

THE DEVELOPMENT OF WEB-BASED TRACKING MANAGEMENT SYSTEM FOR HYERI SERVICES

Timothy R. Baldovino, Romar M. Doria, Lex Albert C. Nasayaw, Ronnel A. dela Cruz

Abstract—The Web-based Tracking Management System for Hyeri Services is developed to help them in providing real time updates to the customers about their package that is consolidated. It also helps them to easily transact with the customers. The customers can use the website in checking the services of Hyeri Services. They can avail the service of consolidating packages through the website. They can easily track their boxes by entering the corresponding tracking number of their box. The project is developed using the agile model. It underwent different types of testing such as functionality testing, browser compatibility testing and Software Usability Measurement Inventory (SUMI), where all the buttons are functioning properly, website runs on the browser smoothly and respondents agreed that the way the system information presented was clear and understandable and they can also act on the information provided by the software. It was also evaluated using ISO/IEC 25010 where the combined rating from IT and Non-IT respondents is 4.56 which means it is functional, efficient, compatible, usable, reliable, secured, maintainable and portable.

Index Terms—Consolidation, tracking, real-time updates.

I. INTRODUCTION

People today have a strong preference for imported goods, which is one of the global trends.^[1] That is why many business-minded people view it as an opportunity and make a business out of it. Tracking system plays a vital role to bridge the sellers and consumers and help them to acquire imported products. A tracking system is one that keeps track of information about moving things. It is quickly becoming an essential tool for businesses that need real-time information about their personnel, fleet, or products. The system enables the business to run smoothly and effectively. Many oil and gas firms, as well as other organizations, are adopting the system in order to save money on operating costs. The position, elevation, and range of the target are continually updated in an ideal system. This system offers convenience and ease in terms of monitoring products especially imported products. That is why businesses that offers these types of products adapts this type of information system.

Hyeri Services is a business that offers packaging consolidation services and is based overseas, specifically in South Korea. Consolidation is the act of consolidating numerous orders into a single tracking number so that all of your products will be delivered in a single, bigger box. In this way instead of paying the shipping fee of each item separately which will cost the customer a lot, they just need to pay for the shipping fee of one box. Upon shipping processes, it is important to a customer to track it so that they will be updated

about the status of the boxes. Since mostly all of their customers are from Philippines, customers are becoming anxious about their orders resulting for repetitive queries about updates every day. One of the common queries from customers is the status of the box. They ask if the box is already shipped out, handed to the courier, if it is already in transit, does the box already arrived at the customs and etc. Hyeri Services has an estimated customer base of 80 people. Some of those customers have more than one boxes so if those 80 customers ask for an update in one day, they will be bombarded with messages. Another query from customers is if the orders arrived already in the warehouse in Korea. Since customers' orders from different shops, then the products do not arrive at the same time. Because of the number of customers, some of are not noticed and it makes the customer worried. These are the problems Hyeri Services are experiencing. To cope up with it, a tracking system that will give a tracking number to each customer for updates and help them to track every item in each of their box will be needed. One-time update will be more efficient than messaging one by one.

The general objective of the project is to develop a web-based tracking management system for Hyeri Services. The project specifically aims: 1) to design a web-based tracking system for Hyeri Services. 2) to develop a system that has the following capabilities: a) can show real time updates provided with a tracking id and its updated status; b) can view and edit status of all items and boxes to ship; c) can view summary of all items and boxes to ship. 3) to test the developed project using functionality testing, cross browser compatibility testing and Software Usability Measurement Inventory (SUMI). 4) to evaluate the developed project using ISO/IEC 25010.

