

## Enhancing maritime management efficiency: Developing a next-generation Android App to review agent satisfaction level in sailing approval procedures

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Received February 1<sup>st</sup> 2024; Revised March 25<sup>th</sup> 2024; Accepted April 1<sup>st</sup> 2024

 **Cite this** <https://doi.org/10.24036/jptk.v7i2.35923>

**Abstract:** This research was conducted to develop a state-of-the-art Android application to measure the satisfaction of agents involved in the sailing approval process. The main objective is to improve the efficiency and satisfaction of ship agents during the process of issuing sailing permits at the Harbour Master and Port Authority, Teluk Bayur, Sumatera Barat, Indonesia. This research involves the design and development of an Android-based survey application, which has undergone expert validation and usability testing to ensure its effectiveness. This research used the Plomp development model and involved 21 people who made arrangements at the Port Authority office as research subjects. The results of the study show that the newly developed application is valid for assessing agent satisfaction in managing the services for issuing Sailing Permits, with a material validity of 0.87 and a media validity of 0.88. Furthermore, the results of the agents' evaluation show that the Android-based agent satisfaction survey is very practical, with a practicality rate of 93%. This study also outlines the limitations encountered during the research and proposes future recommendations to improve the research. In conclusion, this research highlights the practicality and validity of the developed Android-based Agent Satisfaction Survey application.

**Keywords:** Technology media; Mobile application; Mentawai island; Sea transposition

### 1. Introduction

The maritime industry is a significant sector that supports the economic growth of a country ([Fratila et al., 2021](#)). Sailing approval is a critical stage in maritime operations, where agents play an essential role in ensuring the process runs smoothly and follows applicable regulations ([Chang & Khan, 2023](#); [Syahril et al., 2023](#)). The satisfaction of agents in performing their duties affects the efficiency of procedures. It impacts by ensuring high levels of satisfaction, a positive contribution to operational effectiveness, public confidence, and the overall reputation of the maritime sector can be expected.

The Harbourmaster and Port Authority Office has a crucial role in improving services to the public and private shipping agents which is one of the public agencies must always carry out various policies that can provide excellent and quality services ([Manampiring et al., 2024](#); [Martanto et al., 2023](#)). As an integral element in providing services to the public and private shipping agents, the Office of the Harbourmaster and Port Authority is faced with the demand to continue to innovate and improve the quality of its services. These efforts ensure that the general public and industry players, including Private Sea Transportation Companies (Agents), feel maximum satisfaction in utilizing the various services of the Office of the Harbour Master and

Port Authority ([Iman et al., 2022](#)).

Implementing effective, efficient, and competitive national sea transportation and providing added value as the primary infrastructure per the vision of the Directorate General of Sea Transportation is very important to realize ([Liu et al., 2021](#)). Based on the Regulation of the Minister of Transportation of the Republic of Indonesia Number 122 of 2018 concerning the Organisation and Work Procedure of the Ministry of Transportation, the Directorate General has the responsibility of formulating and implementing policies and technical standardization in its field ([Mahalana et al., 2021](#)), including the functions of formulating policies, implementing activities, preparing norms, standards, procedures, and criteria, as well as providing technical guidance, evaluation, and administration.

In carrying out their duties, service providers are expected to be highly responsive to service users' needs, aspirations, and expectations ([Ricardianto et al., 2023](#)). In the world of products and services, large companies often feature particular information on packaging labels, such as "Customer Service," "24-Hour Toll-Free Service Hotline," and similar terms. This is not just a form of prominence but a manifestation of the service provider's dedication to the quality of the product the customer is purchasing. It reflects how much the service provider cares about the client's needs and its ability to anticipate customer feedback and criticism regarding the goods they have acquired ([Appiah et al., 2021](#); [Rosak-Szyrocka et al., 2022](#)).

