JOURNAL OCEAN

Appissode

Digitalization of Incoming Cargo Data Collection and Information Systems Based on Website at H. Hasan Aroeboesman Ende Airport Using Prototype Method

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Abstract

H. Hasan Aroeboesman Ende Airport offers air and cargo transportation services, with the cargo unit managed by PT. Indojaya Flores Indah (IFI). Cargo volume at the airport has risen annually, increasing by 20% in 2023. However, the cargo administration process, especially for incoming cargo, is still manual, relying on handwritten logbooks and checklists. Additionally, there is no website to provide cargo-related information. To address this, a digital data collection and information system was developed. The system consists of two parts: a digital form for cargo data collection and a website for information dissemination. Clappia was chosen for the digital form, and WordPress for the website. Both systems were tested and found to perform well; the digital form is accessible to cargo staff, while the website, kargoene.my.id, is available to the public. Performance evaluations showed excellent results, with the digital form achieving a 92% rating and the website an 88.5%. These systems have proven beneficial for users.

1 INTRODUCTION

Transportation is an important need for society. One of them is air transportation which is a mode of transportation and an economic sector that provides an important contribution, by helping to ensure the transportation of goods for industry, trade, tourism, and job creation, especially in remote areas [1]. This includes air transportation activities. Based on PM Number 33 of 2021, it is explained that one of the business activities at the airport consists of airport-related service services to support aircraft operational service activities at the airport, one of which is for handling cargo and post [2].

H. Hasan Aroeboesman Ende Airport provides air transportation services as well as air cargo transportation. The cargo unit is managed by PT. Indojaya Flores Indah (IFI) is a Business Entity that serves Air Cargo and Post and is responsible for managing incoming cargo and outgoing cargo administration. The number of air cargo transportation increases every year. The chart below shows that the number of air cargo tends to increase every year. This increase has an impact on the increasing workload for cargo personnel because the greater amount of cargo requires more intensive handling.
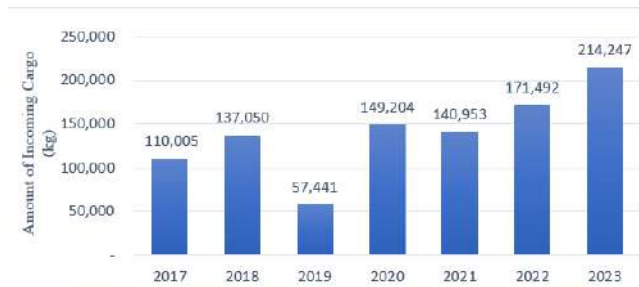
Figure 1. Number of Cargoes Arriving
(source: enende.org)

The increase in the number of incoming cargo has an impact on the cargo administration process, one of which is the recording of incoming cargo. Currently, the recording of incoming cargo information is still manually handwritten in the log book and incoming cargo checklist which is filled in after checking the SMU number in the manifest according to the reality of the incoming cargo. However, this manual data collection has several shortcomings, such as the large amount of data that must be filled in, the risk of losing or damaging data in hard file form, and the difficulty in finding old data when needed.

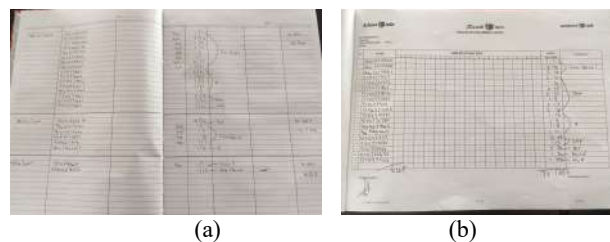(a)   (b)
Figure 2. (a) *Logbook* (b) *Checklist Incoming cargo*

In addition, H. Hasan Aroeboesman Ende Airport does not yet have a media to disseminate information related to air cargo including information on incoming cargo to service users. So far, consumers must come directly to the cargo terminal building at H. Hasan Aroeboesman Ende Airport to get the information they need, so it is considered less efficient. So to maintain data security while simplifying the data collection system and disseminating incoming cargo information, it is necessary to utilize technology. With the increasing integration of digital systems (technology), it is important for an efficient logistics process [3]. This study aims to make time and energy efficient for personnel to input information and for cargo service users to obtain information.

