Agile Implementation for Inventory (Case study: Business unit of Private University)

Cempaka Ananggadipa Swastyastu [1], Ratna Nur Tiara Shanty [2,*], Rika Puspita Sari [3], and Anggit Wikanningrum [4]

[1,2,4] Department of Informatics Engineering, Universitas Dr. Soetomo, Indonesia
[3] Department of Accounting, Universitas Dr. Soetomo, Indonesia
* Corresponding author: ratnanurtiara@unitomo.ac.id

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Abstract

The Unitomo Employee and Lecturer Business unit in the city of Surabaya, Indonesia, has several problems arising from the implementation of a manual system in the form of a paper-based system, which has the potential risks, such as 1) Damage and Risk of data loss, 2) Ineffectiveness in making reports; 3) Increased risk of human error caused by transaction volume, lack of management, and non-integration data; 4) Limited user accesses to the ledger, Time-consuming processes, and no col-laboration. This research aims to overcome this problem by developing an inventory recording system using an Agile approach with the Scrum framework, PHP with the Slim 3 framework, MySQL, black box testing, and adding revenue and sales features as a difference from previous research. The re-search results show that the system developed was successful in helping Unitomo Business unit em-ployees and lecturers overcome their problems, especially in monitoring the amount of inventory stock. The proposed system has features for recording incoming and outgoing goods transactions and sales and income reports. The use of the Agile Scrum method in software development helps teams in pro-ject planning and monitoring progress throughout the design process.

Keywords: Agile, Business unit, paper-based system, Scrum, system inventory.

1. Introduction

The Unitomo Employee and Lecturer Business unit is at the University of Dr. Soetomo (Unitomo) Surabaya, Indonesia. This business unit provides various products for the needs of its members, consisting of the academic community at Dr. University. Soetomo Surabaya. This business unit was founded in 1981 under the Utama Scholar Foundation. Since its founding, this business unit has adopted a manual system in all recording processes, starting from purchases, sales, outgoing goods, and incoming goods using paper-based ledgers (hardcopy or paper-based systems). The implementation of this manual system has an impact that causes several problems, including 1) Risk of data loss and damage (Kholifaturrahman et al., 2023); Less effective and prone to errors in making reports (Rochman et al., 2018); 3) Increased risk of human error as transaction volume increases (Akesinro & Adetoso, 2016); 4) The process takes a long time, limited access, lack of integration, scalability problems, and inefficiencies in collaboration (Kaluvakuri & Amin, 2018). When there are problems with recording and reporting, it will cause new problems regarding inventory information. Inventory recording is critical to determine the availability of business entity assets in managing purchase and sales transactions (Arlindayani et al., 2022). Good inventory management ensures product variety, maintains appropriate inventory levels, and prevents customers from switching elsewhere (Sridhar et al., 2021).

Similar problems have been studied, including 1) Sridhar et al. (2021) proposed using the OptQuest module to optimize an inventory management system through a simulation model using Arena simulation software. Results show significant improvements in inventory management; 2) Muyunda & Phiri (2016) designed the RFID Grain Inventory Management System (RFID-GIMS) model to eliminate paper-based manual

systems, as well as minimizing theft; 3) Apolonio & Norona (2021) propose adapting supply chain automation 4.0 barcoding to overcome the problem of inventory accuracy and check in check out (CICO) in the beverage industry. The goal is to reduce long processing times and inventory inaccuracies. The proposal succeeded in improving inventory accuracy and CICO processing time; 4) Oliverio et al. (2023) introduced Enterprise Resource Planning (ERP) using the Business Process Reengineering methodology to overcome errors and inefficiencies caused by implementing manual processes in rubber companies in the Philippines. The goal is to increase efficiency, provide real-time data, and consolidate department processes to respond more to client needs. As a result, lead time can be reduced from 243 minutes to 40 minutes, resulting in significant improvements in process effectiveness and productivity as well as increasing the company's VS ratio; 5) Eme et al. (2018) developed software that can provide warnings every time a drug expires and when the minimum quantity of each drug is available in stock using Rapid Application Development (RAD), Visual Basic 6.0 and Microsoft Access. The aim is to reduce the problem of inconsistency and inaccuracy of sales and drug data inherent in manual systems in pharmacies; and 6) Dewi et al. (2021) developed a Point of Sales (POS) system to overcome potential risks in data management and security arising from the use of manual systems or paper-based recording. The goal is to record sales, manage inventory, print invoices, and calculate profits. This POS development uses Agile with the SCRUM framework, PHP using the CodeIgniter framework, and MySQL. The results of system functionality testing show a success rate of 96.15%.

Based on this explanation, this research proposes a web-based inventory recording system. This system is based on research by Setiawan & Oktavia (2022), who developed a desktop-based inventory application system at the PLN Pusdiklat Employee Business unit by implementing Agile and XP (Extreme Programming), Netbeans, and MySQL. The system features developed by Setiawan & Oktavia (2022) consist of user pages, master data, incoming goods, outgoing goods, ordering goods, incoming goods reports, outgoing goods reports, and goods purchased reports. Meanwhile, this research will add income and sales features. This research aims to resolve the problems faced by the Unitomo Data Employee and Lecturer Business unit. To realize this goal, this research uses the Agile method with the Scrum framework as the development method, PHP with the Slim 3 framework as the programming language, MySQL as the database, and Blackbox as the testing. Agile was chosen, hoping this information system development activity could produce a quality information system quickly (Dewi et al., 2021). In the Scrum Model, users are actively involved in the information system development process so that the resulting information system can meet user needs (Agarina et al., 2020).

