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Abstract: Optimizing warehouse operations and leveraging data insights are driving forces behind the rise of automation. This research explores the development of the SWIF warehouse management system (WMS) using the Agile methodology, a departure from traditional software development approaches.Agile's iterative and step-by-step approach facilitated a stream- lined development process. It allowed for quick adjustments based on evolving needs and feedback from stakeholders. This resulted in a substantial decrease in development time and anoticeable improvement in the final product's quality. The study emphasizes the positive effect of Agile on teamwork and customersatisfaction. Developers reported enhanced communication and collaboration, leading to a stronger sense of ownership and engagement. Customers expressed greater satisfaction with the features and functionalities delivered in stages [1]. The successful implementation of Agile in SWIF's development showcases its effectiveness in managing complex and ever-changing software development projects. The study encourages the adoption of Agilemethodology for similar projects to boost responsiveness, quality,and overall project success.

Keywords: Warehouse Automation; Agile Methodology; Software development; Warehouse; Shiping; Website

I. INTRODUCTION

In today's fiercely competitive business landscape, the sig- nificance of efficiency and precision in warehouse manage- ment cannot be overstated. Traditional manual approaches to warehouse management, encompassing tasks such as receivingand dispatching items, inventory control, and shipping, often prove to be error-prone and inefficient. Recognizing thesechallenges as impediments to operational excellence, our teamembarked on the development journey of the Smart Ware- house Information Flow (SWIF) system, a web-based solution meticulously crafted to streamline and automate warehouse management processes.

SWIF heralds a paradigm shift by replacing antiquated man-ual practices with a sophisticated computerized framework. This transition promises to elevate the accuracy and efficiency of warehouse operations to unprecedented levels. Through the seamless integration of diverse warehouse management facets into a unified digital platform, SWIF empowers stakeholders with real-time data insights and advanced analytics, facilitating data-driven decision-making with unparalleled precision and agility.

The genesis of SWIF was rooted in the identification and resolution of critical pain points pervasive in traditional ware- house management practices. Challenges such as inaccurate inventory tracking and the absence of real-time stock visibilitywere among the primary issues addressed by SWIF's inno- vative functionalities. By automating these processes, SWIF mitigates the likelihood of errors and discrepancies, while con-currently enhancing the accuracy and reliability of inventory management. Furthermore, SWIF optimizes the orchestration of shipping and receiving operations, ushering in a new era of efficiency and seamless in item processing and dispatch [1].

The development journey of SWIF was underpinned bythe adoption of Agile methodology, complemented by theprinciples of the Software Development Life Cycle (SDLC). This strategic amalgamation ensured the nimbleness and adapt-ability of the project, enabling iterative refinement and contin-uous enhancement in response to evolving user feedback and dynamic requirements. The Agile approach fostered an envi- ronment conducive to collaboration, transparency, and rapid iteration, thereby expediting the realization of SWIF's fullpotential as a transformative force in warehouse management.

II. RELATED WORK

A. Agile Software Development: Methodologies and Trends bySamer Sawalha and Hiba Abdel Nabi (2020)

Software engineering has evolved to keep up its pacewith technological advancements and modern business re-quirements. A significant improvement worth mentioning isthe adoption of agile method in software development, a lightweight approach designed to overcome the limitationsof traditional development methods. Agile aims to reduceoverhead costs and enhance flexibility by allowing changesin requirements at any stage. This is achieved through a set ofvalues and principles that manage tasks and their coordination.This paper outlines the core agile values and principles and highlights the key differences between agile and traditionalmethods. It also discusses the most popular agile methodolo- gies, their life cycles, roles, advantages, and disadvantages.Additionally, it explores recent trends in agile development,particularly in cloud computing, big data, and coordination.The review concludes by providing guidance on selecting themost suitable agile methodology based on the task, product sensitivity, and organizational structure.

Traditional software development projects often face sig- nificant issues, especially regarding maintenance and user-requested changes, which can lead to major problems. Agile method address these issues by speeding up development and effectively responds to changes, making them a preferred option in many scenarios [2].

B. Agile Software Development Methods: Review and Analysisby Pekka Abrahamsson, Outi Salo, Jussi Ronkainen and JuhaniWarsta (2017)

Agile software development methods emphasize nimble-ness, readiness for motion in response to the demands of the rapidly growing and volatile Internet software and mobile application industries. These methods aim to provide lighter, faster, and more responsive development processes, addressingthe business community's needs.

The central values of the agile community include:

1) Human Relationships and Team Spirit: Emphasizing the importance of relationships and community among software developers, agile practices foster close team relationships and working environments, prioritizing hu-man roles over institutionalized processes and tools.
2) Continuous Delivery of Working Software: Agile teams aim to produce tested, working software at frequent intervals. This approach encourages keeping the code simple and advanced, reducing the documentation bur- den.
3) Developer-Client Cooperation: Agile methods prioritize collaboration between developers

and clients over strict contracts. Negotiation is seen as a means to maintain a viable relationship, focusing on delivering business valueimmediately and reducing non-fulfillment risks.

4) Flexibility and Competence: Agile teams, including both developers and customer representatives, should be well- informed, competent, and authorized to make necessary adjustments during the development life-cycle. Contractsshould support and allow for these enhancements [3].

C. Improving Warehouse Operation Digitally by Felipe Busta-mante, Ashutosh Dekhne, Jörn Herrmann, and Vedang Singh (2020)

Warehouse operations are becoming increasingly complex due to the growth of e-commerce, which has led to a pro- liferation of SKUs and a need for super fast fulfillment. Additionally, new automation technologies pose challenges for operations leaders who must keep pace with advancements anddetermine their impacts.