The system is designed to be accessible with anything that uses a browser and can work with data media such as mobile phones (HP), the aim is that the system can be used easily and optimally. [4]. The function of the system is to improve the company's work process (capacity) in achieving goals, especially the speed of information processing, timeliness, data accuracy, and effective and efficient processing. [5].

In this study, it is included in applied research called R&D (Research and Development) results. The model used in this development research is the prototype model. The prototype model can be interpreted as a software development model that allows interaction between developers and system users, so that researchers can determine the objectives and needs of the system's operations. [6]. In this research, system users can act as sources of information and as co-developers, by considering the benefits and costs of having a designed system. [7].

2   METHODS

In this study, it is included in applied research called the R&D (Research and Development) prototype model. R&D (Research and Development) is a method used in a study to obtain results in the form of certain products and test the effectiveness of the product [8]. The prototype development model can be adapted into 5 (five) stages, namely: communication also called needs analysis, quick plan stage, namely the planning stage of what system will be created, quick design modeling stage, namely a simple description of the system design, construction stage (construction of prototype), namely the development of a system according to the prototype, and the deployment stage, namely consisting of system testing and validation tests from related parties by assessing the effectiveness of the media [9]. This stage is carried out to create the entire system starting from the user entering data/information, then the system integrates with other systems including the database, to produce output in other media [10]. The following are the stages of system design in this study using the prototype method:
1) Communication
   a. Initial Analysis, in this study, the initial analysis was conducted by observation during the first On the Job Training at the cargo unit of H. Hasan Aroeboesman Ende Airport. This observation can also predict the extent of the shortcomings of the previous system to be adjusted to the design of the system to be created to effectively reduce the manual work process [11].
   b. Needs Analysis, to analyze the needs related to the system to be built, the researcher interviewed one of the cargo personnel as the party responsible for the administration process of all activities in the cargo of H. Hasan Aroeboesman Ende Airport. The interview method is used to find out the flow of incoming and outgoing cargo at the airport, data collection of cargo information that is still manual, what instruments need to be recorded for

incoming cargo data, as well as the system needed by the user, and approval that information related to the cargo can be published.

2) Quick Plan
    a. System planning includes identifying the functional and non-functional needs of the system, such as the required features and expected performance.
    b. Media selection, this media selection requires technical and functional identification to run the system, such as hardware and software requirements. In addition, choosing the media that best suits the system's needs, considering factors such as availability, performance, security, scalability, and cost.

3) Modelling Quick Design
    a. System Design, the system design in this study was carried out using a use case diagram, namely a diagram that is useful for describing the behavior of actors in the system to be designed. So that the use case diagram is useful for explaining the functions of the system and what access is given by the actor to use these functions [12]. In the image below there are 2 system user actors, namely personnel and users of air cargo services at H. Hasan Aroeboesman Ende Airport.
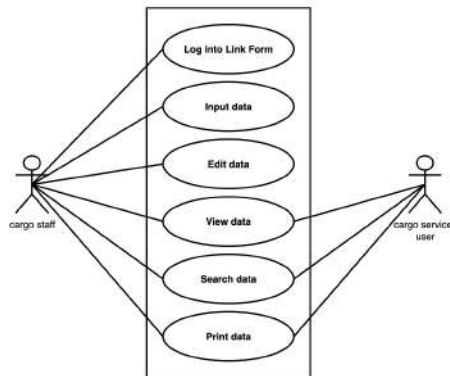