II. RELATED LITERATURE

I. Courier

A courier service is a premium, all-inclusive service that collects and delivers things in the shortest amount of time possible. They are available for online booking and payment. Customers can opt to have a courier pick up their packages, or they can choose to drop them off at a nearby place for the courier to pick up at a scheduled time. Courier services are praised for their quicker turnaround times and tracking capabilities when compared to national mail systems. If you're selling goods online and need a transportation method that can handle several packages, courier services are a great option. There are a variety of options here, ranging from vendors on online marketplaces like eBay, Etsy, and Amazon to well-established national and international companies with an online

presence. Some of the largest online retailers choose to use a specialized courier service for their delivery. Businesses may save money on delivery costs by negotiating a volume discount with a courier.^[2]

II. Packaging Consolidation

Individual shipments from different carriers are combined into a single complete container cargo using the shipping process known as "consolidated shipping." A consolidator joins many tiny items into one bigger box as part of the transportation process known as consolidation. By doing this, they were able to lower the overall shipping costs since, regardless of the final weight of the products, shipping one shipment is less expensive than shipping numerous parcels.^[3]

Retailers and brands are seeking for solutions to combine and send several orders in a limited number of shipping packages. They can save packaging and shipping expenses through effective order consolidation while also offering clients significant convenience and sustainability advantages.^[4]

III. METHODOLOGY AND PROJECT DESIGN

A. Methodology

In order to design, develop, and evaluate the "Web-based Tracking Management System for Hyeri Services," this study is classified as a developmental research. This design analyzes and describes the development process, and then evaluates the finished product. The IPO model shown in Fig 1.

served as the conceptual model of the study. It served as a guide for the proponents to simply identify the requirements needed for the development of the project and to ensure that the proponents are equipped with the necessary requirements to be able to achieve their primary goal which is to create a functional and responsive system. The development of Web-based Tracking Management System for Hyeri Services has four elements which are the input, process, output, and evaluation. Input includes all the requirements needed in the project like the knowledge requirements, software requirements, hardware requirements during development and hardware requirements for implementation. Knowledge requirements includes web development, database management, programming and also the business process of Hyeri Services for better understanding of what has to be done in the system and what needs has to be fulfilled by the developers. As for the software requirements, it includes all the software used in programming and developing the website such as PHP, MySQL, Sublime 3 and Web browser. In terms of hardware requirements, during the development of the system, a computer with the following minimum specifications of 64 bit operating system, 2GB memory, 250GB storage and 2.0 GHz processor were used which is the same for the implementation of the system.

The steps that were taken and the techniques used throughout development make up the process component of Web-based Tracking Management System for Hyeri Services. The project is developed using the Agile model. This method divides the planning, requirement analysis, design, development, testing, and deployment aspects of software development into separate steps. Since there is some connectedness across the stages in this model, it may be assumed that several tasks are carried out concurrently. The customer may evaluate each development iteration's results using the agile methodology, and they can determine whether or not they are satisfied. In the planning and requirement analysis phase, the developers had a brainstorming to come up on what will the system would be like. This is where they discussed with the client to plan on what will happen to the system and what will it do. This is where the roadmap of the project is created to be a guide for the developers. Then they prepared the hardware and software requirements. To identify each user's job and visualize the system, the developers created a use case diagram.

The next phase is where the whole architecture is designed for the future project. Collected requirements was broken down further to make a visual of what should be done and what resources are needed. This helped the developers to gain a sight of how will the whole system will come out. In the development phase, the designed software implements all components and creates its source code. This is the phase where developers started programming. This is where the whole system is developed and saw its functions. They combined all the collected requirements here to make an output which is the developed project.

The testing is carried out by the developers to ensure that the project they designed met its objectives. It assessed the interface to see whether all of its features are operational. This assisted the developers in determining if the system is simple to comprehend and use for the administrator and customer. The

