Implementation of Scrum Method for Designing Website-Based E-commerce Application
(Case Study: Putra Prabu Workshop)

William Wijaya[1], Fenina Adline Twince Tobing[2]*
[1,2]*Informatics Department, Universitas Multimedia Nusantara*, Indonesia
[1]william.wijaya1@student.umn.ac.id, [2]fenina.tobing@umn.ac.id

Abstract— **The internet is a technology that has now become a major necessity in the world. There are many applications designed using the internet to meet daily needs, such as educational, commercial and other applications. according to DataIndonesia.id the number of motorized vehicles in Indonesia, which according to vehicles in Indonesia reached 141.99 million units in 2021. Bengkel Putra Prabu is a workshop that operates in the city of Prabumulih, Putra Prabu has several problems, such as lack of intensive advertising. Scrum is a software engineering method using agile principles that relies on team collaboration, incremental products and an iteration process to realize the final result. The results show user acceptance of the system system was 76.06% for the Perceived Ease Of Use category, 73.51% for the Perceived Usefulness category, 71.53% for the Atitude Toward Using category, and 71.89% for the Behavioral Intentional category. The conclusion of this research the system that has been created is well received by users.**

Index Terms— **E-commerce; Scrum; Technology Acceptance Model; Website; Workshop Putra Prabu**

I. INTRODUCTION

The internet is a technology that has now become a major necessity in the world. There are many applications designed using the internet to fulfill daily needs, such as educational, commercial and other applications. The advancement of internet-based technology allows buying and selling transactions to be carried out online [1]. Internet-based applications can also be utilized in the field of automotive services. In the automotive world, maintenance services and buying and selling of spare parts are common, and are generally carried out in a place called a workshop. In Indonesia, the important role of workshops can be felt by the number of vehicles used daily by Indonesian citizens [2].

Internet-based applications can also be utilized in the field of automotive services. In the automotive world, maintenance services and buying and selling of spare parts are common, and are generally carried out in a place called a workshop. In Indonesia, the important role of workshops can be felt by the number of vehicles used daily by Indonesian citizens [3].

Bengkel Putra Prabu is a workshop that operates in the city of Prabumulih and has customers who are mostly from South Sumatra. Although it has been in business for 40 years, Bengkel Putra Prabu has several problems, such as less intensive advertising and manual stock checks.

This research seeks to solve the problems experienced by Bengkel Putra Prabu, by introducing internet-based applications in the form of online stores into Bengkel Putra Prabu's business processes. The creation of this application is also one form of improving branding through The most commonly practiced digital [4]. Online stores or commonly known as Ecommerce have become one of the most widely used concepts in the internet world [5]. In this era, many companies and MSMEs promote goods through e-commerce with the concept of customer to customer (C2C) or commonly known as marketplaces such as Tokopedia, Shopee and others, this is to attract customers to buy online [6]. However, the concept of e-commerce marketplace like this is not very suitable for this Putra Prabu workshop because the services offered are not available on the tokopedia or shopee marketplace features. So the type of e-commerce website that will be created uses the business to consumer (B2C) type.

Some research on website design has been done, one of the methods used is the Scrum method. Scrum is a software engineering method using agile principles that relies on team collaboration, incremental product and iteration process to realize the final result. According to Schwaber, Scrum is described as a process of accepting that "the development process is unpredictable" and formalizing the "do what it takes" style of thinking [7]. Research that has applied this method to website development includes "Implementation of Scrum Method on Website-Based Delivery Order Application Development (Case Study on Lombok Idjo Restaurant Semarang)" which contains the development of a delivery website with the scrum method [8]. In addition, there is also a journal that is an inspiration for using what is used, namely a journal entitled "Designing Web-Based Online Sales Applications Using the Scrum Method" which contains

the implementation of scrum in the development of a sales website. This website was created to be one of the efforts to provide a container and market MSME products [9].

Based on previous studies, the method that will be used in this research is to use the scrum method. This scrum method is suitable for use because this method emphasizes transparency in the development process. This can make the owner of the putra prabu workshop able to provide input and create an online business model as desired [10]. There are also other methods that can actually be used, namely the Waterfall method, but this method is more linear during development and is usually used for developments that tend to take longer [11]. Therefore, the Scrum method is the choice for this research because it can make application development in accordance with the wishes of the workshop owner.