Figure 3. *Use Case Diagram*

    b. Instrument Design, which describes the instrument (material) that will be displayed in a system that is built. Instrument design includes depicting the layout and what information is displayed in the system. In this study, instrument design was carried out using flowcharts and tables. Flowcharts are used to visualize how a system is arranged, and tables are used to visualize the data that will be displayed.Perancangan Instrumen

      a) Formulir Digital Instrument Design
      The digital form will be divided into three parts (sections) and the data that will be entered into the digital form is as follows:

Table 1. Digital Form Instruments

Flight Information				Cargo Identity						Attachment	
No Flight	*Arrival From*	*Date*	*Time*	NO SMU/ Scan Barcode	Consignee	Coli	Qty (Kg)	Origin	Information	Photo of *Manifest*	cargo personnel

      b) Website Instrument Design Informasi
      The following will be displayed on the website page in the incoming cargo menu. The information is obtained after the process of filling in the digital form by cargo personnel.

Table 2. Information Instruments on the Website

No	No Flight	Cargo Arrival Date	No SMU	Consignee	Coli	Origin	Information

      c) Website Menu Structure
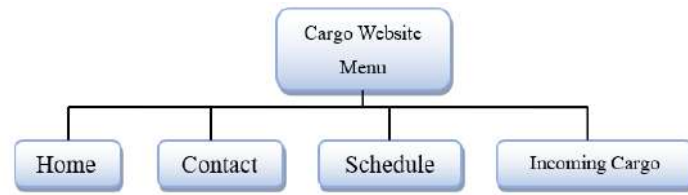   The following structure explains the menu that will be displayed on the airport cargo website.

Figure 4. Website Menu Structure

4) Construction
a. Design of Data Collection System, this system is in the form of a digital form that is done by compiling instruments and adding various features and guides to make it easier to input cargo data. In this study, the digital form was designed using the Clappia platform, which started by entering the Clappia platform via a web browser and creating a subdomain. After that, start compiling each section with the drag-and-drop block feature and adjusting it to the data collection instrument. Then configure the form with Google Spreadsheet and Google Drive as a database to store data. Because this Google media has been widely used in the scope of work to create financial reports, worksheets, calculate formulas, and much more [13].

(a)   (b)
Figure 5. (a) Assembling each Section (b) Designing the Instrument

Figure 6. Configuring the Form with the Database

b. Designing an information system in the form of a website, the media chosen is WordPress. The first step is to order hosting and domain services, then manage cPanel (Control Panel). After that, install CMS (Content Management System) to compile incoming cargo information instruments, create a Navigation Bar, and design the appearance of the website with the help of the Elementor plugin so that the website has an attractive appearance by adjusting colors, fonts, images, and other design elements.
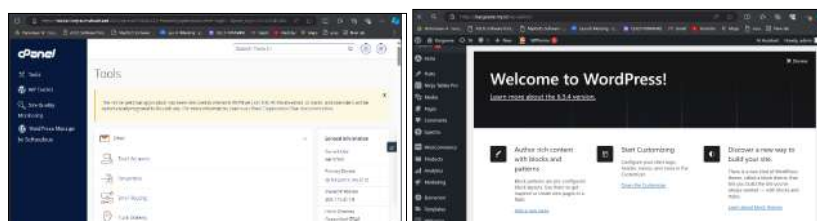

(a)   (b)
Figure 7. (a) Managing cPanel (b) Wordpress CMS

(a)   (b)
Figure 8. (a) Creating a Navigation Bar (b) Designing the Website Appearance

c. Integrating the data and information system can be done by installing the appropriate plugins according to the system's needs. The input results from the digital form will be distributed as information on the website with the Ninja Table plugin. The data stored in the spreadsheet is set to be published to the web, then embed the spreadsheet