Customer satisfaction is therefore crucial for service providers so that their offerings are valued and used by the public or service consumers. Service quality is an ever-changing goal, forcing every business, institution, agency, or service provider to continuously improve their service quality ([Siddiqui et al., 2023](#)). Tools considered adequate today, thanks to technological innovation, may not be able to fulfill users' needs in the future, thus requiring constant modification and updating. These demands are relevant for companies and crucial for the Teluk Bayur Port Authority as a provider and organizer of public services in sea transportation ([Holstein et al., 2020](#)). Until now, reviewing agent satisfaction in sailing approval procedures still relies on conventional methods that may not be optimal. With the rapid development of information technology, there is an excellent opportunity to improve efficiency and accuracy in measuring agent satisfaction. Therefore, this research aims to develop a Next-Generation Android Application that can help assess and improve agent satisfaction levels in sailing approval procedures. This research is expected to support efficient maritime management and positively contribute to the maritime sector's progress at the national level, especially in improving sailing approval procedures. The research questions to achieve the objectives of this study are:

- RQ1. How do you develop an agent satisfaction survey to issue a Sailing Approval Letter at the Harbour Master and Port Authority, Teluk Bayur, Sumatera Barat, Indonesia with an Android application?
- RQ2. What is the validity and practicality of analyzing agent satisfaction results in issuing a Sailing Approval Letter at the Harbour Master and Port Authority, Teluk Bayur, Sumatera Barat, Indonesia using the Android application?

## 2. Methods

### *Research type*

Research and Development (R&D), with a development approach in the form of Plomp, often refers to Plomp's development model, which incorporates certain phases of instructional development ([Siswanto & Nofikusumawati, 2023](#)). This model is known as the "Plomp Model" or

"Plomp Model for Instructional Development".

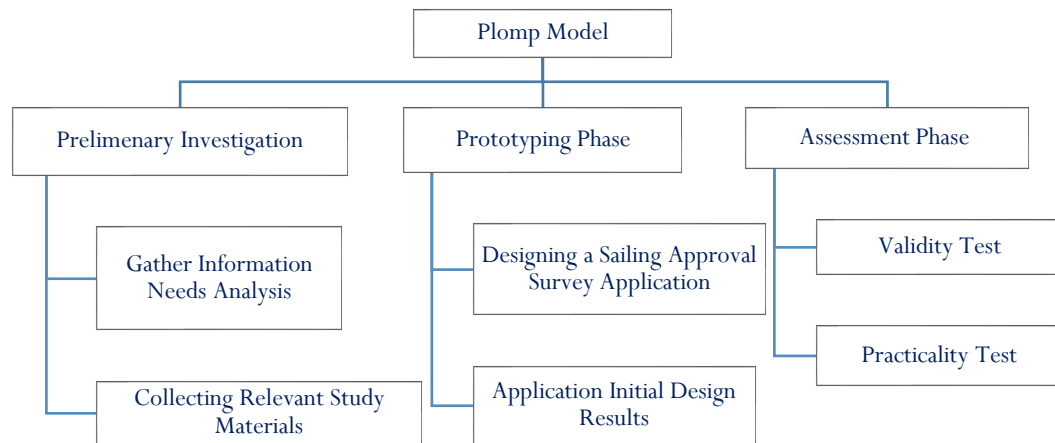


Figure 1. 4D development model

**Research subjects and locations**

The subjects of this study were 21 ship agents who applied for the issuance of a Sailing Approval Letter at Harbour Master and Port Authority, Teluk Bayur, Sumatera Barat, Indonesia. Prior to collecting research data, the researcher has obtained permission from the relevant authority and the vessel agents have consented to be the subject of this research and are willing for the data provided to be published. The research started from the Prada period, focusing on the office's activities and processes. In the context of this study, researchers focused on developing an Android-based application to improve the experience and satisfaction of ship agents in the issuance procedure Sailing Approval Letter.

**Research instruments**

This study measures agent satisfaction with the developed Android application by assessing the availability of information, ease of use, and processing speed. This research instrument is designed to provide a comprehensive overview of how the latest generation Android application can improve efficiency and satisfy agents in the sailing approval procedure. The criteria for validating the research questionnaire assessment are validated by experts from 2 material experts and three media experts with ten years of teaching and research experience at the Sumatera Barat Sailing Polytechnic. Each validation assessment item is assessed from survey content eligibility, language, visualization, benefits, interaction, and ease of use (Martínez-Gómez et al., 2022; Shaw et al., 2020).