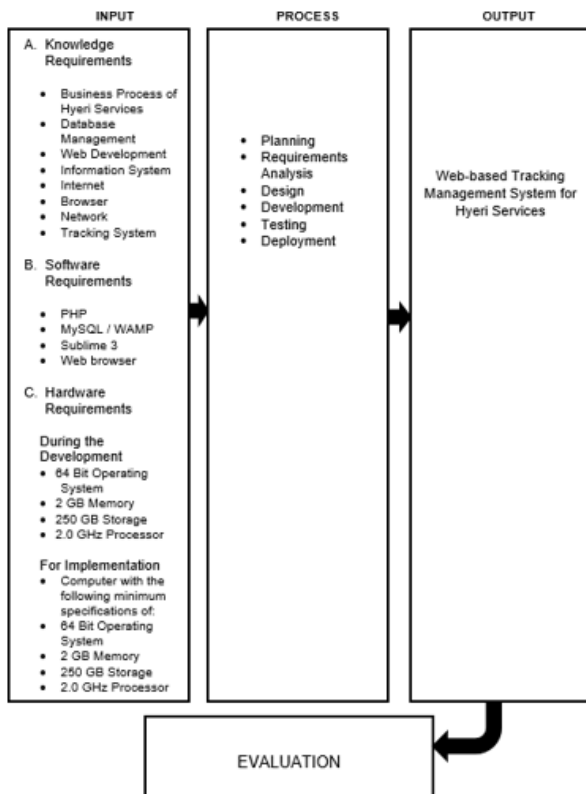


Fig. 1. Conceptual Model.

developers were also able to determine what aspects of the system needed to be improved by testing it. The Web-based Tracking Management System for Hyeri Services undergone different types of testing which are functionality testing, cross browser compatibility testing and Software Usability Measurement Inventory (SUMI). Every development aims to provide satisfaction to its potential users; otherwise, the system will fail to fulfill its intended function. The Software Usability Assessment Inventory (SUMI) was developed to standardize user satisfaction measurement. It's widely used to compare and assess apps, particularly in the field of customer satisfaction.

The developers performed the assessment procedure utilizing ISO/IEC 25010 to evaluate the system's acceptability. This defined which quality traits were taken into account while assessing a software product's attributes. The developed project was evaluated by twenty-five (25) Non – IT respondents and ten (10) I.T Professionals. These Non-IT respondents are the people who always order to online shops, so that they all have the familiarity in ordering and tracking their orders. On the other hand, these IT experts are those people who have expertise in the field of IT and has already created more than 5 projects. The responders were also shown illustrations of the developed system and had discussions about it. They were given enough time to use the system. A questionnaire for a survey was used to obtain the data. The instrument used in this research is adapted from ISO/IEC 25010. The respondents used Google Form to respond to the questionnaire. Questions were designed to be answered using the Numerical Scale of the ISO/IEC 25010. Respondents may answer the items using a scale of 1 (Poor) to 5 (Excellent). The Numerical Scale of the ISO/IEC 25010 is shown in Table I.

Table 1. Numerical Scale of ISO/IEC 25010

Scale	Interpretation
4.51-5.00	Excellent
3.51-4.50	Very Good
2.51-3.50	Good
1.51-2.50	Fair
1.00-1.50	Poor

B. Project Design

The discussion that follows focuses on how the system is designed in terms of what a specific user can do when utilizing it. The Use Case Diagram is shown in Fig. 2.

The administrator and the customer are the two factors that are present in the developed system. The person in charge of the packaging consolidation management system is the only one who can access the whole system (admin) through the admin page. They are responsible in managing the overall records being submitted by the users. The admin will be able to record the information of the customer in the database and use it for shipping details and updates. They can also edit the status of the box so that it will be specific and real time. Admin will be also be able to edit the status of the items ordered by the customer, if it is loaded in the box or not. They will also be able to create a tracking number for the customer to use to track the items to be consolidated and the status of the boxes.

They are the only one who can approve the customer's application to avail the service. The customer is the one who can also access the website aside from the administrator but not

the database. They can submit applications through registration. They can access also the tracking and track the items loaded to their box and the box itself also if it is already shipped out or not. They can also request to ship the box even if it is not full.