URL link to the Ninja Table plugin on WordPress, then design the appearance of the incoming cargo information table, and add a print feature to the website.
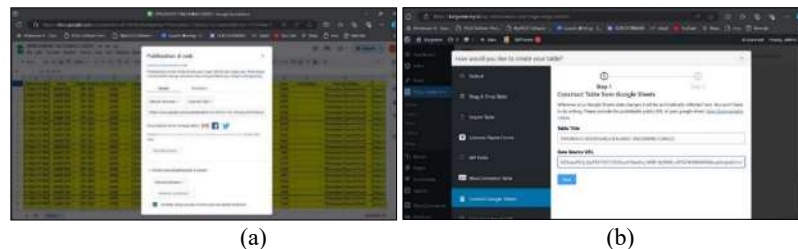

|(a)|(b)|
Figure 9. (a) Publishing a Spreadsheet (b) Embedding a Link in a Plugin

(a)   (b)
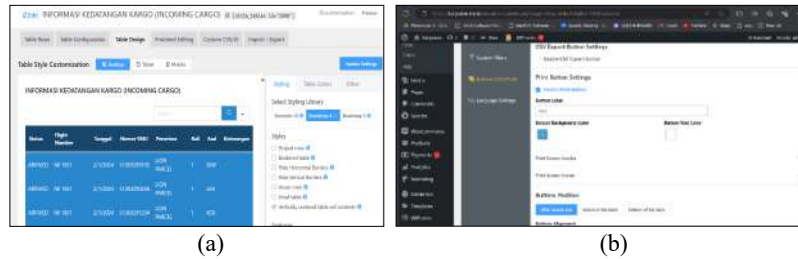Figure 10. (a) Designing a Table (b) Adding the Print Feature

    d. Integrating the System into the Airport Website, to integrate the cargo website that will be built with the airport website, this is done by embedding the cargo website URL link in the cargo service menu on the Ende airport website.

5) Deployment
    a. System Testing, system testing needs to be done to find out whether the system as a whole can be used and to ensure whether there is a system failure. This testing is also done by users other than researchers.
    b. System Evaluation is conducted to determine whether the system built is my expectations. In this study, testing was conducted using a questionnaire with the PIECES method to measure the performance (effectiveness) of the system. The PIECES framework consists of six variables including performance, information, economics, control, efficiency, and services [14]. This questionnaire is in the form of a Likert scale, namely, respondents determine their level of agreement with a statement or respond to questions by selecting one of the available options [15]. The questionnaire statement has the following alternative answers:

Table 3. Questionnaire Answer Values

No	Answer	Value
1.	Strongly Agree (SS)	5
2.	Agree (S)	4
3.	Neutral (C)	3
4.	Disagree (TS)	2
5.	Strongly Disagree (STS)	1

And for measuring system performance is determined by calculating the percentage of answers from respondents using the following formula:

Formula = T × P

Description: T = Total respondents, Pn = Choice of score numbers.

Before determining the final percentage, first determine the interval (range of distance) by the method of finding the percentage score interval (I), with the interval formula as follows [16]:

$$I = \frac{100}{Jumlah\ Skor\ Likert}$$

Based on the assessment, there are 5 alternative answers, so it can be calculated:

$$(I) = \frac{100}{5} = 20$$

Result (I) = 20 is the interval distance from the lowest 0% to 100%. So the data obtained is converted to the score category based on the interval obtained with the following classification:

Table 4. Value Category

No	Number (%)	Category
1	< 21 %	Very (Disagree, Bad, Dislike)

2	21 – 40 %	No (Agree or Like) / Bad
3	41 – 60 %	Neutral or Enough
4	61 – 80 %	Agree or Like
5	81 – 100 %	Very (Agree, Good, Like)

In the final solution, find the value results generated from the following index formula:

Index formula % = (Total Score) / Y x 100

Description: Y = Highest score X Number of respondents

c. Implementation is the stage where the system that is built is ready to be used after being tested and evaluated first, until the system is said to be effective.