2. Methods

The method used in research is the Agile method. The Agile method is a development method in which the development process is broken down into various short development series (called "iterations" or "sprints"), where each cycle usually consists of 2 to 4 weeks (Terho et al., 2017). This method is said to be fast in software development because it allows the team to collaborate and make corrections during the ongoing development process. This method can also quickly adapt to system development changes without reducing the system's quality.

One of the developments of the Agile method is the Scrum Method, where the Scrum method itself is a development method that is based on a team, where additional product processes and software development focus on speed without having to spend a long time to realize the final result (Naz et al., 2016). The main goal of Scrum is to see existing problems and then adapt to these problems (Wrike, 2015).

In Scrum, there are main roles. The function of this role is to ensure the success of a project. This role consists of Baumgart et al. (2015):

1) Product Owner
   The product owner is a role that focuses on product success by maximizing the value of the software product. The product owner is tasked with exploring user needs and creating and managing the product backlog.
2) Scrum Master
   Play a role in ensuring development activities follow the Scrum process. The scrum master facilitates all activities within the scrum. This role also helps the development team and product owner work collaboratively in Scrum.
3) Development Team
   It is a team tasked with creating software. Consisting of various roles, such as analyst, software developer, UI designer, quality assurance, etc.

The Scrum development process can be implemented by fulfilling the roles in Scrum. The Scrum method consists of several steps (Nurmaizal et al., 2023), including:

1) Product Backlog
   The Scrum method's first step is to find out the needs of users or system users. The data collection process can use several methods, one of which is direct interviews. The result of this preparation is data for user needs.

2) Sprint Planning
   At this Sprint Planning stage, data and information obtained from users in the previous stage are collected and analyzed to determine the features needed in the system. Each sprint is tailored to the required features.

3) Daily Scrum
   As the name suggests, the Daily Scrum stage is a daily meeting in which each team member discusses the progress and adjusts the Sprint Backlog if necessary. Daily Scrum can also be interpreted as brainstorming, minimizing misunderstandings and reducing the risk of errors in product development, identifying obstacles early so that you can take the necessary actions to speed up progress and avoid delays, and promoting quick decision-making so that the team can avoid situations where the Scrum master has to hold extra meetings that hinder productivity.

4) Sprint Review
   The Sprint Review stage is essential in the Agile methodology (Crowd, 2021). At this stage, a meeting is held to review the results of the completed Sprint and evaluate whether the Sprint Goal has been achieved. At this meeting, the results of the Scrum Master's work are presented to stakeholders, users, and product managers. Discussions are opened regarding what has been achieved, obstacles encountered during the Sprint, and user and stakeholder feedback.
   After discussing the Sprint results, it is determined whether the Sprint Goal has been achieved. If the Sprint Goal has been completed, the Scrum master's performance in achieving the Sprint Goal will be evaluated as ways to improve performance in the next Sprint. However, if the Sprint Goal has yet to be achieved, changes needed in the next Sprint will be considered.

Task		Status	Priority
> Designing Business Process Modeling Notation 3	⊕	Backlog	High
> Designing UML 2	⊕	Backlog	High
> Creating Database 2	⊕	Backlog	High
> Developing Item Management (Master Barang) 2	⊕	Backlog	High
> Developing Item Category Management (Master Kategori Barang) 2	⊕	Backlog	High
> Developing Admin Account Management (Master Akun Admin) 2	⊕	Backlog	Medium
> Developing Casheer Account Management (Master Akun Kasir) 2	⊕	Backlog	Medium
> Developing Sales Transaction Feature (Transaksi Penjualan) 2	⊕	Backlog	Medium
> Developing a feature for creating Sales Receipt (Submit | Grand Total) 2	⊕	Backlog	Medium
> Developing a feature for creating Sales Report (Laporan Penjualan) 2	⊕	Backlog	Medium
> Developing a feature for creating Income Report (Laporan Pendapatan) 2	⊕	Backlog	Medium
> Developing Stock Checking features (Pemeriksaan Stok) 2	⊕	Backlog	Low
> Developing Stock Transaction Tracking Features (Penelusuran Transaksi Stok) 2	⊕	Backlog	Low
> Developing General Settings (Pengaturan Umum) 2	⊕	Backlog	Low
+ Add task			

Fig. 1. Product backlog.

5) Sprint Retrospective
   After the Sprint Review is completed, a meeting is held to reflect on the completed Sprint and evaluate how work occurred during the Sprint. The discussion focused on increasing efficiency and

effectiveness in achieving the Sprint Goal. During the Sprint Retrospective, evaluate how things work and consider changes that must be implemented to improve performance in the next Sprint.

At this stage, there is a discussion about what has been done during the Sprint. This discussion process is carried out to determine which processes have been implemented well and which ones need to be improved. This process is a way to improve product quality by improving work processes and ensuring that the Definition of Done is met (Magdalena, 2023).