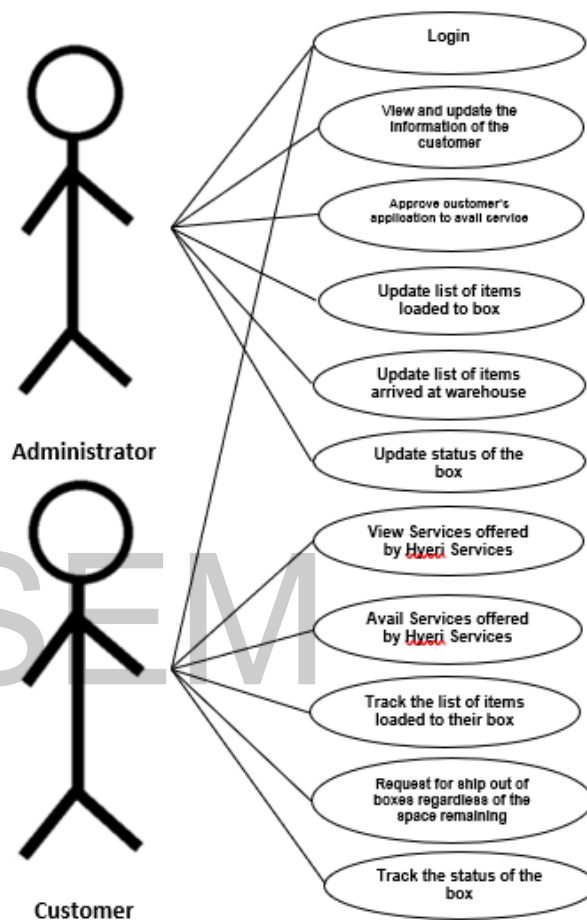
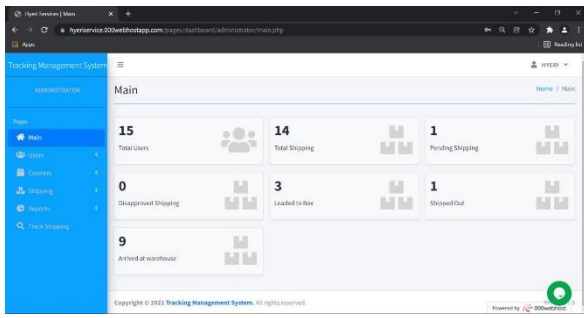


Fig 2. Use Case Diagram.

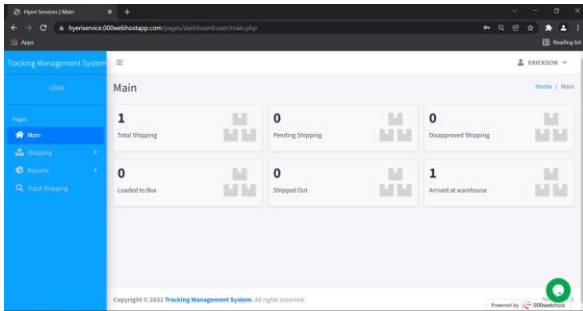
IV. RESULTS AND DISCUSSION

A. Developed System

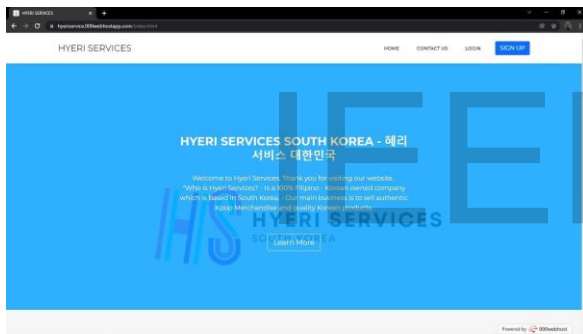
Web-based Tracking Management System for Hyeri Services is a system that helps Hyeri Services and its customers for easy viewing and tracking the parcels consolidated in the warehouse of Hyeri Services in Korea (Fig. 3a). The system is divided into two modules, each of which corresponds to one of the system's users. The admin can use the features of the website to manage it. They can view all the total user and the status of all the orders. They can also add and manage all the users and couriers. Reports can also be viewed and printed here (Fig. 3b). The system additionally enables the user to complete the shipping form in order to use the service. They can also see the status of their order. The activity records are also accessible to them. To monitor the status of their order and track it, they can just enter their tracking number (Fig. 3c).