II. METHODOLOGY

A. Workshop

A workshop is a place used to carry out repairs, maintenance, maintenance and design and assemble a machine. A workshop can also be defined as a place where technical repairs are made to a product, which in this context, the product in question is a vehicle [12, 13].

B. Website

Website or site is a term for a group of web pages (web pages), which are part of a domain (domain name) or WWW (World Wide Web) subdomain. Websites can only be opened through a browser program such as: Google Chrome, Firefox, Opera and others. Websites have two characteristics, namely Dynamic and static. A dynamic website is a website where the website information is always changing and the website is two-way interactive information from the user and the website. Meanwhile, a static website is a website whose information does not have two-way interactive and the information can only be updated by the developer [14].

C. E-commerce

Electronic Commerce or e-commerce for short is a new land to generate and exploit businesses that use internet networks as a means to support their business activities [15]. E-commerce includes distribution, sales, purchasing, marketing and service of a product carried out through other computer networks [16]. E-commerce also has several types, namely [17]:

1) Consumer to Consumer (C2C)
2) Business to Consumer (B2C)
3) Businessr to Business (B2B)
4) Consumer to Business (C2B)
5) Business to Administration (B2A)
6) Consumer to Administration (C2A)
7) Online to Offline (O2O)

D. Scrum Method

Scrum is a software engineering method that can be used to address complex software development. Scrum is widely used in research and practice to develop systems, this method can also determine the risk and quality of the project created [18]. This method originated from projects which still use the waterfall method where a project is made to improve quality standards and reduce problems that arise instead resulting in a project becoming monotonous [19].
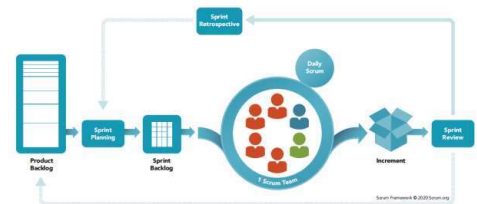

Figure 1. Scrum Method
Source: www.scrum.org

The above is the flow of scrum, the following are the rarities of implementing methods in software development in this scrum concept, namely:

a. Product Backlog At the product backlog stage, the client's needs are grouped to determine the purpose of making the system and designing the project. In addition to explaining problems or issues in a company.

b. Sprint planning The sprint planning stage is the stage for determining the product backlog items to be worked on. This sprint planning aims to determine high priorities that can be done first.

c. Sprint Backlog At this stage of the sprint backlog is a collection of product backlog items that have been identified by the scrum team. This list of items will be worked on by the team during the Sprint.

d. Sprint The sprint stage is the stage where the team will work on the assigned tasks with a predetermined duration during the sprint. The goal of this sprint is to get something done (sprint goal).

e. Daily Scrum This stage is a daily activity in the sprint carried out by the team to check what has been done. This Daily Scrum is also to see what are the obstacles in working on the project.

f. Sprint Retrospective This stage will present the results of the work during 1 sprint period to get suggestions and opinions (feedback) in the work.

g. Increment This stage is the final stage where all work that can be checked and completed to support empiricism at the end of the sprint. This rarity is the stage of the project work that the product owner says must be completed [20, 21].

E. Technology Acceptance Model (TAM)

TAM is one of the most influential extensions of the Theory of Reasoned Act (TRA), in 1989 Davis, Bagozzi, and Warshaw developed this model. This TAM model is considered the most appropriate according to many researchers to determine group readiness for acceptance of information systems and technology in their activities [22]. This TAM method has two factors or perceptions, namely usefulness and ease of use, the perception of usefulness is related to the use of a system that will improve performance while the perception of ease of use is related to the ease of the system to reduce workload. Both perceptions will affect attitude towards and this attitude will also have a positive effect on behavioral intentional [23]. The overall TAM relationship can be shown in Figure 2.
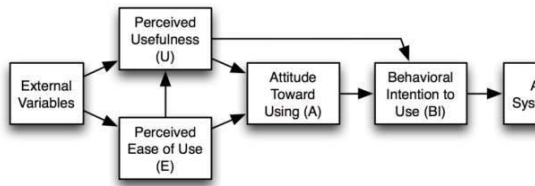
Figure 2. Technology Acceptance Model
Source: id.wikipedia.org