3   RESULTS/ FINDINGS/ DISCUSSION

From the results of the design of the data collection system and information system, the author found several research results that will be explained, including the system display, namely digital formulas and websites, as well as the results of system testing and evaluation as follows:

3.1   Research Results

The results and explanation of the design of a website-based incoming cargo data and information system using the prototype method have been adjusted to the formulation of the research problem, namely as follows:

a. Data Collection System (Digital Form)

The digital form login process can only be done by anyone who has the URL link of the form, namely cargo personnel and airport staff. The data collection is adjusted to the manifest or shipping label attached to the cargo packaging. For filling in the SMU Number, there is an additional feature, namely a barcode scanner that can be used to scan the barcode on the shipping label for faster SMU Number data collection. In addition, testing is carried out by looking at the results of the data input which after being submitted, will be stored in a spreadsheet that has been previously integrated.
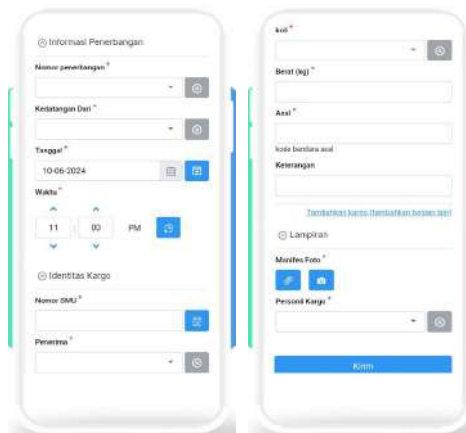

Figure 11. Digital Form Display

Figure 11 above is a display of the digital form and there is an instrument that contains information from incoming cargo such as:

a) Flight Number, consisting of 3 options for flights at H. Hasan Aroeboesman Ende Airport, namely IW 1831, IW 1957, and 1830.

b) Arrival From, consisting of aircraft routes at this airport, namely Kupang (KOE), Labuan Bajo (LBJ), and Other Routes.

c) Date and time, namely the date when the cargo arrived at the airport cargo warehouse.

d) SMU Number, filled with a series of numbers taken from the shipping label and manifest.

e) Recipient, consisting of expedition companies that often use air cargo services at H. Hasan Aroeboesman Airport and personal cargo (Regular).

f) Coil, the number of coils in the same SMU number.

g) Weight (Kg), the total weight of the cargo in the same SMU number.

h) Origin, which is filled in with the city of origin of the cargo using a three-letter code.

i) Description, filled in if there is a discrepancy between the incoming cargo and the manifest.

j) Attachments, uploading a photo of the manifest and selecting the cargo personnel in charge of recording the data.

b. Information System (Cargo Website)

This website can be accessed by anyone, especially users of air cargo services at H. Hasan Aroeboesman Ende Airport. This cargo website contains several pages including home (airport cargo profile), contact, schedule, and incoming cargo (incoming cargo information).
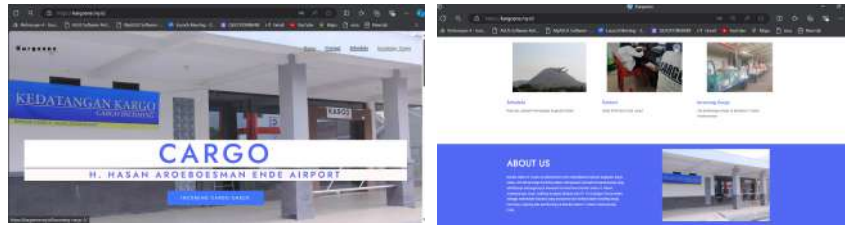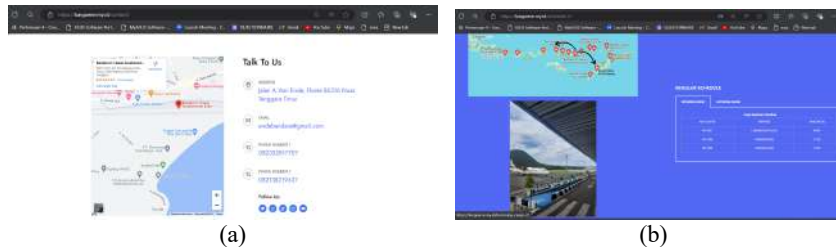
Figure 12. Home Menu Display