Improving warehouse operations requires careful planning, as trial-and-error approaches are not feasible. However, com- panies can now use ”digital twin” simulations to create virtual models of their warehouses. These simulations allow themto test various scenarios, such as different floor plans and workflows, without disrupting actual operations. This approachenables operations leaders to evaluate the impact of changeson factors like SKU mix, order profiles, seasonal demand, productivity, and automation options.

The digital warehouse design process typically takes six to ten weeks and can improve efficiency by 20 to 25 percent be- fore any physical changes are made. It has broad applications, including productivity initiatives, mergers, consolidations, and new warehouse construction, consistently leading to significantsavings in operating and capital expenses.

This approach identifies the full potential of a facility, optimizes slotting and product flows, and evaluates mecha- nization and automation options, helping to avoid issues from inappropriate automation. Ultimately, digital warehouse designallows companies to make informed investment decisions and achieve optimal efficiency and effectiveness [4].

D. Manifesto for Agile Software Development by Kent Beck, Mike Beedle, Arie van Bennekum, Alistair Cockburn, Ward Cunningham, Martin Fowler, James Grenning, Jim Highsmith,Andrew Hunt, Ron Jeffries, Jon Kern, Brian Marick, Robert

E. Martin, Steve Mellor, Ken Schwaber, Jeff Sutherland, and Dave Thomas (2001)

This paper talks about an overview of notable figures in Agile software development. Mike Beedle, founder and CEO of e-Architects Inc., specializes in application development using Scrum and XP and has introduced Scrum to several organizations. Arie van Bennekum, active in DSDM since 1997, focuses on agile methods that meet end-user needs. Alis- tair Cockburn, founder of Humans and Technology, developedthe Crystal family of agile methodologies and collaborates with Jim Highsmith. Ward Cunningham, founder of Cun- ningham and Cunningham, Inc., contributed to object-orientedprogramming, Extreme Programming, and the WikiWikiWeb.Martin Fowler, Chief Scientist at ThoughtWorks, is a keyfigure in object-oriented techniques and software design. Jim

Highsmith, developer of Adaptive Software Development, co-authored ”The Agile Manifesto” with Martin Fowler. Andrew Hunt, partner in The Pragmatic Programmers, co-authored ”The Pragmatic Programmer” and specializes in agile de- velopment. Ron Jeffries, proprietor of XProgramming.com, was the first Extreme Programming coach. Jon Kern helps clients deliver business value through software development and contributed to Feature-Driven Development. Brian Marickexplores ”Agile Testing” and its integration with Agile Devel- opment. Robert C. Martin, president of Object Mentor Inc.,is an author and speaker on software development and agile processes. Ken Schwaber, president of Advanced DevelopmentMethods, co-formulated the Scrum development process. Jeff Sutherland, CTO of PatientKeeper, co-invented Scrum and in- troduced agile processes to various companies. Dave Thomas, co-author of ”The Pragmatic

Programmer," emphasizes the importance of people in projects and individual involvementin agile methodologies [5].

F. Warehouse Management System for Smart Digital Order Picking Systems by Dina Fitria Murad, Bambang Dwi Wija- narko, Widya Ratnasari, and Bhumyamka Yala Saputra (2019)

A Warehouse Management System (WMS) is designed to control the movement and storage of materials within a warehouse and handle related transactions such as shipping, receiving, cancellation, and retrieval of goods. WMS uses a database to improve efficiency by directing tasks and main- taining accurate inventory records, with data synchronization occurring either in batches or in real-time. The implementationof a new digital order picking system aims to streamline the order picking process by reducing the steps involved from ten to three, thereby speeding up order fulfillment and reducing cancellations. This system was developed based on user needsand aims to enhance the productivity of pickers and sorters, and accelerate the outbound process. Pickers can use a web- based application accessible via smartphones to log in, retrievegoods according to picking instructions, and update the systemwith transaction details. The progress of these activities canbe monitored through a dashboard, providing real-time data and performance metrics. The improved system significantly reduces the order picking time from 28 minutes to 2 minutes for validation, achieving a total time reduction of 26 minutes. However, the efficiency of the process also depends on the condition and performance of the users, including pickers,sorters, and warehouse managers. The study highlights the importance of digital order picking systems that are accessible via smartphones and user-friendly for mobile operations [6].

III. METHODOLOGY

In this context, the survey describes the input features for the accepted samples credit scoring.

A. Search

For beginning as undergraduated in computer science, we collected articles primarily relevant to the 'Agile Method'.We collected articles and journals based on our topic. This relevance to facilitate the identification and review of thesoftware we develop for fulfill our assessment. We useda method known as 'snowballing' for collecting references. Snowballing is a method of collected numerous items to createan idea [7]. This method will ease our process and increaseour confidence in the software we will develop using the Agilemethod. As argued by Petersen, "in the particular contextstudied all relevant studies identified by the search could also be obtained by snowball sampling. The key to success is to define a good start set [8]."

We collected papers from website based references suchas Semantic Scholar, Google Scholar, and ScienceDirect. Through these websites, we gathered a total of (18) papers. Weselected these papers based on the relevance we had previouslydetermined. In other side, we also considered the identity and quality of the journals. To achieve more accurate research results, we selected references that had international standardsor status.

After collecting the articles, we identified them. In the iden-tification process, we found two interesting topics related to the Agile Method: "software failure" [9] and "documentation in software development" [10]. These topics was interested forus because software can be failed uniquely. Software is con- sidered unsuccessful or failed if the user cannot use it properly[9]. From this, we agreed that software development should not only focus on functional but also consider capability of user in its operation. That thing becomes an essential part of the software development project.

B. Objective

In this research, we will focus on the software development methodology known as Agile. Agile emphasizes the respon- siveness of the software we develop and customer satisfaction. Responsiveness performance will depict the effectiveness of the software we develop and how it resists errors. Responsive-ness performance is responsible for managing and fulfilling user requests.