F. Skala Likert

Likert scale is a measurement scale developed by Likert in 1932. Likert scale is used to measure the attitudes, opinions, and perceptions of a person or group in the form of questions that are combined to form a score / value [24]. Likert scale can also be said to be a psychometric scale that is commonly used in questionnaires. In the Likert scale there are two questions, namely positive and negative. Positive questions are scored 5,4,3,2, and 1 while negative are scored 1,2,3,4, and 5 [25].

TABLE I. Likert Scale

Skala	Category
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Calculation of scores from the Likert scale can be calculated using the following formula:

$$Persentase = \frac{(STS*1) + (TS*2) + (N*3) + (S*4) + (SS*5)}{number\,of\,questions*5*n} * $$

Description:

- STS = Number of answers strongly disagree.

- TS = Number of disagree answers.
- N = Number of neutral answers.
- S = Number of answers agreed.
- SS = Number of answers strongly agree.
- n = Number of respondents.

From the calculation results of the formula, grouping can be done in intervals as in Table II.

TABLE II. Likert Scale Interval

Category	Interval
Strongly disagree (STS)	0% - 19.9%
Disagree (TS)	20% - 39.9%
Neutral (N)	40% - 59.9%
Agree (S)	60% - 79.9%
Strongly Agree (SS)	80% - 100%

G. Cronbach Alpha

Cronbach Alpha is a reliability test to measure the variables used in the research questionnaire whether they are appropriate [26]. The calculation of the score of Cronbach alpha can be calculated using the following formula:

$$r = \frac{k}{(k-1)}\left[1 - \frac{\Sigma si^2}{\Sigma st^2}\right]$$

Description:

- r = Instrument reliability coefficient.
- k = Number of questions.
- $\Sigma si2$ = Variance of each question.
- $\Sigma st2$ = Varians total.

From the calculation results of the formula, grouping can be done in intervals as in Table III.

TABLE III. Cronbach Alpha Interval

Kategori	Alpha
Less Reliable	0.0 - 0.20
Moderately Reliable	0.201 - 0.40
Quite Reliable	0.401 - 0.60
Reliabel	0.601 - 0.80
Strongly Reliabel	0.801 - 1.0

III. METHODOLOGY

In the research of website-based e-commerce development, the Scrum method is used. Scrum is included in agile software development which is considered to produce good software quality in accordance with user desires [8]. The following steps are taken in this research, among others.

A. Requirements Analysis

On the e-commerce website that will be built, there are several pages and several features needed. Based on the results of discussions with the Product Owner, there are three actors concerned, namely Admin, User, and Guest. The following requirements are owned by each actor:

1. ADMIN

• Admin can access the website.
• Admin can access the admin-only page.
• Admin can Create and Read on the product list page.
• Admin can delete the product list on the product detail page
• Admin can do Read and Update on order data.

2. USER

• Users can access the website.
• Users can login and register an account.
• Users can place product orders on the home page.
• Users can see the history of orders that have been made by the user himself.
• User can see the order status on the history page.

3. GUEST

• Users can access the website.
• Users can login and register an account.
• Users can place product orders on the home page.
• Users can see the history of orders that have been made by the user himself.
• User can see the order status on the history page.

B. System Design

The system design process includes the workflow of the Putra Prabu e-commerce system in the form of Database Schema, DFD (Data Flow Diagram), and Flowchart.
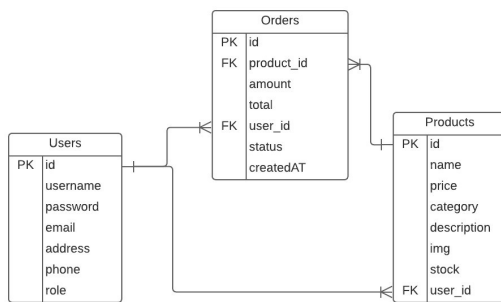
1. Database Schema

