: Provide a visual grid with icons/images of devices like GPS, radar, electronic speedometers, etc, Clickable Icons: Users can click on each device to access detailed information, Device Details: Display images, descriptions, and usage scenarios for each modern device, Advantages and Limitations: Present bullet points or icons for the benefits and limitations of modern devices, Interactive Examples: Include simulations, diagrams, or animations to demonstrate the functioning of modern devices.

Integration and Comparison consist of: Title: "Integrasi dan Perbandingan", Explanation: Describe the importance of integrating both conventional and modern devices for comprehensive navigation, Visual Comparison: Include a split-screen or interactive slider to visually compare the two types of devices, Scenarios: Present navigation scenarios and ask users to choose which devices they would use, highlighting integration possibilities.

Web navigation design is a critical aspect of user experience (UX) design. Over the years, researchers and designers have conducted various studies and investigations to enhance web navigation and improve user satisfaction. Here are some key areas of previous research related to web-navigation design: Navigation Patterns and Usability, User-Centered Design, Navigation and Accessibility, Navigation and Content Discovery, Navigation Personalization (Bergstrom-Lynch, 2019). In applying the findings from the Web-Navigation Design research, it is

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important to consider these limitations in order to make the resulting navigation design better suited to the needs of the user and the specific context

3. Conclusion

The prototype design of the web-based modern navigation device learning information system to determine a vessel's location had a communicative design. Thus, the prototype met the needs of Higher Maritime Education cadets to study the navigation devices visually. The prototype would be implemented in the subject and consist of various navigation devices, functions and usabilities of modern navigation devices; principles and mechanisms of modern navigation devices; and the strength and drawbacks of the modern navigation tools. Each sub-system of the developed prototype described the operations of modern navigation devices in detail and systematically. The information system prototype was designed with a web-based design.

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