This will then become one of the bench- marks for software quality, especially in the representationof information [11]. Meanwhile, customer satisfaction willdescribe how easily the software which we will develop canbe used and understood by the user. Customer satisfaction is a benchmark that developers must consider so that the software does not become a ”failed software”. Some software, althoughfunctionally capable of executing, aren't usable by user or client due to misunderstanding [9].

We implement Agile Method with to try make a sofware. The software named ’SWIF WAREHOUSE”. The software is automatization of warehouse traditional system which will our configure to computing system. With computing system, it canshorten operational time than usual, with increased accuracy and minimal mistake. According to the Agile Method, wemake the software with functionality base on client's require- ment. And for avoid a ”failed software”, we teach and make documentation for client to operation the software. We alwaysfocus and stay look about responsiveness and satisficationof customer even while the software development was done because these will influence of feedback. We consider aboutfeedback from client was most important thing for us.

Table 1. ISO IEC 25010:2011 software product qualitymodel.

Characteristic	**Sub-Characteristic**
Functional Suitability	Functional Completeness, Functional Correctness, Functional Appropriatness
Perfomance Ef-ficiency	Time Behavior, Resource Utilization, Capacity
Compability	Co-existence, Interoperability
Usability	Appropriateness, Recognizability, Learnability, Oper-ability, User Error Protection, User Interface Aesthet-ics, Accesibility
Integrity	Non-repudiation, Authenticity, Accountability
Maintability	Modularity, Reusability, Analysability, Modifiability, Testability
Portability	Adaptability, Installability, Replaceability

To measure responsiveness performance and customer sat- isfaction, we use a measurement concept known as ’Quality Measurement Concepts based on ISO Standard’ [7]. This concept measures software by focusing on its ability to fullfill user demands. This concept can serve as a representative tool for assessing software quality, particularly performance and efficiency [7]. One most important thing reviewed aspect for evaluation is the entity. ISO Measurement standard include (functional Suitability, Perfomance Efficiency, Compability, Usability, Reliability, Security, Maintability and Portability) [7]. All attributes that represent success indicators in software development.

C. Data Collection and Design

Our team comprises computer science lecturers and six computer science students who have studied for approximately4th semesters or 2th years. Our lecturer will be the supervisor and scrum master because they have the best experience and skills among the team. The students will be given guidance during the software development.

Adopting the Agile method in developing the software project, we collect data iteratively. This is because client requests may change over time, and we need initiation asa direction for the next development stage. We collect databy communicating with clients either face-to-face or through online meeting platforms like Google Meet. We believe that client approval is paramount in our project

To provide a clearer picture, we also give the client a designrepresenting our software project. Using the online designplatform ’Figma’, we can show the client how the software will be used in the future. Client need to know to reduce concerns and distrust towards the developer team. This is also a step to prevent failed software projects.

D. Data Analysis and Evaluation

Based on the existing data and design, the next stage is identification and selection. Data analysis is a crucial stepfor developer to allocate all resources accurately. Improper resource allocation will have negative impacts for developer and client. The most influential resources in software devel- opment are cost or funding and time allocation. The time and cost required during this software development shall match theneeds and urgency of the client.

Using the Agile method, we perform iterative data analysis similar as our the data collection phase [12]. Although changesare possible, the data from the collection stage must still be processed to form a provisional decision.Decisions madeby the developers must be based on the client's urgency. Developers can set aside existing theories if they do not align with the client's urgency [12].

In this data analysis phase, our team has started coding[13]. Just little story, in most companies, they selection team with coding tests for recruiting a developer team. However,in our case, the developer team members have already been determined, so our team starts coding after the design phaseis complete. For programming language, we use Laravel Framework. Reason why our team choose Laravel because Laravel make easier for our task about software development. With MVC feature and capability, Laravel help us to fulfillour project related on Agile Method. The coding must match the design presented to the client. If changes or issues arise during development, the developer team must transparently inform the client.

Indirectly, the Agile method makes the data analysis stage iterative like evaluations. Usually, evaluations focus on two things: the process (coding and sample design) and data collection [13]. However, in our case, there is a difference.As undergraduate, we also iteratively evaluate the theoretical foundation used in this software development.

E. Validation

This is the final and most crucial stage in Agile. At this stage, the client and developer reach final agreement. Thedeveloper team must ensure that the software developed can fulfill the client's criteria. Developers must convince the client to agree to terms or contracts previously made. Developers also need to assist the client in checking the accuracy and documentation, which will guide the client in using the devel- oped software [12]. Fortunately, in our case, client accept our software and he has deal with us.

IV. RESULT AND DISCUSSION

A. Result

Having delved into the intricacies of warehouse operations and the principles of Agile methodology, we now shift our focus to the practical implementation of these concepts. Our objective is to transform the methodology into a tangible product design, laying the groundwork for efficient futuredevelopment. This entails a structured approach encompassingseveral key steps:

1. Use Case Diagram: A Use Case Diagram serves as a visual representation of the interaction between an admin user and our program, highlighting the functionalities and capabil- ities offered by the program. It effectively communicates the program's purpose and demonstrates how an admin can utilizeit to perform various tasks.

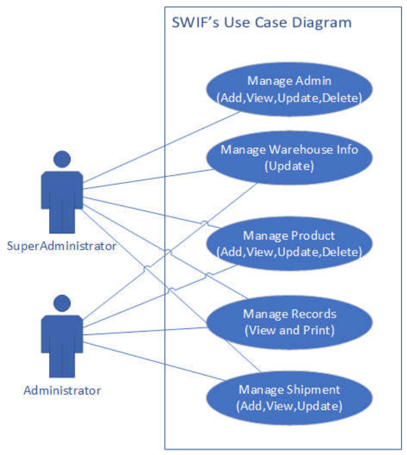

SWIF’s Use Case Diagram
Manage Admin (Add,View,Update,Delete)
Manage Warehouse Info (Update)
Manage Product (Add,View,Update,Delete)
Manage Records (View and Print)
Manage Shipment (Add,View,Update)
SuperAdministrator
Administrator

Figure 1. Use Case Diagram of SWIF.