Figure 3. Database Schema
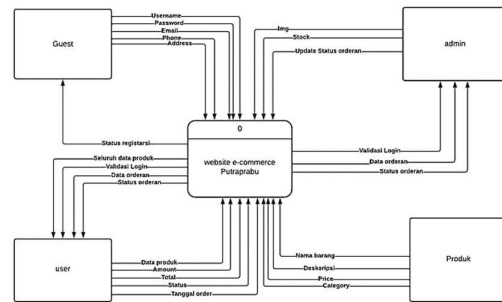
2. Data Flow Diagram (DFD)
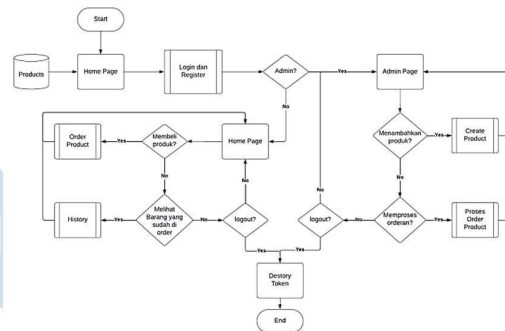

Figure 4. Data Flow Diagram level 0
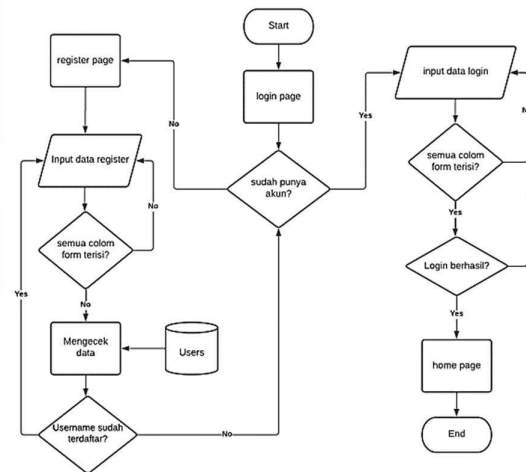
3. Flowchart

Figure 5. Main Flowchart

Figure 6. Login and register flowchart

Figure 7. Flowchart proses order product
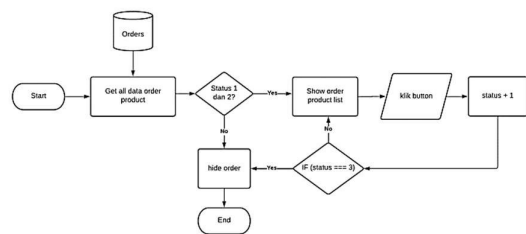
Page		
Integration Detail Product Page	4	2
Integration Admin Page	5	3
Integration Create Product Page	3	2
Integration Order Page	3	2
Integration History Page	2	2

B.   Sprint

The sprint iteration process was carried out as many as 8 iterations starting from April - June 2023. This sprint process will continue to be carried out repeatedly until the application is complete.

I.   Sprint 1 (April 1, 2023 - April 8, 2023)
a)   Daily Scrum
- April 3, 2023: Creating react and installing the necessary packages.
- April 5, 2023: UI navigation bar has been completed without any obstacles during the work. Then immediately continued by working on the UI home page section, in this home page section, the header section and why us section have been completed.
- April 6, 2023: Continue to create the contact us component and product list. There are no obstacles in the process.
- April 7, 2023: Creating the footer component on the home page. There were no obstacles in the process.

b)   Sprint Review & Sprint Retrospective
In this sprint there is input for the addition of logos and color changes.

II.   Sprint 2 (April 9, 2023 - April 15, 2023)
a)   Daily Scrum
- April 10, 2023: Creating the product detail page UI has been completed without any obstacles during the work.
- April 11, 2023: Creating the admin page UI has been completed without any obstacles during the work.
- April 13, 2023: Creating the Create Product Page UI has been completed without any obstacles during the work.

b)   Sprint Review & Sprint Retrospective
In this sprint there is no feedback.

III.   Sprint 3 (April 16, 2023 - April 22, 2023)
a)   Daily Scrum
- April 17, 2023: Creating the Order Page UI is almost complete. There is an obstacle where the image crosses the boundary of the box card that has been created.
- April 19, 2023: Creating the History Page UI has been completed without any obstacles during the work.