3. Results and Discussion

Implementation of software development using the Scrum method is carried out following the steps in this method. Before entering into determining the product backlog, an interview process is carried out with users to determine the business unit's business processes. This initial data collection process is to determine the condition of the Unitomo Lecturer and Employee Business unit. This business process will later determine the features needed in the application.

3.1. Product backloging

This is the first stage of the Scrum development method. The Product Backlog is formulated by the Product Owner and used as a software development reference. This Product Backlog is used to plan what is needed by the system. The Product Backlog is determined from the results of interviews, which determine several needs, which will then be implemented according to the priority scale. The product backlog can be seen in Fig. 1.

In Fig. 1, you can see the priority scale for each backlog, where P0 is a high-priority scale, P1 is a medium-priority scale, and P2 is a low-priority scale. The design becomes the most prioritized by determining this priority scale. Continue with the planning process of the application.

	Task		Status ⓘ	Priority	Estimate Days
☐	› Designing Business Process Modeling Notation 3	⊕	Backlog	High	2
☐	› Designing UML 2	⊕	Backlog	High	7
☐	› Creating Database 2	⊕	Backlog	High	7
☐	› Developing Item Management (Master Barang) 2	⊕	Backlog	High	3
☐	› Developing Item Category Management (Master Kategori Barang) 2	⊕	Backlog	High	3
☐	› Developing Admin Account Management (Master Akun Admin) 2	⊕	Backlog	Medium	3
☐	› Developing Casheer Account Management (Master Akun Kasir) 2	⊕	Backlog	Medium	3
☐	› Developing Sales Transaction Feature (Transaksi Penjualan) 2	⊕	Backlog	Medium	3
☐	› Developing a feature for creating Sales Receipt (Submit | Grand Total) 2	⊕	Backlog	Medium	1
☐	› Developing a feature for creating Sales Report (Laporan Penjualan) 2	⊕	Backlog	Medium	3
☐	› Developing a feature for creating Income Report (Laporan Pendapatan) 2	⊕	Backlog	Medium	3
☐	› Developing Stock Checking features (Pemeriksaan Stok) 2	⊕	Backlog	Low	3
☐	› Developing Stock Transaction Tracking Features (Penelusuran Transaksi Stok) 2	⊕	Backlog	Low	3
☐	› Developing General Settings (Pengaturan Umum) 2	⊕	Backlog	Low	2
☐	+ Add task				
					46 sum

Fig. 2. Sprint planning.

3.2. Sprint planning

At this Sprint Planning stage, data and information obtained from users in the previous stage are collected and analyzed to determine the features needed in the system. Sprint planning aims to determine the duration of one sprint. The formulation of sprint planning is carried out by the Scrum Master and the Development Team and supervised by the Product Owner.

Sprint Planning in Fig. 2 shows that the Product Backlog worked on in Sprint 1 focused on observation, data collection, analysis and system design, and database design. Product Backlog Sprint 2 focuses on working on features for the admin role. This feature includes creating item master features, item category master features, admin account management, and cashier account management. Product Backlog Sprint 3 focuses on working on features for the cashier role, namely transaction pages for purchased product items and their quantities, printing sales receipts, and a feature to view a list of sales transactions that have been carried out so far.

Table 1

Daily Scrum.

Name	Start Date	End Date	Problems	Completed Days
User Requirements and Business Process Gathering	2023-10-09	2023-10-10	Approval of the description and analysis of business processes took longer than planned due to several changes from the user side	5
Describe and analyze existing system	2023-10-10	2023-10-12	-	
Create a Business Process Modeling Notation Diagram	2023-10-12	2023-10-13	BPMN creation depend on the approval from the user for the proposed new business process	
Creating Flowchart Diagram	2023-10-13	2023-10-16	-	7
Creating Use Case, Sequence, Activity Diagram	2023-10-16	2023-10-23	-	
Creating CDM, PDM	2023-10-23	2023-10-26	-	7
Creating Database based on CDM, PDM	2023-10-26	2023-10-31	-	
Design and Code: Item Management (Master Barang)	2023-10-31	2023-11-01	-	4
Testing: Item Management (Master Barang)	2023-11-01	2023-11-03	There are some discrepancies with the diagram	
Design and Code: Developing Item Category Management (Master Kategori Barang)	2023-11-03	2023-11-06	-	4
Testing: Item Category Management (Master Kategori Barang)	2023-11-06	2023-11-08	There are bugs in several actions in the item category feature	
Design and Code: Admin Account Management (Master Akun Admin)	2023-11-08	2023-11-09	-	3
Testing: Developing Admin Account Management (Master Akun Admin)	2023-11-09	2023-11-10	-	
Design and Code: Casheer Account Management (Master Akun Kasir)	2023-11-10	2023-11-13	-	3
Testing: Casheer Account Management (Master Akun Kasir)	2023-11-13	2023-11-14	-	
Design and Code: Sales Transaction Feature (Transaksi Penjualan)	2023-11-14	2023-11-15	-	3
Testing: Sales Transaction Feature (Transaksi Penjualan)	2023-11-15	2023-11-16	There is a bug in the item data reduction process	
Design and Code: Feature for creating Sales Receipt (Submit | Grand Total)	2023-11-16	2023-11-17	-	2
Testing: Feature for creating Sales Receipt (Submit | Grand Total)	2023-11-17	2023-11-17	-	
Design and Code: Feature for creating Sales Report (Laporan Penjualan)	2023-11-17	2023-11-20	-	4
Testing: Feature for creating Sales Report (Laporan Penjualan)	2023-11-20	2023-11-22	Unable to generate sales reports	
Design and Code: Feature for creating Income Report (Laporan Pendapatan)	2023-11-22	2023-11-23	-	3
Testing: Feature for creating Income Report (Laporan Pendapatan)	2023-11-23	2023-11-24	-	
Design and Code: Stock Checking features (Pemeriksaan Stok)	2023-11-24	2023-11-27	-	3
Testing: Stock Checking features (Pemeriksaan Stok)	2023-11-27	2023-11-28	-	
Design and Code: Stock Transaction Tracking Features (Penelusuran Transaksi Stok)	2023-11-28	2023-11-29	-	3
Testing: Stock Transaction Tracking Features (Penelusuran Transaksi Stok)	2023-11-29	2023-11-30	There are some bugs in tracking the stock transactions	
Design and Code: General Settings (Pengaturan Umum)	2023-12-01	2023-12-04	-	2
Testing: General Settings (Pengaturan Umum)	2023-12-04	2023-12-04	-	