Based on the provided Use Case Diagram 1, it is evident that the administrator role possesses a wide range of func- tionalities, yet it falls short of the capabilities granted to the higher-authority actor. This higher-authority actor, presumablya system administrator or manager, holds the privilege to per- form critical tasks such as modifying warehouse information and adding new administrators.

2. Physical Data Model: A Physical Data Model (PDM)serves as a crucial tool for representing the final or preliminarydesign of a database schema for a warehouse management system. It provides a comprehensive overview of the datastructures, relationships, and constraints within the database, facilitating efficient database development and management.

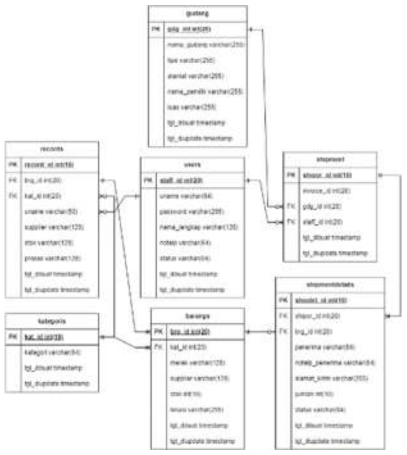


Figure 2. Physical Data Model of SWIF.

A well-structured Physical Data Model (PDM) 2 serves asa cornerstone for designing an efficient and scalable database, particularly in the context of a Warehouse Management Sys- tem (WMS). By carefully defining entities, their relationships,and data attributes, the PDM 2 empowers developers to minimize data redundancy, optimize storage utilization, and enhance the overall performance of the database system.

Consider a scenario where you want to retrieve data from thebarangs table using information from the shipmentdetails table.With a well-designed PDM, you can achieve this efficiently byutilizing a single column, such as the id column, that uniquely identifies the relevant records in both tables. This approach eliminates the need to join multiple columns, reducing the complexity and improving the performance of the data retrievaloperation.

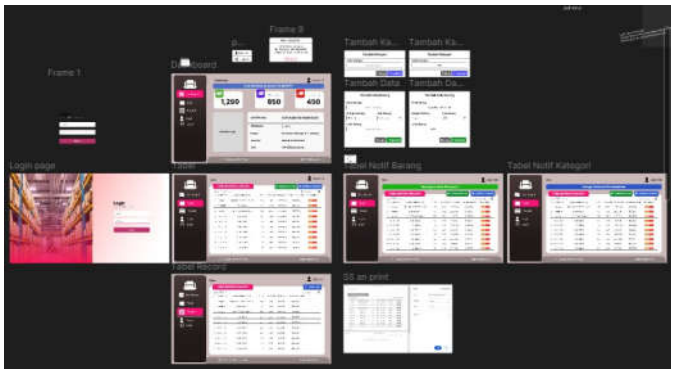


Figure 3. Design Prototype of SWIF.

3. *Design Prototype:* Within the realm of software development, the design prototype plays a pivotal role in establishing the foundation for an intuitive and user-centric in-terface. It serves as a tangible representation of the software's layout, functionality, and overall aesthetic, enabling developersand designers to meticulously refine the user experience beforeembarking on the intricate coding process.

To ensure a user-friendly experience, we created a stream- lined prototype3 for our warehouse management system. The design prioritizes clarity and ease of use, while incorporating atouch of visual appeal through a calming pink color palette andwell-chosen icons. This Figma prototype serves as a blueprint for the final software, guaranteeing a seamless and intuitive interface that contributes to the overall success of the system.

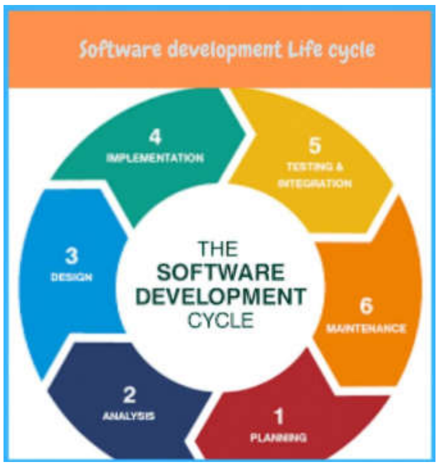
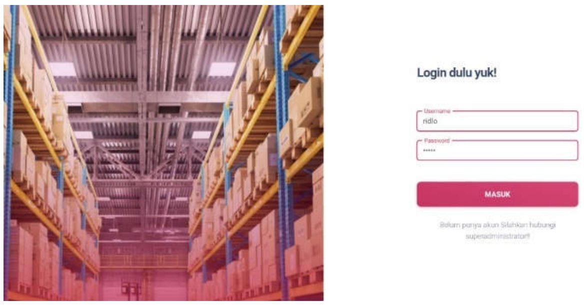


Figure 4. Agile Software Development Life Cycle.

User Interface 4.1 Authentication Authentication is a process of verifying the identity of a user who wants to access a software system. The purpose of authentication is to protect data from misuse by unauthorized parties. In SWIF, we use sign-in and log-in as steps for authentication. This way, every user who operates SWIF can be tracked for identification if necessary. In addition, this authentication also plays a role in protecting the data of each user from misuse. Figures 5 and 6 are the authentication views of SWIF.


Login dulu yuk!