C. System Development

The system development process is carried out using PERN Stack, PERN Stack is a combination of PostgreSQL as a database, ExpressJS as a backend especially API, React as a front end, and NodeJS as javascript to run the server. At this stage, the Scrum method will also be applied, the Scrum method used includes making Product backlogs and sprints which have sprint planning, sprint backlogs, daily scrums, and retrospective sprints and Sprint reviews. This Scrum method will be carried out repeatedly until the system development is complete or what is commonly referred to as a sprint. Evaluation of this system will be carried out by means of a survey distributed to employees of the Putra workshop. Prabu and people in South Sumatra province who know the Putra Prabu workshop to measure the level of the Technology Acceptance Model (TAM).

IV.   Results and Discussion

A. Scrum Implementation

A.   Product Backlog Creation

At the initial stage of the Scrum method is to create a product backlog, at this stage the determination of the product backlog is directly discussed with the product owner. The product owner in question is the owner of the Putra Prabu workshop. The process of making this product backlog using Trello. There are 21 product backlogs with scope numbers between 1-8, where scope number 8 is the most difficult level to work on. The following product backlog created can be seen in Table IV.

TABLE IV. Product Backlog

Product Backlog	Estimated Time (hours)	Scope
UI Navigation Bar	2	1
UI Home page	14	2
UI Login Page	2	1
UI Register Page	2	1
UI Detail Product Page	4	1
UI Admin Page	10	2
UI Create Product Page	2	2
UI Order Page	4	1
UI History Page	3	2
ERD	1	2
Database	1	2
API	48	8
Integration Navbar	3	2
Integration Home Page	5	3
Integration Login Page	2	3
Integration Register	2	3

- April 20, 2023: Creating ERD has been completed without any obstacles during the work.

b)   Sprint Review & Sprint Retrospective
In this sprint there is input such as the addition of text.

IV.   Sprint 4 (April 30, 2023 - May 6, 2023)
a)   Daily Scrum
- May 1, 2023: Creating react for API and installing the necessary packages.
- May 2, 2023: Installing pgadmin4 and creating a database according to the ERD that has been made. The creation has been completed and there are no obstacles during the work.
- May 3, 2023: API creation for login and register. During the process, there were obstacles in using tokens and encrypting passwords.
- May 5, 2023: Continue working on the login and register API. The work has been completed.
- May 6, 2023: Continue making APIs for products. The work has been completed without any obstacles during the work.

b)   Review & Sprint Retrospective
In the evaluation of sprint 4, the work done was not in accordance with the schedule during the sprint, which will be continued in the next sprint.

V.   Sprint 5 (May 7, 2023 - May 13, 2023)
a)   Daily Scrum
- May 1, 2023: Creating react for API and installing the necessary packages.
- May 2, 2023: Installing pgadmin4 and creating a database according to the ERD that has been made. The creation has been completed and there are no obstacles during the work.
- May 3, 2023: API creation for login and register. During the process, there were obstacles in using tokens and encrypting passwords.
- May 5, 2023: Continue working on the login and register API. The work has been completed.
- May 6, 2023: Continue making APIs for products. The work has been completed without any obstacles during the work.

b)   Sprint Review & Sprint Retrospective
The results that have been done are not shown to the product owner because the product owner does not understand programming Instead, only explain in general what has been done.

VI.   Sprint 6 (May 14, 2023 - May 20, 2023)
a)   Daily Scrum
- May 15, 2023: Integrating the register page on this page is done by integrating the form that has been created to run the account register. The work has been completed without any obstacles during the work.
- May 17, 2023: Integrating the login page on this page is done by integrating the form that has been created to run the login. The work was hampered due to other work.
- May 18, 2023: Continuing the integration of the login page. The work has been completed without any obstacles during the work.
- May 19, 2023: Integrating the detail product page on this page is done by integrating the display of images, descriptions, and other data. The work has been completed without any obstacles during the work.

b)   Sprint Review & Sprint Retrospective
In this sprint there is no feedback.