(a)



(b)



(c)

B. Testing Result

The developers tested the web application to ensure that it satisfied the intended objectives and functionality. The developers used this testing to verify if the interface and all of its features are functional. It is required in order for the developers to determine whether the system is already usable and understood under the supervision of the admin and users.

TABLE II: SUMMARY OF FUNCTIONALITY TEST RESULT

Functionality / Test Scenarios	Number of Test Cases	Remarks
1.Login / Logout	5	5 Passed, 0 Failed
2.Registration	3	3 Passed, 0 Failed
3.Manage Users	2	2 Passed, 0 Failed
4.Manage Couriers	2	2 Passed, 0 Failed
5.Requested Shipping	2	2 Passed, 0 Failed
6.Track Shipping	4	4 Passed, 0 Failed
7.Reports	2	2 Passed, 0 Failed
8.Manage Account	3	3 Passed, 0 Failed

Legend:

Passed - indicates that the actual result of the test meets the expected result.
Failed - indicates that the actual result of the test was different from the expected result.

In order to conduct this test, test scenarios and test cases were created and executed. A list of test scenarios and the number of test cases conducted are shown in Table II. For this testing, a total of 8 test scenarios were generated. Accordingly, 23 test cases in all were completed to evaluate the system's functioning.

The first test scenario was to log in and out. The test cases for providing a valid username and password, entering an invalid username and password, entering one invalid and one valid, and logging out of the system are all included in the Login and Log out test scenario. In the Registration test scenario, entering legitimate information, incorrect information, and submitting blank forms were all put to the test. The third test scenario was carried out to see if the administrator could add, edit, and remove users to update the dashboard and look at all of the pending customers that needed assistance. The Manage Couriers test scenario was conducted to check if the admin and customers can add, change or remove the courier they selected. As for the Requested Shipping test scenario, it was checked if the pending shipping requests appear and can be edited. Track Shipping test scenario on the other hand was conducted to check if the details of the customer will appear if the tracking number was inputted. It was also checked if it will show a package information if a non-existing tracking number was inputted. Reports test scenario was conducted if admin can view and print reports depending on the time frame the admin wants. Lastly for the Manage account test scenario, it was checked if customers can edit and update their information given in the registration. By displaying all of the anticipated results and the post-condition, all test cases executed made a favorable observation. This indicates that every test case and its accompanying test scenario passed the testing carried out.

In this study, a further test was conducted. In order to ascertain the system's compatibility with different web browsers, browser testing was conducted. According to statistics, the five leading browsers are Google Chrome, Microsoft Edge, Mozilla Firefox, Opera and Safari, that is why these browsers were used to the developed project's compatibility. Table III. Summarizes the browser testing results that was conducted.

Table 3. Cross Browser Compatibility Testing Result

Web Browsers	Status/Result	Actual Result	Recommended
Google Chrome	Passed	The size of the images, buttons and design are fitted to screen. The browser responds the quickest.	Yes
Microsoft Edge	Passed	The size of the images, buttons and design are fitted to screen. The browser responds quickly.	Yes
Mozilla Firefox	Passed	The size of the images, buttons and design are fitted to screen. The browser responds quickly.	Yes
Opera	Passed	The size of the images, buttons and design are fitted to screen. The browser responds quickly.	Yes
Safari	Passed	The size of the images, buttons and design are fitted to screen. The browser responds quickly.	Yes

All mentioned browsers passed in the compatibility

testing and runs smoothly. Functions and features worked well but in terms of speed using Google Chrome has the advantage. That is why the proponents recommended the Google Chrome as browser to use when running the developed system which is the Web-based Tracking Management System for Hyeri Services.

The proponents also conducted their final testing using the Software Usability Measurement Inventory (SUMI). To test and measure the usability of the developed project, the developers provided SUMI questionnaires to 25 non-IT respondents. These respondents are the people who always order to online shops, so that they all have the familiarity in ordering and tracking their orders. The questionnaire is answerable by Agree, Undecided and Disagree and is composed of 28 questions. The SUMI testing instrument has 5 aspects which are: efficiency, affect, helpfulness, control and learnability.