3.3. Daily Scrum

The next step is the Daily Scrum. At this stage, the work dates are recorded and evaluated as tasks to be done, what has been done, problems encountered, and total work done in days. The implementation of the Daily Scrum can be seen in Table 1.

3.4. Sprint review

The fourth step is the Sprint Review. After carrying out daily sprint activities, the results of the daily sprint will be reviewed again to determine suitability with the product backlog that has been created. In this

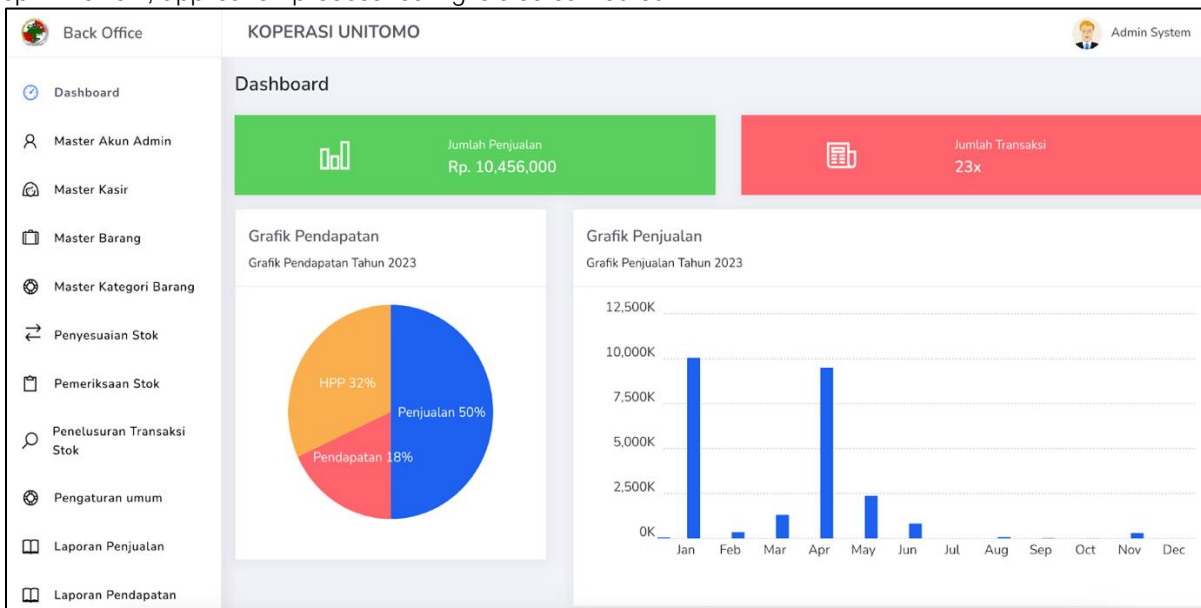sprint review, application process testing is also carried out.
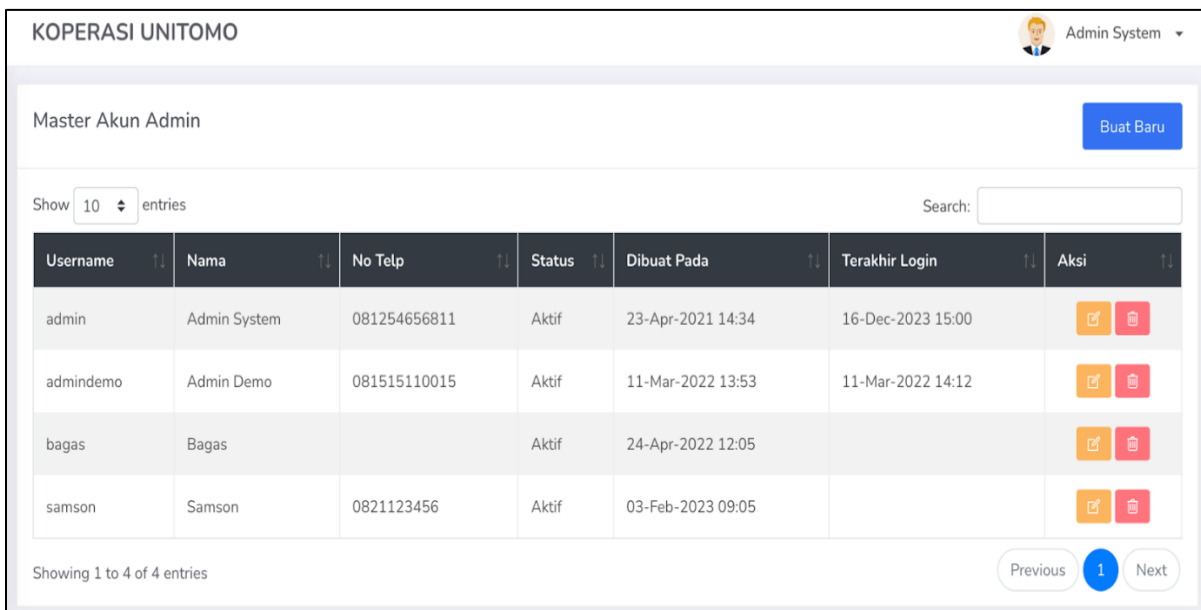