**Data analysis technique**

The data analysis technique in this study begins with distributing questionnaires directly and Google Forms. The process includes needs analysis, survey application design, preparation of validity and practicality questionnaires, and testing of material experts and media experts. The results of the validity of this research were measured using data interpretation developed by (Aiken, 1985), which is formulated as follows:  $V = \sum s / [n(c - 1)]$ . Additionally, the App is considered valid after passing the revision and evaluation stage based on the feedback from the validators (Sudaryono et al., 2019). Moreover, this research also involves the participation of agents as respondents to the service survey application on the level of agent satisfaction while sailing. Practical tests on Android survey applications can involve several aspects, including usage

time, simplicity of use, and user satisfaction (Azmi et al., 2022; Jumaroh et al., 2023). The level of user satisfaction can be measured using a rating scale or questionnaire ranging from strongly agree to disagree strongly, and a simple formula for calculating the average is  $\text{Efficiency} = \frac{\text{results or data obtained}}{\text{with the previous method results or data obtained with the new application}} \times 100\%$  (Hakiki et al., 2022). Consequently, it is essential to design a practical test appropriate to the context of the use of the Android survey application and the purpose of its development.

### 3. Results

#### *Preliminary investigation*

Front-end Analysis is the first step of research that invites researchers to investigate the essence of problems related to developing Agent Satisfaction Surveys in the management service for issuing Sailing Approval Letters at Harbour Master and Port Authority. This research aims to design and develop an Android-based Agent Satisfaction Survey at Harbour Master and Port Authority, which aligns with the findings from field research that illustrate the need for application development. Learner Analysis involves researching the characteristics of ship agents as research subjects, which includes identifying relevant aspects for instructional design and development. Task Analysis is an empirical analysis aimed at identifying the needs that agents must meet to achieve satisfaction in the issuance management service at Harbour Master and Port Authority. Concept Analysis is a step to identify the main objectives and concepts in developing an Agent Satisfaction Survey for SPB issuance management services at Harbour Master and Port Authority Teluk Bayur based on Android. Specifying Instructional Objectives is a stage where researchers unite task analysis and concept analysis into one instructional objective that suits the needs of increasing efficiency and agent satisfaction.

#### *Prototyping phase*

The program content is organized into material groups and survey objectives. The systematization of the program content is based on the rules of viewing materials, the difficulty level, and the survey's prerequisites. Therefore, the design should consider the order and materials to be displayed in advance. Moreover, the shooting order must also be considered so the application's use runs without errors. The development of programming in the internet era, which is an Android-based Agent Satisfaction Survey Application on the management service for the issuance of Sailing Approval Letters at the Harbour Master and Port Authority, is designed to understand the level of satisfaction of ship agents when managing Sailing Approval Letters at the Harbour Master and Port Authority.

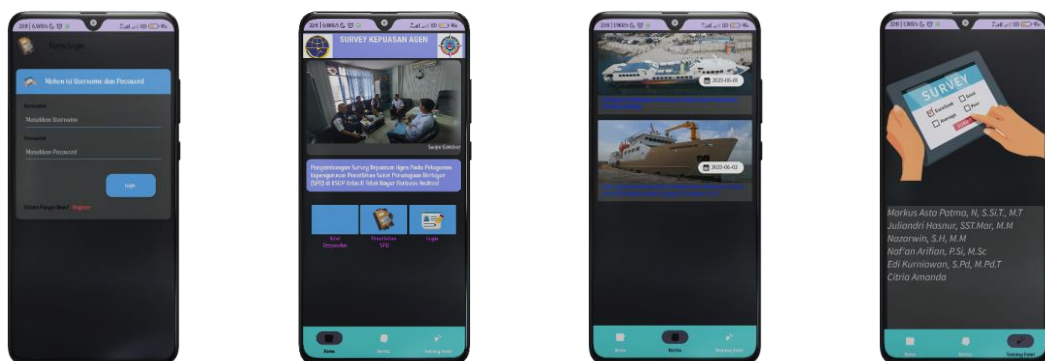


Figure 2. Results of Android application development in reviewing agent satisfaction levels

**Assessment phase**

The validity of the product development was evaluated through analysis of the product, involving the views of five subject matter experts and five application experts. The experts acted as validators and provided assessments related to the quality of the application and the material aspects of the Survey questions. This assessment is carried out to provide judgment on the content of the Survey instrument. Details of the validation results can be found in Table 1.