Based on a survey of 25 respondents called the Software Usability Measurement Inventory (SUMI), Figure 4 displays the overall percentage of users that are satisfied. The proponents came to the conclusion that there had been a noticeable rise in user satisfaction in all elements of SUMI, including the system's effectiveness, its impact on users, its helpfulness, the simplicity with which it could be controlled, and how quickly it could be learned. A positive outcome from all the testing indicates that the Web-based Tracking Management System for Hyeri Services has functioned according to plan, is interoperable with other products, and has satisfied its users.

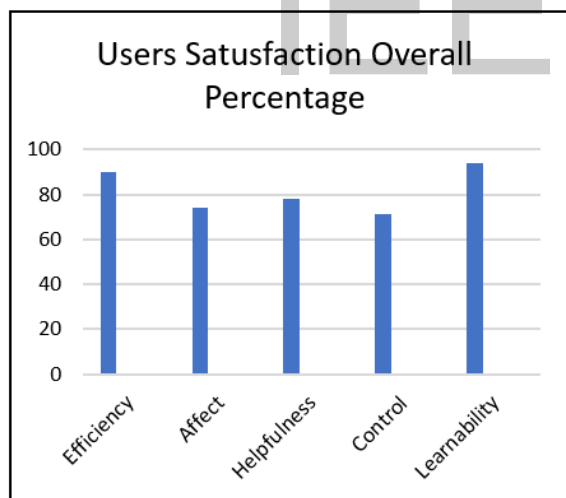


Figure 4. User's Satisfaction Overall Percentage(SUMI)

C. Evaluation Result

The project's success was assessed in terms of the Product Quality Composition using a questionnaire that was modified from the ISO 25010 software quality model. All of the respondents' assessments were combined to produce the final findings. The results of the twenty-five (25) Non-IT respondents ratings are shown in Table V, along with the mean for each criterion and the qualitative interpretation. The table

Table 5. ISO 25010 Evaluation Result of the Non-IT Experts

Criteria	Rating	Interpretation
Function Suitability	4.39	Very Good
Performance Efficiency	4.45	Very Good
Compatibility	4.48	Very Good
Usability	4.39	Very Good
Reliability	4.45	Very Good
Security	4.42	Very Good
Maintainability	4.38	Very Good
Portability	4.45	Very Good
Overall Mean	4.43	Very Good

also displays the overall mean, which is obtained by averaging the means of each of the seven criteria.

With regards to function suitability, the developed project acquired a rating of 4.39 that is equivalent to "Very Good". This means that the developed project is easy to understand, comfortable and convenient to use.

In terms of performance efficiency, the developed project acquired a mean of 4.45 that is equivalent to "Very Good". This means that the developed project enables the tasks to be performed in a quick, effective and economical manner.

When it comes to compatibility, the developed project acquired a mean of 4.45 that is equivalent to "Very Good". This means that the developed project functions without problems or conflict.

In terms of usability, the developed project acquired a mean of 4.39 that is equivalent to "Very Good". This means that the developed project has appealing design to the user.

With regards to reliability, the developed project acquired a mean of 4.45 that is equivalent to "Very Good". This means that the developed project has the capability of being fault tolerant.

In terms of security, the developed project acquired a mean of 4.42 that is equivalent to "Very Good". This means that the project developed is safe and not a threat to devices.

On the other hand, in terms of maintainability, the developed project acquired a mean of 4.38 that is equivalent to "Very Good". This means that the project developed has the ability to sustain changes.

In terms of Portability, the developed project acquired a mean of 4.45 that is equivalent to "Very Good". This means that the developed project is very easy to carry or moved.

Overall, the developed project acquired a rating of 4.43 that is equivalent to "Very Good". Which means that the non-IT respondents generally agree that the developed project is functional, efficient, compatible, usable, reliable, secured, maintainable and portable. Even so, the developed project still has room for improvement especially with the maintainability aspect.

improvement in the usability of the developed project.