(a)   (b)
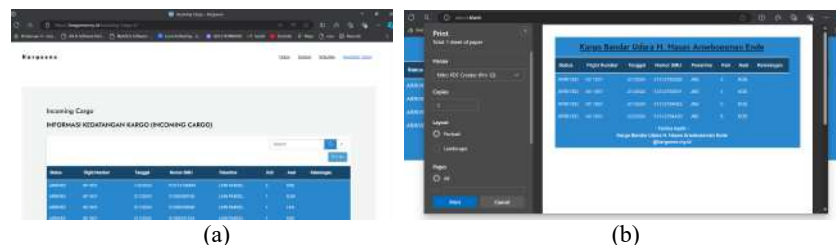Figure 13. (a) Contact Menu Display (b) Schedule Menu

(a)   (b)
Figure 14. (a) Incoming Cargo Menu Display (b) Print Feature

Figures 12, 13, and 14 are the cargo website menu displays via the address https://kargoene.my.id/. This website has 4 (four) pages consisting of:

a) Home, contains information related to the cargo profile of H. Hasan Aroeboesman Ende Airport and air cargo services.

b) Contact, contains contact person information from cargo personnel who can be contacted including social media owned by the airport, as well as the airport address.

c) Schedule, contains information on regular flight schedules at H. Hasan Aroeboesman Ende Airport for three (3) flights using passenger aircraft with Wings Air.

d) Incoming cargo, this menu displays information in the form of incoming cargo data at H. Hasan Aroeboesman Ende Airport in table form. And in this menu there are search and print features for data.

c. Accessing the cargo website via the airport website

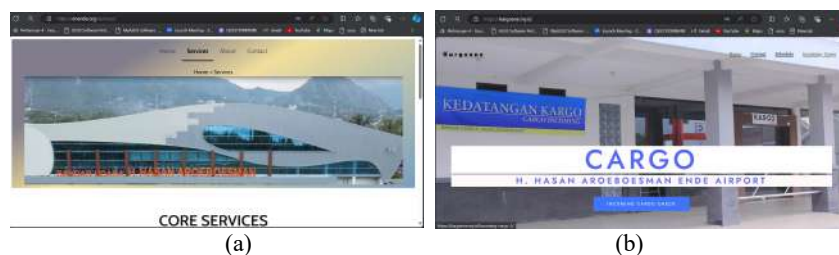(a)   (b)
Figure 15. (a) Ende Airport Website (b) Cargo Website

Figure 15 shows a display of the cargo website of H. Hasan Aroeboesman Ende Airport and the cargo website that has been designed and the cargo website can be accessed via the airport website, namely enende.org, which has been previously integrated and is located in the service menu> cargo service> cargoene.my.id.

3.2 System Testing and Evaluation

1. From the system testing that has been carried out starting from the process of accessing digital forms and websites, inputting incoming cargo data in digital forms then submitting and viewing the results (output) of incoming cargo information on the cargo website that was created to accessing the cargo website from the airport website, all processes ran well (functioning) and there were no errors in the system that had been designed.

2. This evaluation activity was carried out by distributing a google form questionnaire to system users. Before that, a socialization was held via zoom to provide an explanation of how the system works and at the same time as a medium

to distribute questionnaires to participants. The participants were representatives of cargo personnel, airport staff, and users of cargo services at H. Hasan Aroeboesman Ende Airport.Evaluasi Sistem

a. Data Collection (Digital Form)

The questionnaire was distributed to 5 respondents consisting of 2 cargo personnel, and 3 airport website managers (airport staff) as users who can access the data collection system in the form of a digital form to input incoming cargo data. The following is the questionnaire data from respondents to assess the effectiveness of the data collection system (digital form):