Table 1. The results of the validity analysis of the survey material assessment

| No | Assessment Indicator                        | Aiken's V Score | Interpretation |
|----|---|-----------------|----------------|
| 1  | Appropriateness of Survey Content           | 0.85            | Valid          |
| 2  | The linguistic Quality of the App           | 0.89            | Valid          |
| 3  | Visualization of Survey Application Viewing | 0.86            | Valid          |
|    | <b>Overall</b>                              | <b>0.87</b>     | <b>Valid</b>   |

The results of the validity analysis of the material in the survey show that the material is declared valid with an average score of 0.87. Consequently, this material is considered suitable for evaluating the level of satisfaction in the management service for issuing Sailing Approval Letters at the Teluk Bayur Harbour and Port Authority Office.

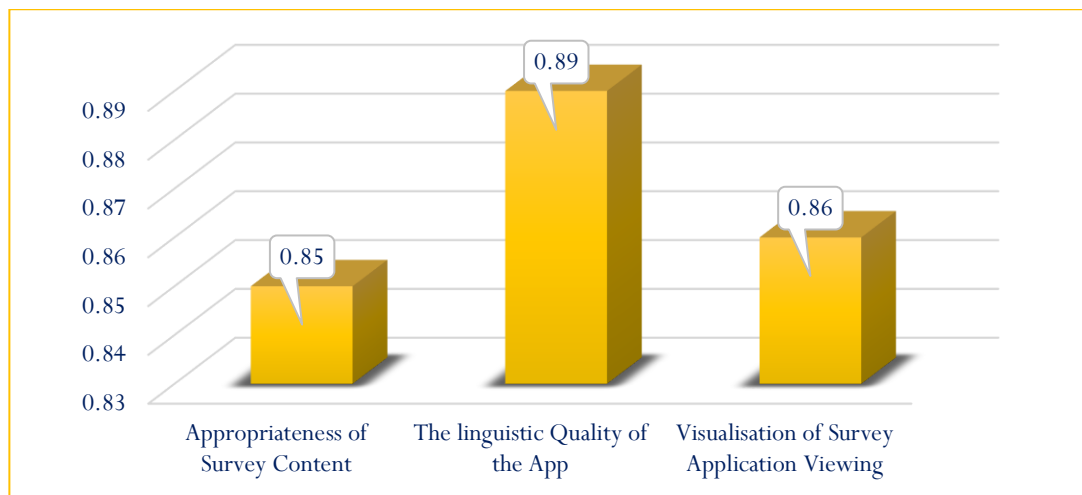


Figure 3. Material expert validation

In this section, evaluators assessed the substantive nature of the survey instrument. Details of the evaluation results can be accessed in Table 2.

Table 2. The results of the validity analysis of the survey media assessment

| No | Assessment Indicator | Aiken's V Score | Interpretation |
|----|----------------------|-----------------|----------------|
| 1  | Display              | 0.85            | Valid          |
| 2  | Benefits             | 0.86            | Valid          |
| 3  | Interaction          | 0.91            | Valid          |
|    | <b>Overall</b>       | <b>0.88</b>     | <b>Valid</b>   |

After going through a validity evaluation, the Survey application obtained a validity assessment with an average score of 0.88. Therefore, this application is considered suitable for evaluating the

level of satisfaction in the management service for issuing Sailing Approval Letters at the Teluk Bayur Harbour Authority and Port Authority Office.