V. CONCLUSION AND RECOMMENDATIONS

Table 6. ISO 25010 Evaluation Result of the IT Experts

Criteria	Rating	Interpretation
Function Suitability	4.79	Excellent
Performance Efficiency	4.67	Excellent
Compatibility	4.73	Excellent
Usability	4.59	Excellent
Reliability	4.66	Excellent
Security	4.66	Excellent
Maintainability	4.64	Excellent
Portability	4.67	Excellent
Overall Mean	4.68	Excellent

With regards to function suitability, the developed project acquired a rating of 4.79 that is equivalent to "Excellent". This implies that the developed project is simple to grasp, pleasant to use, and enjoyable to interact with.

The developed project achieved a mean of 4.67, which is equivalent to "Excellent" in terms of performance efficiency. This means activities may be completed quickly, effectively, and cost-effectively with the help of the developed project.

When it comes to compatibility, the developed project acquired a mean of 4.73 that is equivalent to "Excellent". This implies that the developed project runs smoothly and without issues.

The developed project's usability was rated "Excellent" with a mean of 4.59 out of 5. To put it another way, the developed project has a visually pleasing design.

With regards to reliability, the developed project acquired a mean of 4.66 that is equivalent to "Excellent". This signifies that the project has the capacity to withstand failures in the future.

The developed project's security rating was given an average of 4.66, which is considered "Excellent" by the IT experts. There is no danger to gadgets in the project that was built in this way.

On the other hand, in terms of maintainability, the project acquired a mean of 4.64 that is equivalent to "Excellent". As a result, the project established is capable of coping with changes.

In terms of portability, the developed project got a 4.67 out of 5, which is considered excellent. This implies that the finished product is lightweight and portable.

Overall, the project received a score of 4.68, which is comparable to "Excellent" grade. This signifies that the project is functional, efficient, compatible, useable, reliable, secure, maintained, and portable. Even yet, there is still potential for

The Web-based Tracking Management System for Hyeri Services is developed to help them in providing real time updates to the customers about their package that is consolidated. It also helps them to easily transact with the customers. The customers can use the website in checking the services of Hyeri Services. They can avail the service of consolidating packages through the website. They can easily track their boxes by entering the corresponding tracking number of their box. The project underwent several testing. In terms of functionality, all of the buttons were functioning properly according to their functions. While in compatibility testing, the developers would recommend to use Google Chrome because the design matched to the expected requirements and the size of the images and buttons are fitted to screen. Additionally, this browser is the fastest among other browsers and users are more familiar to use this.

The developers used Software Usability Measurement Inventory (SUMI) to measure the usability of the developed project. The twenty-five (25) Non-IT Respondents agreed that the way the system information presented was clear and understandable and they can also understand and act on the information provided by the software. They also agreed that the software has a very attractive presentation.

The developers also conducted an evaluation procedure using ISO/IEC 25010 for evaluating the project. IT Experts rated the developed project with a rating of 4.68 and a rating of 4.43 from non-IT respondents. It means that they generally agreed that the developed project was easy to operate, control and the functions accomplish the specified objectives.

The following recommendations for future developers and system users are included for the project improvement and enhancement. First is to include a record search or classification/ category of shipped items or client orders by date for the ease of actual modification of status.

Another recommendation is to include an option to send to different addresses other than the registered address in the account of the user.

Use JavaScript Alerts for notifications so that administrator can know easily when there are new entries from customers is also recommended.

Lastly, add the tracking feature in the homepage, where in the user do not need to sign- up or sign-in in the system, instead they just only need to input their reference number to track their things.

CONFLICT OF INTEREST

No conflicts of interest are disclosed by the authors.

AUTHOR CONTRIBUTIONS

Timothy R. Baldovino headed the development of the software program, designed the system and wrote the paper; Romar M. Doria gathered the qualified respondents, headed the computation and interpretation of the evaluation, headed the

construction of diagrams, design and graphs and wrote the paper; Lex Albert C. Nasayaw headed the documentation of the system, headed the collaboration with the client which is Hyeri Services and wrote the paper; Ronnel dela Cruz headed and supervised the whole development of the system and write the paper, all authors had approved the final version.

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