Fig. 3. User admin page.

Fig. 4. Feature: Master admin account.

1. Login as Admin

The first review carried out was an application test as admin. The admin role has various access, where almost all features are present. The Admin Login page has Username and Password columns, which must be entered as authentication to log in with the role of Admin or log in as an Employee.

When you successfully login as Admin, a page will appear, as shown in Fig. 3. At the beginning of the page, there is also a dashboard that displays graphs of income and sales results of goods at the Unitomo Business unit.

a. Feature: Master Admin account

The function of this feature is to manage accounts with the admin role. So on this page, as seen in Fig. 4, users can add other accounts with the admin role, change data username, password, name, and telephone number

b. Feature: Master Cashier account

The function of this feature is to manage accounts with the Cashier role. So, on this page, as seen in Fig. 5, the user can add another account with the cashier role and change the username, password, name, and telephone number data.

c. Master Cahsier: Add Cashier

This feature's function is to add another account with the cashier role and change the username, password, name, and telephone number data.

d. Feature: Master Goods

The function of this feature is to manage item data. The item master table, as in Fig. 6, shows columns including Item Code, Item Name, Category, Unit, Selling Price, Weight, Entry Date, Notes, and Status. Users can edit and delete data in each row of data.

KOPERASI UNITOMO   Admin System

Master Kasir   Buat Baru

Show 10 entries   Search:

Username	Nama Kasir	No Telp	Status	Dibuat Pada	Terakhir Login	Aksi
adit	Adit Prayoga		Aktif	15-Jun-2021 11:12	18-Jan-2023 02:41	
wahyu	Wahyu Ramadhan		Aktif	15-Jun-2021 11:12	27-May-2022 17:44	
kasir	kasir demo		Aktif	11-Mar-2022 13:46	12-Dec-2023 21:19	
Barber1	Joko		Aktif	28-May-2022 08:40	28-May-2022 08:40	
Djari	Adi		Aktif	30-May-2022 16:36	04-Jun-2023 03:49	
esa	Mahesa Dharma Setiawan		Aktif	18-Jun-2022 13:05	18-Jun-2022 13:09	
samsons	samsons	0812123456	Aktif	03-Feb-2023 09:06		
alvi	Alvi		Aktif	03-Mar-2023 16:37	03-Mar-2023 16:37	
belanja	bagas		Aktif	31-May-2023 16:08	31-May-2023 17:47	

Fig. 5. Feature: Master Cashier account.

KOPERASI UNITOMO   Admin System

Master Barang   Cetak Barcode   Buat Baru

Show 10 entries   Search:

Kode Item	Nama Item	Kategori	Unit	Harga Jual	Harga Beli	Berat	Tgl Entri	Member	Pengiriman	Catatan	Status	Aksi
85729173	Whiteboard orlee	Palen	Pack	21,000	18,000	0	02-Jun-2023				Aktif	
50169143	Ipen X gel	Palen	Pack	16,000	13,000	0	02-Jun-2023				Aktif	
18469273	Gelpen NT100	Palen	Pack	18,000	14,000	0	02-Jun-2023				Aktif	
76044203	neolite roda Ecer	Palen	Pce	1,700	1,200	0	01-Jun-2023				Aktif	
17779262	Korek GAS neolite Ecer	Palen	Pce	1,500	1,200	0	01-Jun-2023				Aktif	
14032764	Spidol whiteboard Orlee	Palen	Pce	5,000	3,000	0	31-May-2023				Aktif	
76008623	Kangaro staples Refill	Palen	Pack	12,000	8,000	0	31-May-2023				Aktif	
24659711	Refill Staples T3-MAX	Palen	Pack	15,000	10,000	0	31-May-2023				Aktif	
42005278	GUN Tracker MAX TG-A	Palen	Pack	315,000	250,000	0	31-May-2023				Aktif	
26586980	Korek Neolite Magnet	Palen	Box	65,000	47,000	800	30-May-2023		Tempo 30Hari		Aktif	