Table 5. Digital Form Questionnaire Results Data

NO	Respondent Questionnaire Answer Score					Total Respondents	Total Questionnaire Score (JSK)	Index %	Assessment Interval
	STS (Strongly Disagree)	TS (Disagree)	C (Neutral)	S (Agree)	SS (Strongly Agree)				
	1	2	3	4	5				
Performance									
1	0	0	0	1	4	5	24	96	Very Good
Information									
2	0	0	0	1	4	5	24	96	Very Good
Economics									
3	0	0	0	2	3	5	23	92	Very Good
Control									
4	0	0	0	3	2	5	22	88	Very Good
Efficiency									
5	0	0	0	3	2	5	22	88	Very Good
Service									
6	0	0	0	2	3	5	23	92	Very Good

From table 5, it can be concluded that:

a) The system performance related to the suitability of the digital form link is considered very good with an index of 96%.

b) The information and suitability of the data designed in the system with the data collection needs is considered very good with an index of 96%.

c) The economic benefits of the system are considered very good with an index of 92%.

d) The ease of managing the system is considered very good with an index of 88%.

e) The efficiency of using the system with several features is considered very good with an index of 88%.

f) The ease of accessing the system with various devices is considered very good with an index of 92%.

g) Overall, the average system performance is considered very good with an index of 92%.

b. Evaluasi Sistem Informasi *(Website)*.

The questionnaire was distributed to 20 respondents consisting of 2 cargo personnel, 3 airport website managers (airport staff) and 15 cargo service users at H. Hasan Aroeboesman Ende Airport. The following is the questionnaire data from respondents to assess the effectiveness of the information system (website):

Table 6. Website Questionnaire Results Data

NO	Skor Jawaban Kuesioner Responden					Total Respondents	Total Value	Total Questionnaire Score (JSK)	Index %	Assessment Interval
	STS (Strongly Disagree)	TS (Disagree)	C (Neutral)	S (Agree)	SS (Strongly Agree)					
	1	2	3	4	5					
Performance										
1	0	0	0	8	12	20	92	174	87	Very Good
2	0	0	3	12	5	20	82			
Information										
3	0	0	3	7	10	20	87	178	89	Very Good
4	0	0	0	9	11	20	91			
Economics										
5	0	0	1	8	11	20	90	182	91	Very Good
6	0	0	0	8	12	20	92			
Control										
7	0	0	0	10	10	20	90	176	88	Very Good
8	0	0	2	10	8	20	86			
Efficinecy										
9	0	0	1	9	10	20	89	175	87.5	Very Good
10	0	0	3	8	9	20	86			

Service										
11	0	0	2	11	7	20	85	177	88.5	Very Good
12	0	0	0	8	12	20	92	177	88.5	Very Good

From table 6, it can be concluded that:

a) System performance related to the suitability of website links and ease and speed of data processing is considered very good with an index of 87%.

b) The suitability and accuracy of the information displayed is considered very good with an index of 89%.

c) The economic benefits of the system are considered very good with an index of 91%.

d) Ease of system control and legality of information are considered very good with an index of 88%.

e) Efficiency with a website with sufficient and not excessive information is considered very good with an index of 87.5%.

f) Ease of operation and access to the system with various devices is considered very good with an index of 88.5%.

g) Overall, the average system performance is considered very good with an index of 88.5%.

4   CONCLUSION

In this study, it can be concluded that the incoming cargo Data Collection System and Information System based on the website using the prototype method, for the data collection system in the form of a digital form built using the Clappia platform, while the information system in the form of a cargo website was built using Wordpress. Both systems are integrated by adding the Ninja Table plugin. In addition, the cargo website is also integrated with the website owned by H. Hasan Aroeboesman Ende Airport, on the cargo service menu on the Ende airport website. After that, system testing and system evaluation were carried out with the average results for system performance on the digital form being assessed as very good with an index of 92%, as well as for system performance on the website also being assessed as very good with an index of 88.5%. From this assessment, it can be concluded that the system is running well.

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