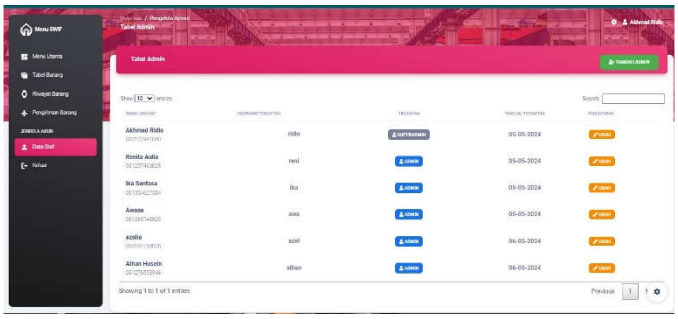
Username: ridlo

Password: *****

Belum punya akun? Silahkan hubungi superadministrator!!

Figure 5. Demo: Log In.

Main Menu Upon successful authentication, the user will be directed to the main menu page. In the main menu, users can view the overall report of expenses and incomeof goods, as well as information about the identity of thewarehouse that the software is operating on. On the other hand, only the SuperAdministrator can change the warehouse identity on the main menu page.



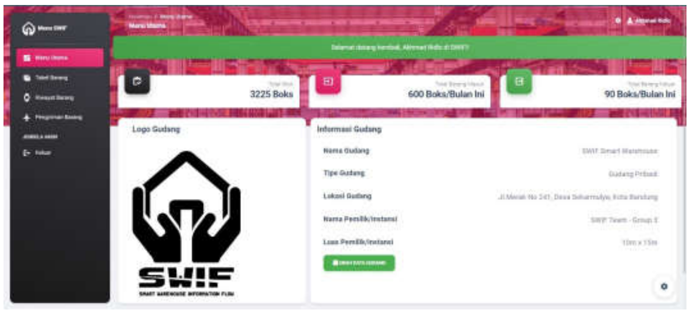
Tabel Admin

Show 10 entries Search:

NAMA LENGKAP	USERNAME TERDAFTAR	TINGKATAN	TANGGAL TERDAFTAR	PENGATURAN
Akhmad Ridlo [illegible]	ridlo	SUPERADMIN	05-05-2024	UBAH
Renita Aulia 081237463829	reni	ADMIN	05-05-2024	UBAH
Ika Santosa [illegible]	ika	ADMIN	05-05-2024	UBAH
Awasa 081265743820	awa	ADMIN	05-05-2024	UBAH
azalia [illegible]	azel	ADMIN	06-05-2024	UBAH
Alhan Husein 081276053946	alhan	ADMIN	06-05-2024	UBAH

Showing 1 to 1 of 1 entries

Figure 6. Demo: List Admin Page.



Menu Utama

Selamat datang kembali, Akhmad Ridlo di SWIF!

3225 Boks

600 Boks/Bulan Ini

90 Boks/Bulan Ini

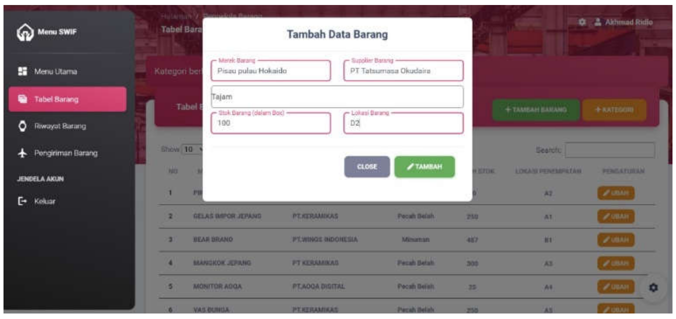
Logo Gudang

Informasi Gudang

Nama Gudang	SWIF Smart Warehouse
Tipe Gudang	Gudang Pribadi
Lokasi Gudang	Jl Merak No 241, Desa Seharmulya, Kota Bandung
Nama Pemilik/Instansi	SWIF Team - Group 5
Luas Pemilik/Instansi	10m x 15m

Figure 7. Demo: Main Menu.

Item Table The SWIF website also has another feature,which is a page for the item table. The purpose of this item table is for users to add categories and items to be entered along with their identities. In addition, on this page users can also change the identity or attributes of items from before. In addition, this item table page is also equipped with a search feature to make it easier to find items.



Tambah Data Barang

Merek Barang: Pisau pulau Hokaido

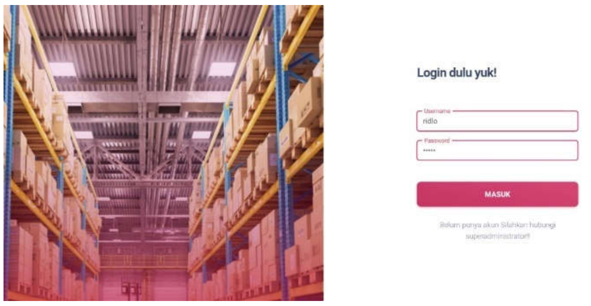
Supplier Barang: PT Tatsumasa Okudaira

Tajam

Stok Barang (dalam Box): 100

Lokasi Barang: D2

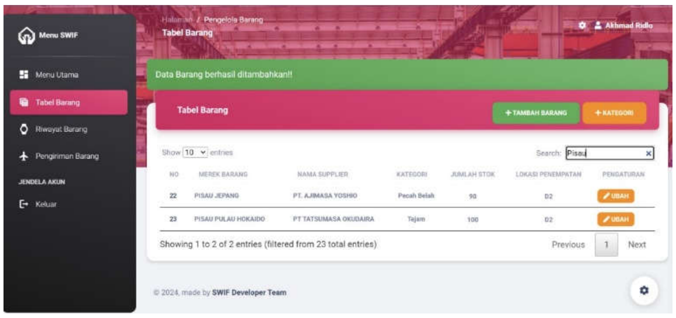
NO				STOK	LOKASI PENEMPATAN	PENGATURAN
1	PI[illegible]			[illegible]	A2	UBAH
2	GELAS IMPOR JEPANG	PT.KERAMIKAS	Pecah Belah	250	A1	UBAH
3	BEAR BRAND	PT.WINGS INDONESIA	Minuman	487	B1	UBAH
4	MANGKOK JEPANG	PT KERAMIKAS	Pecah Belah	300	A3	UBAH
5	MONITOR AOQA	PT.AOQA DIGITAL	Pecah Belah	25	A4	UBAH
6	VAS BUNGA	PT.KERAMIKAS	Pecah Belah	250	A5	UBAH


Login dulu yuk!