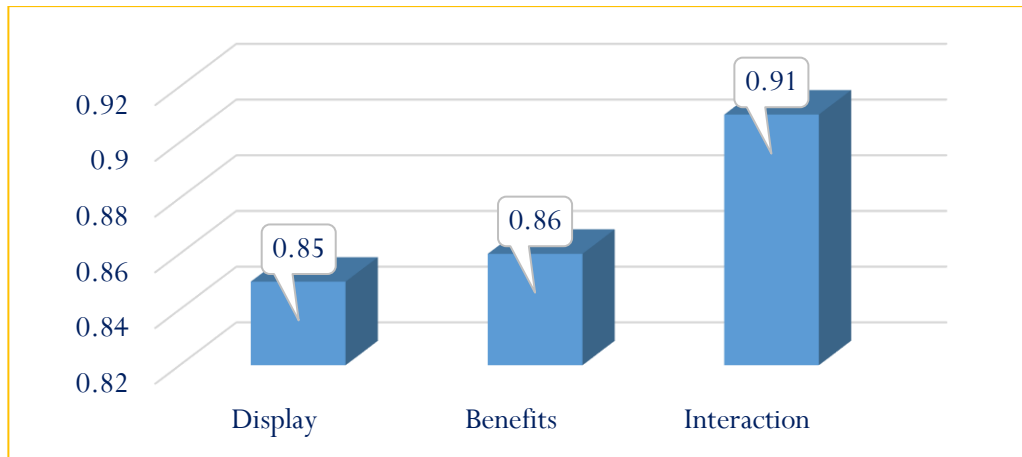


Figure 4. Media expert validation

The practicality test in this research and development was measured through the level of application usability, as perceived by agents when using the application during the trial. Details of the respective results are listed in Table 3.

Table 3. The results of the validity analysis of the survey material assessment

| No | Assessment Indicator | Practicality Score (%) | Interpretation        |
|----|----------------------|------------------------|-----------------------|
| 1  | Usefulness           | 87                     | Very Practical        |
| 2  | Ease of Use          | 96                     | Very Practical        |
| 3  | Satisfaction         | 85                     | Very Practical        |
|    | <b>Overall</b>       | <b>93</b>              | <b>Very Practical</b> |

From the data in Table 3, it can be concluded that the development carried out is considered very practical, reaching a value of 90%. Therefore, agents consider this application very practical in managing the issuance of Sailing Approval Letters at KSOP Teluk Bayur, especially in an Android-based format.

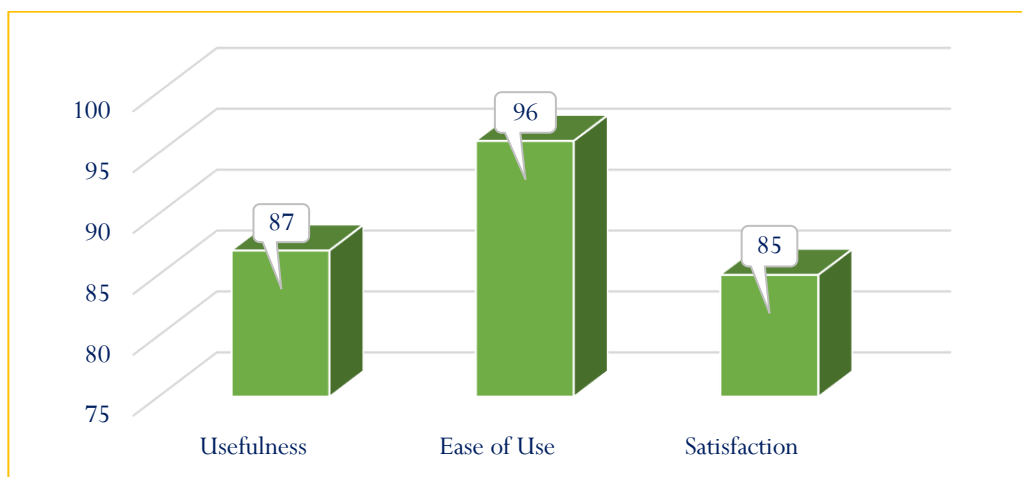


Figure 5. Practicality test results

#### 4. Discussion

This research aims to develop an Android application to review agent satisfaction levels in sailing approval procedures. Previous research studies have investigated the evaluation of user satisfaction in mobile applications used in the logistics and transport sectors. Research by ([Ferreira et al., 2020](#)), highlighted the importance of intuitive user interface and fast performance in improving user satisfaction. The results of this study provide valuable insights into the critical factors that can influence user experience. The use of the latest technology in Android app development is an important aspect that has been the focus of previous research. The study by ([Mateus & Martinez, 2020](#)), includes exploring the use of Kotlin as the primary programming language in the development of current Android apps. The findings can provide insights into the latest developments in Android technology that can be applied to this project.