VII.   Sprint 7 (May 21, 2023 - May 27, 2023)
a)   Daily Scrum
- May 22, 2023: Integrating the admin page on this page is done by integrating the product list display. The work has been completed without any obstacles during the work.
- May 23, 2023: Integrating the create product page on this page is done by integrating the form that has been created. The work has been completed without any obstacles during the work.
- May 24, 2023: Integrating the order page on this page is done by integrating the card product that has been created. The work has been completed without any obstacles during the work.
- May 25, 2023: Integrating the history page on this page is done by integrating the tables that have been made. The work has been completed without any obstacles during the work.

b)   Sprint Review & Sprint Retrospective
In this sprint there are inputs such as creating history for admins, changing alert notifications, improving history, adding modal boxes and cancel order features. For performance evaluation, it is hoped that there will be no obstacles in the process and it is expected that.

VIII. Sprint 8 (May 28, 2023 - June 15, 2023)
a)   Daily Scrum
- May 30, 2023: Added danger and success alerts on various pages. The work has been completed without any obstacles during the work.
- June 1, 2023: Creating a history admin page. The work has been completed without any obstacles during the work.
- June 7, 2023: Creating a modal box. The work has been completed without any obstacles during the work.
- June 14, 2023: Adding a cancel button to user history. there are obstacles where this feature has not been completed where stock data cannot be added if the user cancels the order and there are obstacles to the report deadline.
- June 15, 2023: Continuing the cancel button on user history. The work has been completed where the button function is in accordance with its function.

b)   Sprint Review & Sprint Retrospective

In the evaluation of sprint 8 the work done was almost according to the schedule during the sprint. All product backlogs have been completed. There are no changes to the product backlog anymore that have been done. For performance evaluation, it shows a consistent speed even though there are several sprints that experience extended work and cannot be completed on the product backlog.
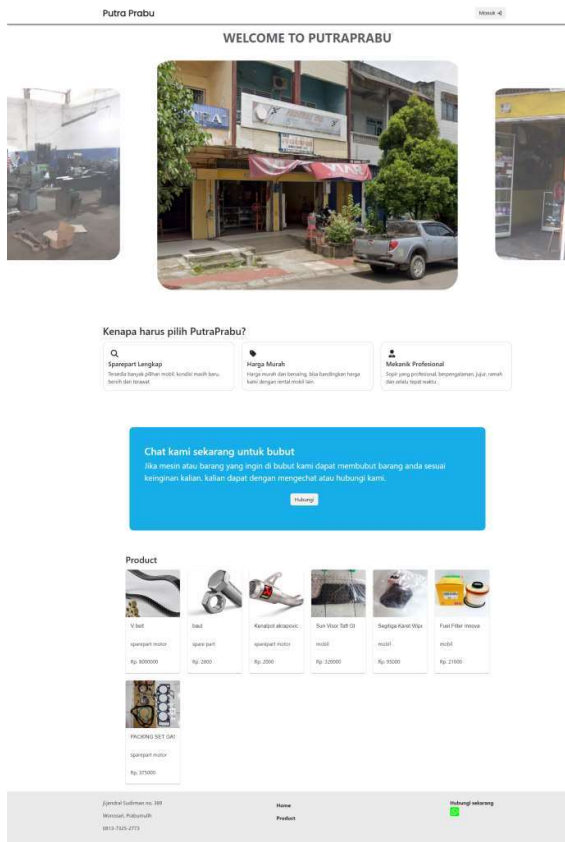
B. Result System

Figure 8. Home Page

The appearance of the home page which has a navbar and header in the form of a carousel image, why us, contact us, product list and footer.
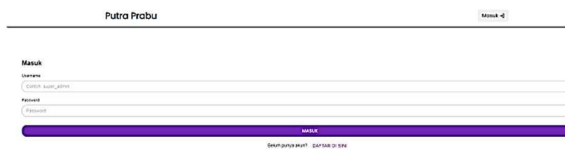
Figure 9. Login Page