Username: ridlo

Password: *****

Figure 8. Demo: Add Item.



Data Barang berhasil ditambahkan!!

Show 10 entries Search: Pisau

NO	MEREK BARANG	NAMA SUPPLIER	KATEGORI	JUMLAH STOK	LOKASI PENEMPATAN	PENGATURAN
22	PISAU JEPANG	PT. AJIMASA YOSHIO	Pecah Belah	90	D2	UBAH
23	PISAU PULAU HOKAIDO	PT TATSUMASA OKUDAIRA	Tajam	100	D2	UBAH

Showing 1 to 2 of 2 entries (filtered from 23 total entries) Previous 1 Next

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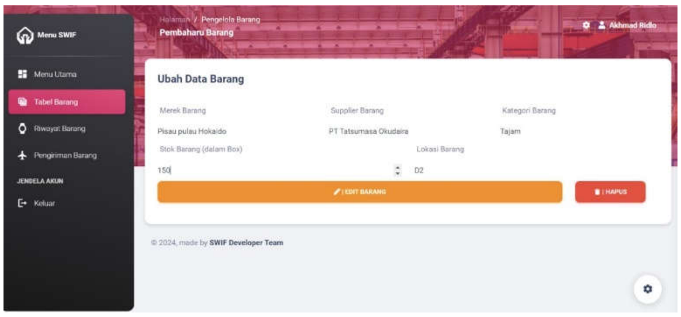
Figure 9. Demo: Search Items and Edit Item Result.



Ubah Data Barang

Merek Barang: Pisau pulau Hokaido

Supplier Barang: PT Tatsumasa Okudaira

Kategori Barang: Tajam

Stok Barang (dalam Box): 150

Lokasi Barang: D2

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Figure 10. Demo: Edit Item.

Item History The SWIF website also has a featurein the form of a page for item history. With this feature,users can view and monitor changes in the stock of each item. This feature has also been designed to detect users who make changes to the stock of these items. Similar to the item table, this page is also equipped with a search feature to make it easier to find the data needed in the history. In addition, inthe item history, users can also print out the data on the table feature.

Table 2. SWIF Development Phase based on Agile Method.

Cycle	Implementation
Plannin g	Defining the Scope and Setting the Stage: The planning phase lays the foundation for the project, outlining the features, pages, budget, timeline, and team size. For SWIF, this involved: 1. Features: - Data management (inbound and outbound) - Streamlined stock adjustments throughan interface - Automated data recording across various processes - Comprehensive shipment tracking capabilities - PDF report generation of data records - Invoice generation based on shipment details - Real-time stock level tracking - Robust privilege-based access control system(staff and super admin roles) 2. Pages: - Login page - Record page - Table page - Dashboard page - Item notification table page - Category notification table page - Add category page - Add data

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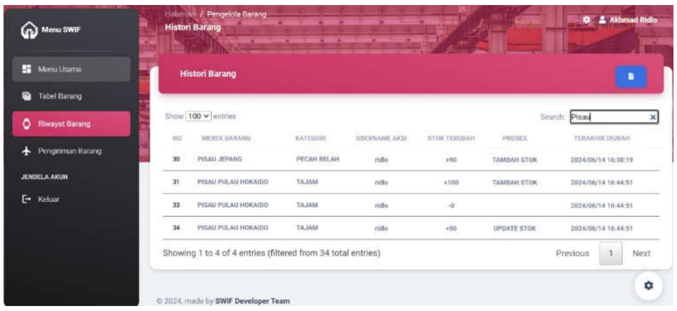
	page 3. Budget: Zero budget (utilizing available resources) 4. Timeline: 4 months 5. Team Group: 6 people
Analysis	Understanding Requirements and Leveraging Existing Designs: The analysis phase delves into the details of each feature, ensuring a clear understanding of requirements and utilizing existing designs. For SWIF, this included: 1. Analyzing existing designs: - Login page (Figma) - Admin page (Figma) - Dashboard (Figma) 2. Defining field requirements: - User authentication for login - Data fields for record page and table page - Dashboard metrics - Notification table fields 3. Reviewing database: Existing MySQL database structure 4. Ensuring design consistency: Aligning all pages with functional requirements and Figma designs
Design	Creating the Blueprint and Selecting Technologies: The design phase translates requirements into a detailed blueprint, encompassing business rules, layouts, themes, and frameworks. For SWIF, this involved: 1. Establishing business rules: - Access control permissions - Data validation rules - Stock adjustment procedures 2. Designing layouts: - User-friendly interfaces for all pages - Consistent design language across the application 3. Selecting themes: Color schemes and typography that align with the brand identity 4. Choosing frameworks: - Front-end frameworks for building responsive and interactive interfaces (Bootstrap 5) - Back-end frameworks for efficient development (Laravel 8)
Implementation	Bringing the App to Life: The implementation phase brings the design to life, developing the application code, testing it for functionality, and integrating it with the backend infrastructure. For SWIF, this included: 1. Backend development: - Setting up servers and databases - Implementing APIs for data exchange - Creating physical data models 2. Ensuring code quality: - Following best practices for code structure and maintainability - Conducting unit tests to verify individual components 3. Integrating frontend and backend: - Connecting the UI/UX elements to the backend functionalities - Ensuring seamless data flow between the frontend and backend
Testing	Ensuring Quality and Bug-Free Operation The testing phase rigorously scrutinizes the application to identify and fix bugs, ensuring it meets quality standards. For SWIF, this involved: 1. Thorough testing: - Unit testing for individual components - Integration testing for inter- component interactions - System testing for overall functionality - User acceptance testing to gather feedback from potential users 2. Bug identification and resolution: - Identifying and tracking bugs throughout the testing process - Implementing fixes and re-testing to ensure bug-free operation 3. Quality assurance: - Ensuring the application meets all defined quality criteria - Addressing any performance or usability issues
Maintenance	Continuous Improvement and Support: The maintenance phase ensures the application's long-term health, addressing issues, implementing enhancements, and ensuring team alignment. For SWIF, this involves: 1. Performance monitoring: - Tracking application performance metrics - Identifying and resolving performance bottlenecks 2. Issue resolution: - Responding promptly to user reported issues - Implementing bugfixes and patches 3. Continuous improvement: - Gathering user feedback and suggestions - Prioritizing and implementing enhancements to improve the application