Showing 1 to 10 of 43 entries   Previous 1 2 3 4 5 Next

Fig. 6. Feature: Master Goods.

e. Master Goods: Add Item

Users can add data on goods owned by the Unitomo employee and lecturer business unit. As seen in Fig. 7. The item data includes Item Code, Item Name, Category, Units, Selling Price, Purchase Price, Weight, Description, and Active Status.
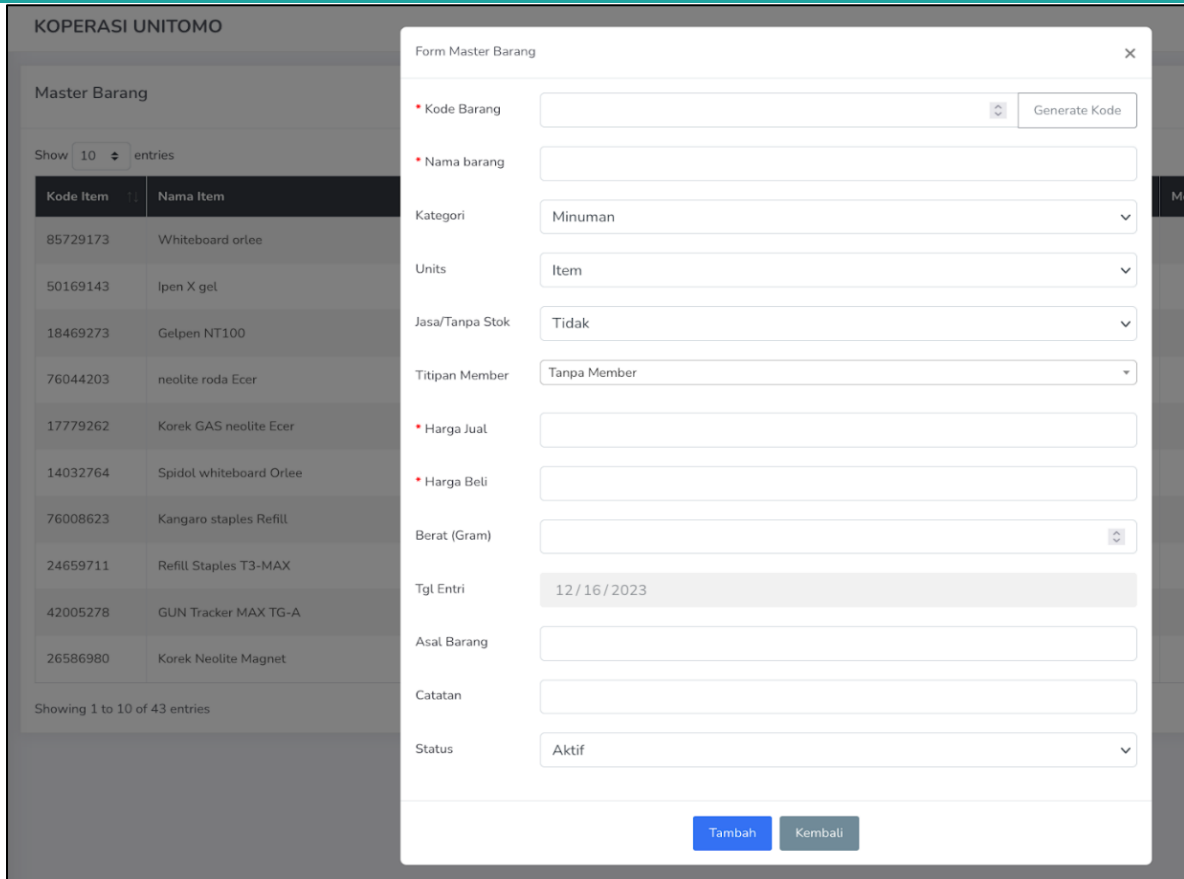
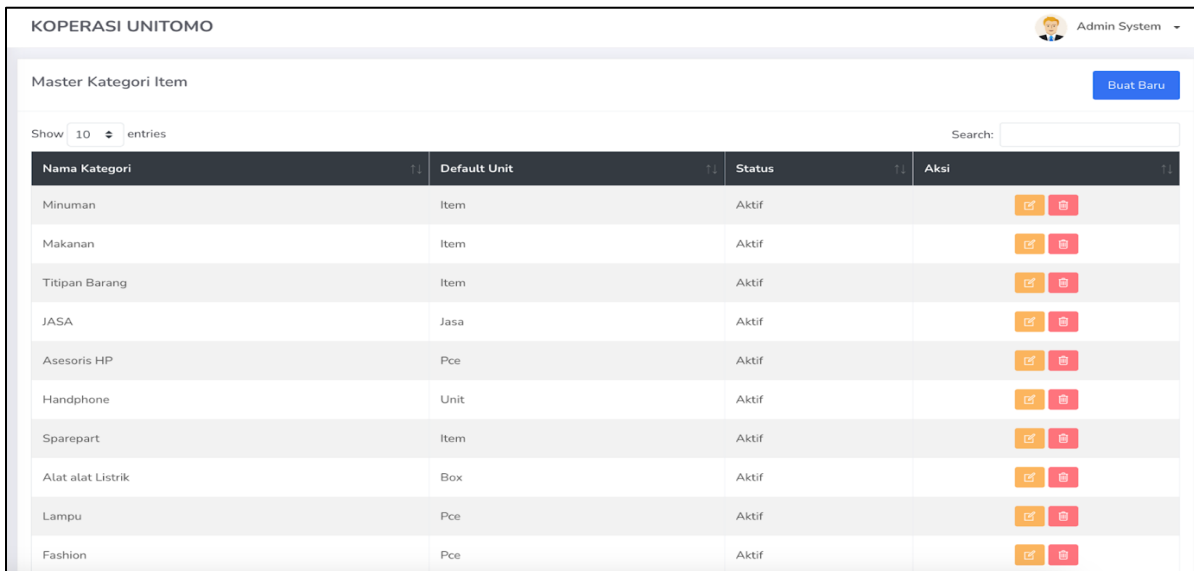**Fig. 7.** Master Goods: Add Item.