Figure 9 views of the login pages. Which is where user login and register.
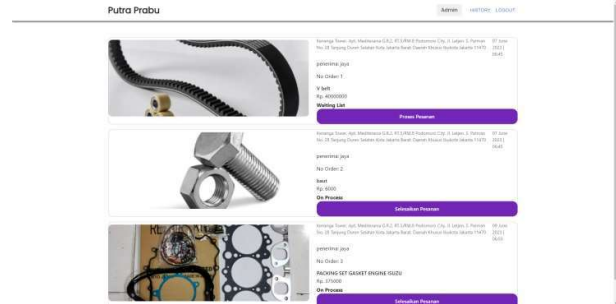
Figure 10. Order Page

Figure 10 shows the order page that can only be accessed by the admin. This page is used by admin to process orders from users.
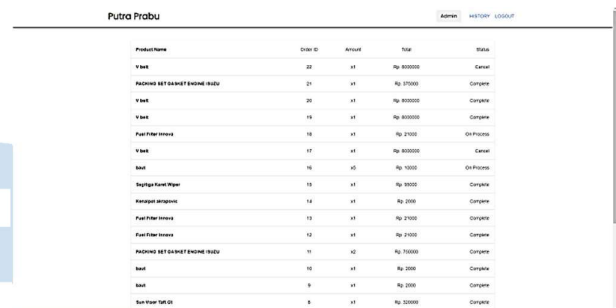
Figure 11. Hisotry Admin page

Figure 11 is admin-only history page where all order data from all users will be displayed.

C. Evaluasi

After implementing the system, an evaluation process of the system was carried out with the aim of measuring the level of user acceptance based on the Technology Acceptance Model (TAM) theory. This evaluation uses a questionnaire via Google Form. The number of respondents obtained was 37 people consisting of 5 employees of the Putra Prabu workshop and 32 people who had tried the application. Table V shows all questionnaire calculations that have been divided by category.

TABLE V. Rekapitulasi Kuesioner per kategori

No	Category	STS	TS	N	S	SS
1	Perceived Ease Of Use	0	6	87	118	48
2	Prerceived Usefulness	0	6	68	96	16
3	Atitude Toward Using	3	6	36	56	10
4	Behavioral Intentional	0	9	37	55	10

1) TECHNOLOGY ACCEPTANCE MODEL (TAM)

$$P_{PEU} = \frac{(0*1)+(6*2)+(87*3)+(118*4)+(48*5)}{7*5*37} * 100\% = 76.06\%$$

$$P_{PU} = \frac{(0*1)+(6*2)+(68*3)+(96*4)+(16*5)}{5*5*37} * 100\% = 73.51\%$$

$$P_{ATU} = \frac{(3*1)+(6*2)+(36*3)+(56*4)+(10*5)}{3*5*37} * 100\% = 71.53\%$$

$$P_{BI} = \frac{(0*1)+(9*2)+(37*3)+(55*4)+(10*5)}{3*5*37} * 100\% = 71.89\%$$

The results of the percentage calculation are grouped based on the percentage inteval. Table VI shows the results of the percentage score per category based on the interval.

TABLE V. Interval Persentase Skor Kategori

Category	Percentage	Description
Perceived Ease Of Use	76.06%	Deal
Perceived Usefulness	73.51%	Deal
Attitude Toward Using	71.53%	Deal
Behavioral Intentional	71.89%	Deal

2) Cronbach Alpha Reliability Test

Figure 12. Desain for Orde

Then the reliability value can be calculated as follows:

$$r = \frac{18}{(18-1)}\left[1 - \frac{10.25}{48.36}\right] = 0.834$$

From the results of the above calculations, the Cronbach alpha value is 0.834. Based on the interval table, the value is included in the Very Reliable level.

V. CONCLUSION

Based on the research that has been done, the following conclusions can be drawn:

1. Putra Prabu workshop e-commerce system based on the website has been successfully designed and built with the scrum method. In the development process, 8 sprints were carried out by the scrum master. With the application of the scrum method, system development can be more timely and organized.

2. From the results of evaluations that have been carried out to 37 people using the Technology Acceptance Model (TAM) method, 76.06% for the Perceived Ease of Use category, 73.51% for the Perceived Usefulness category, 71.53% for the Attitude Toward Using category, and 71.89% for the Behavioral Intentional category. It can be concluded that the system that has been made agrees to be accepted by users.

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