transactions. To do this, users need to fill out a form with the necessary information. Once the form is complete, the order data will appear in the item delivery table. Here, users can viewthe order attributes and change the order status by clickingthe green button shown in Figure 19. The order status can be changed according to the user's wishes, and the changes canbe seen in Figure 20.



Show 100 entries Search: Pisau

NO	MEREK BARANG	KATEGORI	USERNAME AKSI	STOK TERUBAH	PROSES	TERAKHIR DIUBAH
30	PISAU JEPANG	PECAH BELAH	ridlo	+90	TAMBAH STOK	2024/06/14 16:38:19
31	PISAU PULAU HOKAIDO	TAJAM	ridlo	+100	TAMBAH STOK	2024/06/14 16:44:51
33	PISAU PULAU HOKAIDO	TAJAM	ridlo	-0		2024/06/14 16:44:51
34	PISAU PULAU HOKAIDO	TAJAM	ridlo	+50	UPDATE STOK	2024/06/14 16:44:51

Showing 1 to 4 of 4 entries (filtered from 34 total entries) Previous 1 Next

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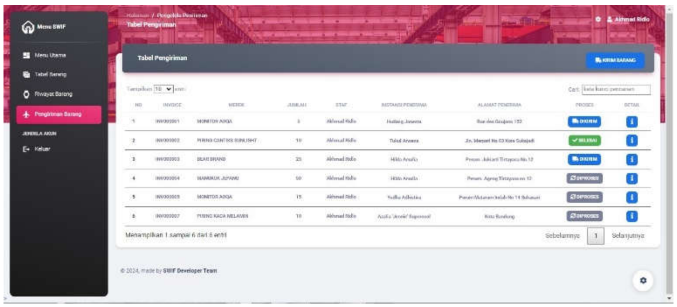
Figure 11. Demo: History.

Figure 12. Demo: Print Record / History.

Item Delivery Item delivery is another important featureof SWIF. This feature allows users to process item delivery



Tampilkan 10 entri Cari: [illegible]

NO	INVOICE	MEREK	JUMLAH	STAF	INSTANSI PENERIMA	ALAMAT PENERIMA	PROSES	DETAIL
1	INV000001	MONITOR AOGA	3	Akhmad Ridlo	Hudang Jawara	[illegible]	DIKIRIM	
2	INV000002	PIRING CANTIKS SUNLIGHT	10	Akhmad Ridlo	Tulud Arsena	Jn. Merpati No 03 Kota Sukajadi	SELESAI	
3	INV000003	BEAR BRAND	25	Akhmad Ridlo	[illegible]	[illegible]	DIKIRIM	
4	INV000004	MANGKOK JEPANG	50	Akhmad Ridlo	[illegible]	[illegible]	DIPROSES	
5	INV000005	MONITOR AOGA	15	Akhmad Ridlo	[illegible]	[illegible]	DIPROSES	
6	INV000007	PIRING KACA MELAMIN	10	Akhmad Ridlo	[illegible]	Kota Bandung	DIPROSES	

Menampilkan 1 sampai 6 dari 6 entri Sebelumnya 1 Selanjutnya

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Figure 13. Demo: Shipment.

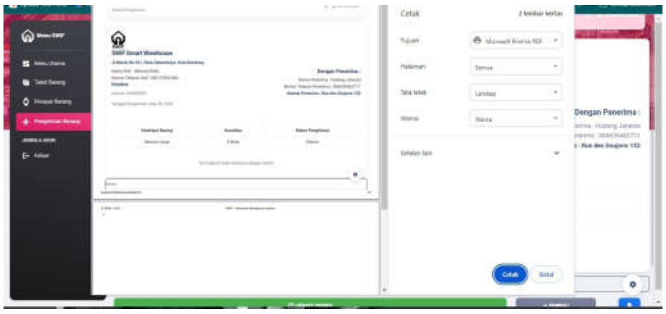
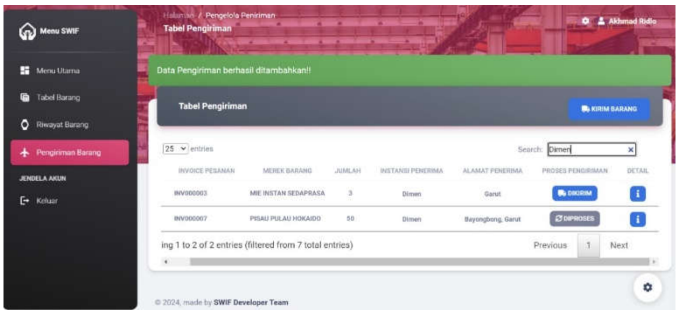


Figure 14. Demo: Shipment Form.



Tabel Pengiriman

Data Pengiriman berhasil ditambahkan!!