Fig. 8. Master Goods Category.

f. Master Goods Category
    In this feature, users can add categories of items to be recorded. Such that show in Fig. 8. This category makes it easier for users to group types of items. For example, the categories are drinks, food, and electrical equipment. Then, in this feature, users will also be asked to enter units from that category. Is it in boxes, bottles, or pieces?

g. Goods category: Add Category
    This feature carries out the process of adding item categories.

h. Feature: Sales report

This feature makes it easier for users in the admin role to view sales reports based on item categories and the report's start date and end date. As seen in Fig. 9 and Fig. 10. Reports can be printed using HTML preview format and Excel.

i. Feature: Income report

This feature makes it easier for users in the admin role to view income reports based on sales of goods. As seen in Fig. 11 and Fig. 12. Reports can be filtered based on the start date and end date of the report. Reports can be printed using HTML preview format and also Microsoft Excel.

Fig. 9. Feature: Sales report.

Fig. 10. Feature: Display sales report.

Fig. 11. Feature: Select sales report.

2. Login as Employee (Cashier)

The function of this role is to record goods sales transactions. When the user successfully enters the cashier role, the user can make transactions for any goods and the amount purchased. Apart from that, users can also enter sales discounts and the money buyers pay. The display of this page can be seen in Fig. 13.

After making a sales transaction, the user can print a sales receipt. The results of the sale of goods also become stock transactions out of the inventory system. The printed receipt can be seen in Fig. 14.

Laporan Pendapatan

User : Admin System
Tgl Mulai : 01-Jan-2023
Tgl Akhir : 31-Dec-2023

KOPERASI UNITOMO

Tgl Cetak : 17-Dec-2023 11:04
Output : Preview

Tanggal	Nama Kategori	Total Penjualan	Total Pendapatan
Senin, 06/02/2023	Asesoris HP	5,050,000	1,825,000
	Alat alat Listrik	755,000	115,300
	Fashion	2,600,000	1,430,000
	SUB TOTAL	8,405,000	3,370,300
Rabu, 15/02/2023	Asesoris HP	500,000	200,000
	Alat alat Listrik	175,000	25,000
	SUB TOTAL	675,000	225,000
Rabu, 22/03/2023	Alat alat Listrik	44,000	7,030
	SUB TOTAL	44,000	7,030
Selasa, 30/05/2023	Palen	130,000	36,000
	SUB TOTAL	130,000	36,000
Rabu, 31/05/2023	Palen	704,000	156,000
	SUB TOTAL	704,000	156,000
Kamis, 01/06/2023	Palen	90,000	19,250
	SUB TOTAL	90,000	19,250
Jumat, 02/06/2023	Palen	415,000	89,500
	SUB TOTAL	415,000	89,500
Sabtu, 03/06/2023	Palen	21,000	3,000
	SUB TOTAL	21,000	3,000
Sabtu, 25/11/2023	Alat alat Listrik	9,000	2,030
	SUB TOTAL	9,000	2,030
Selasa, 12/12/2023	Alat alat Listrik	53,000	9,060
	SUB TOTAL	53,000	9,060
	TOTAL	10,546,000	3,917,170
	DISKON	-90,000	-90,000
	GRAND TOTAL	10,456,000	3,827,170

Fig. 12. Feature: Display income report.

Fig. 13. Transaction page.

Users can also see the entire list of transactions carried out when logging in as an employee. The data columns displayed are based on Transaction Date, Ref Number, Cashier's Name, Total, Discount, and Grand Total. In this feature, action will also be provided to print each transaction number. This page can be seen in Fig. 15.

The results of black box testing can be seen in Table 2, which shows the input data, expected results, observation results, and conclusions from testing each feature. This black box testing process is a sprint review of the design process carried out for each feature.

3.5. Sprint retrospective

The next step is the Sprint Retrospective. After carrying out the sprint review activity, the application will be reviewed again to determine whether it is following the product backlog that has been created or not. If it is appropriate, it is then handed over to the user.