Research by ([Song et al., 2021](#)), highlights the integration of the Internet of Things (IoT) in the shipping industry. The study results show that using sensors and real-time data collection can improve operational efficiency and provide valuable data for performance evaluation. Integrating IoT elements can be crucial in developing Android-based applications for sailing approval procedures. Previously, research by ([Chu & Hsu, 2021](#)), has developed a method of measuring agent satisfaction in the context of the voyage approval process. This study explored the essential criteria needed to assess agent satisfaction with the approval procedure and can provide a basis for developing an assessment model in the Android application being developed. The study by ([Molino et al., 2020](#)), focused on successful change management strategies in implementing new technologies in the work environment. The findings can guide how to manage changes that may occur during introducing of a new Android application in the sailing approval procedure.

Based on the findings of this study, there are some limitations to the generalisability of the results, especially if the data were collected from a limited sample of agents and the results may not cover the diversity of views from all stakeholders involved in the sail approval procedure. This study may only cover a particular observation period, and changes in agent satisfaction or application effects may not be evident within that timeframe. On the one hand, there are some recommendations and future work from this study in evaluating long-term targets, such as conducting further research to evaluate the long-term impact of the application on agent satisfaction levels, procedure efficiency, and potential cost savings. Research is expected to try to conduct comparative studies with similar applications or other agent satisfaction review solutions to assess the advantages and disadvantages of the developed application. Finally, they were developing and integrating artificial intelligence-based features to provide automated solutions or recommendations that can improve the efficiency of the sailing approval procedure.

#### 5. Conclusion

The results of research on the development of an Agent Satisfaction Survey for the issuance of Sailing Approval Letters at the Android-based Harbour Master and Port Authority found the following conclusions: This research produces an Android-based application to conduct an Agent Satisfaction Survey on the issuance of SPB at the Teluk Bayur Harbour Authority Office. The development of this application follows the Plomp development model. The Android-based application developed in this study proved valid and practical after going through the validation stage by five validators, including media and material experts. The results of the validator's assessment showed a material expert validity level of 0.87 and a media expert validity of 0.88. Practical testing was conducted on 21 agents who made arrangements at the Bayur Harbour and Port Authority Office in November 2023. The results of the agent's assessment show that this

Android-based Agent Satisfaction Survey is very practical, with a practicality level reaching 93%.

### **Limitations and Future Work**

The findings of this study may lack generalizability due to data collection from a limited number of agents, potentially overlooking the diverse perspectives of all stakeholders involved in the sailing approval procedure. In addition, this study may only cover a specific timeframe, potentially missing the opportunity to detect changes in agent satisfaction or the App's effects over a more extended period. Furthermore, this study relies primarily on survey methods, which may not be able to capture all the nuances of agent satisfaction or operational efficiency.

Evaluate the long-term impact in further research to assess the App's long-term impact on agent satisfaction levels, procedural efficiency, and potential cost savings over a long period. It is targeted at future plans by comparing the developed App with similar solutions or other agent satisfaction review methods to identify its advantages and disadvantages more comprehensively. Moreover, integrating artificial intelligence in exploring AI-based features to provide automated solutions or recommendations improves the efficiency of sailing approval procedures and agent satisfaction.

In General, although the Android-based application for agent satisfaction survey at the Harbour Master and Port Authority showed promising results, future research should address the identified limitations and explore additional enhancements to improve its effectiveness and utility further.

### **Author contribution**

Juliandri Hasnur is a researcher and data collector of mobile survey application development; Nazarwin is a designer and contributes to the preparation of research methods; Edi Kurniawan and Markus Asta Patma Nugraha conducts an advanced evaluation of research methods and evaluates research methods and data analysis and discussion results, as well as provide an assessment of the background of the problem.

### **Funding statement**

This research has received no specific grants from any funding agency in the public, commercial or not-for-profit sectors.

### **Acknowledgments**

Thank you to all those who have contributed to this research and the Politeknik Pelayaran Sumatera Barat for accommodating and giving permission to collect data for this research.

### **Conflict of interest**

No conflict of interest and approved the article for review and publication.

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