Tabel Pengiriman

25 entries   Search: Dimen

INVOICE PESANAN	MEREK BARANG	JUMLAH	INSTANSI PENERIMA	ALAMAT PENERIMA	PROSES PENGIRIMAN	DETAIL
INV000003	MIE INSTAN SEDAPRASA	3	Dimen	Garut	DIKIRIM	i
INV000007	PISAU PULAU HOKAIDO	50	Dimen	Bayongbong, Garut	DIPROSES	i

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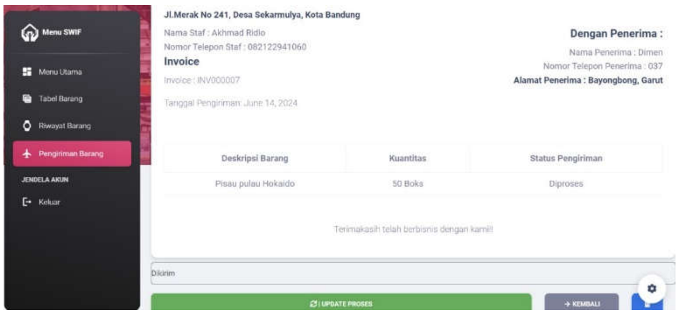
Figure 15. Demo: Shipment Search.



Jl.Merak No 241, Desa Sekarmulya, Kota Bandung
Nama Staf : Akhmad Ridio
Nomor Telepon Staf : 082122941060
Invoice
Invoice : INV000007
Tanggal Pengiriman: June 14, 2024

Dengan Penerima :
Nama Penerima : Dimen
Nomor Telepon Penerima : 037
Alamat Penerima : Bayongbong, Garut

Deskripsi Barang	Kuantitas	Status Pengiriman
Pisau pulau Hokaido	50 Boks	Diproses

Terimakasih telah berbisnis dengan kami!!

Dikirim

Figure 16. Demo: Shipment Update Process.

A. Discussion

Implementation of Agile Methodology in the development of our warehouse management website has proven highly ben-eficial for us as developer. Agile's iterative approach allowed us as developer to continue this project's development and adaptation throughout it's life cycle, ensuring that the website will always remains usable in long term condition and meets the required needs and expectation from users.

Based on the problem formulation that we identified in the beginning, the website we developed has effectively addressed these issues. It has optimized all warehouse management processes, reduced both natural and human resources involvedin warehouse management operations and mitigated accuracy and data storage issues associated with manual warehousemanagement. With SWIF, all warehouse management pro-cesses have become highly efficient due to automation, thereby reducing resource requirements as traditional methods such as books for tracking are no longer necessary.

Based on the related work Warehouse Management System for Smart Digital Order Picking Systems [6]. We mutually agreed that automation in all warehouse management pro-cesses have significantly enhanced efficiency compared totraditional methods involving manual record-keeping.

This research was constrained by limited resources in terms of detailed warehouse information that available to the researchers, our individual knowledge and experience gapsin software engineering development also proved to be a hindrance for us as a team. For future research, a detailed exploration of the specific cases addressed in this study wouldgreatly assist in managing and further developing the softwaresolution presented.

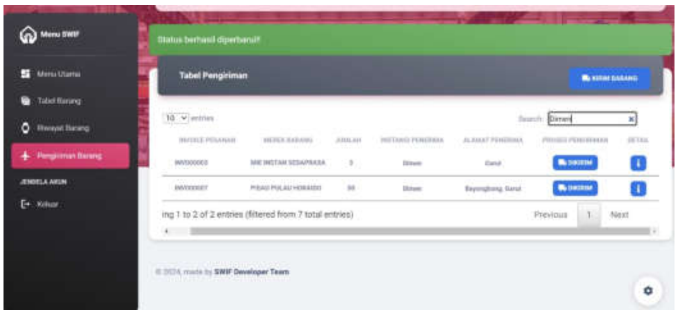


Figure 17. Demo: Shipment Update Process Result.

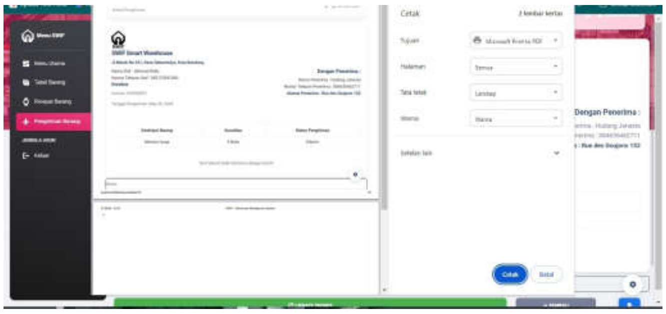


Figure 18. Demo: Shipment Invoice.

V. CONCLUSIONS

This study presents an automated SWIF application to streamline warehouse operations and enhanced efficiency. TheSWIF application integrates various functionalities, manages inbound and outbound data, streamlines stock adjustments through an interface, automates data recording across various processes, provides comprehensive shipment tracking capabil-ities, generates PDF reports of data records, generates invoicesbased on shipment details, provides real-time tracking of stocklevels, implements a robust privilege-based access control system, differentiating between staff and super admin roles.

The system is designed for ease of use and adaptability to diverse warehouse environments.

Our findings demonstrate that the system provides real-time visibility into warehouse performance, enabling data-driven decision-making and continuous improvement.

While the study yielded promising results, it is important to acknowledge its limitations. The research was conducted the- oretically, and generalization of findings may require further investigation in different settings (empirically). Additionally, the long-term impact of the SWIF application on warehouse operations and employee satisfaction warrants further explo- ration.

Based on the findings and limitations of this study, werecommend several directions for future research. First, repli- cating the study in multiple warehouse environments withvarying scales and complexities will enhance the generalizabil-ity of the results. Second, investigating the long-term impactof the WMS application on warehouse operations, employee satisfaction, and overall business performance will providevaluable insights for long-term sustainability. Lastly, adding encryption to the application was constrained in this studydue to limited funding and financing.

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