Apart from reviewing the application, a Daily Sprint review was also carried out to find out the strengths and weaknesses of the team. The difference between Sprint Planning and Daily Sprint can be seen in Fig. 16, where we can see the difference between planning and actual implementation of each feature.
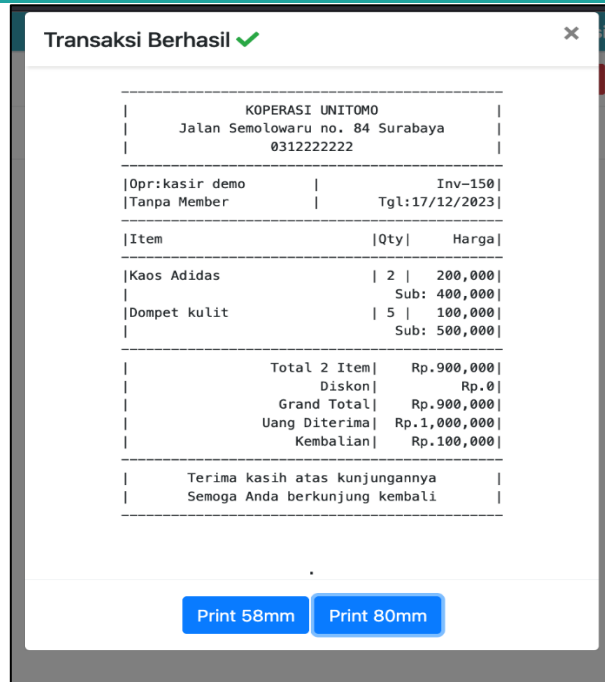
Fig. 14. Receipt print out page.

Fig. 15. List transactions page.

4. Conclusions

The problems in this research arose because the Unitomo employee and lecturer business unit adopted a manual system in the form of a paper-based system, which has the potential to cause several problems, including 1) Risk of data loss and damage; 2) Less effective and prone to errors in making reports; 3) Increased risk of human error as transaction volume increases due to the absence of a primary key and lack of integration between data; 4) The process takes a long time, limited access, and inefficiencies in collaboration because the ledger cannot be accessed by more than one person at the same time. This research aims to overcome this problem. To realize the research objectives, an inventory recording system was developed using the Agile approach with the Scrum framework, PHP with the Slim 3 framework as the

programming language, MySQL as the database, black box as the test, and the addition of revenue and sales features that differentiate this research from previous research. The research results show that the developed system can help the Unitomo employees and lecturers overcome their problems. The proposed system includes features such as recording incoming and outgoing goods transactions and presenting sales and income reports.

Using the Agile Scrum method as a software development approach helps make it easier for software development teams to plan projects and monitor progress throughout the design process. However, this research still has several shortcomings, so it requires further research in the future, including the implementation of 1) Mobile-based real-time pop-up notifications for related parties, 2) Two Factor Authentication (2FA), and 3) A data backup feature to anticipate system failure or potential attacks from unauthorized parties, etc.

Fig. 16. The sprint planning and daily sprint differences chart.

Table 2

Black box testing results.

Feature	Input Data	Outcome	Monitoring	Result
Login	Username, Password, and click the role button user.	Username, password data input, and clicked button go to the dashboard.	Successes	Accepted
Admin account management	Create new.	Go to the page and input data.	Successes	Accepted
	Username, Name, Phone.	Data Username, Name, phone saved.	Successes	Accepted
Cashier account management	Create new.	Go to the page and input data.	Successes	Accepted
	Username, Cashier name, Phone, Status.	Username, Cashier name, phone saved.	Successes	Accepted

(continued on next page)

Table 2 (*continued*)

Feature	Input Data	Outcome	Monitoring	Result
Master Goods feature	Create new.	Go to the page and input data.	Successes	Accepted
	Goods items.	The data is saved.	Successes	Accepted
Master Goods category feature	Create new.	Go to the page and input data.	Successes	Accepted
	Goods category items.	The data is saved.	Successes	Accepted
Purchase transaction feature	Go to Cashier page	Go to transaction page.	Successes	Accepted
	Transaction items.	The data is saved.	Successes	Accepted
	Total amount.	Display receipt and ready to print.	Successes	Accepted
Sales report feature	Sales report menu.	Display sales report.	Successes	Accepted
	Sales report header items.	Display sales report items.	Successes	Accepted
Income report feature	Income report menu.	Display income report items.	Successes	Accepted
	Income report items.	Display income report items.	Successes	Accepted
General Setting feature	General Setting menu General Setting items	General Setting items General Setting update items.	Successes Successes and Updated	Accepted Accepted

5. CRediT Authorship Contribution Statement

Cempaka Ananggadipa Swastyastu: Conceptualization, Supervision, Data curation, Formal Analysis, Project administration, Writing – original draft, and Writing – review & editing. **Ratna Nur Tiara Shanty:** Conceptualization, Resources, Software, Validation, Visualization, and Writing – review & editing. **Rika Puspita Sari:** Funding acquisition, Investigation, Writing – original draft. **Anggit Wikaningrum:** Writing – review & editing.

6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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8. Data Availability

Data will be made available on request.

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10. References

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