Development of Logistics Driver Tenko System (ORIENT) Application Using Scrum Framework

Adelia Maharani[1], Ahmad Luthfi[2]

[1,2]Informatics Department, Islamic University of Indonesia, Yogyakarta, Indonesia
Email: [1]adelia.zahra@students.uii.ac.id, [2]ahmad.luthfi@uii.ac.id

Abstract

Occupational safety and health hold significant importance for both agencies and individuals alike. A crucial aspect of assessing driver readiness involves examining their physical well-being. Truck drivers who possess unhealthy physical conditions face a four-fold higher risk of work accidents compared to those with sound physical health. PT. Toyota Motor Manufacturing Indonesia (TMMIN), being a manufacturing company, must prioritize occupational safety and health, particularly within the logistics domain. Presently, some logistics partners collaborating with TMMIN adhere to their own standards when conducting checks, relying on paper records for documenting the results. Unfortunately, this approach hinders proper archiving of inspection records and fails to establish a direct link with logistics partner customers in cases involving drivers with health issues. Hence, PT. Toyota Motor Manufacturing Indonesia is dedicated to enhancing the quality of driver health checks through logistics partners by implementing an integrated recording system called the Logistics Driver Tenko System Application (ORIENT). The development of ORIENT is based on the Scrum framework. This research aims to offer insights into the direct implementation of the Scrum method in project development.

Keywords: Application Development, Scrum Framework, Agile Method, ClickUp

1. INTRODUCTION

Occupational safety and health is a term to create a healthy and safe work environment to minimize potential work accidents [1]. According to the Regulation of Minister of Manpower No.03/Men/98 [2], work accident means an unintended and unexpected event that can cause human and or property damage. The level of work accidents in Indonesia is quite alarming. Based on the Badan Penyelenggara Jaminan Sosial (BPJS) Ketenagakerjaan, the number of work accidents in Indonesia in 2022 increased by 13.26% from the previous year which amounted to 234,270 cases [3]. Occupational safety and health is an important thing to pay attention to both institutions and individuals. PT. Toyota Motor Manufacturing Indonesia (TMMIN) as one of the companies in manufacturing needs to pay attention to occupational safety and health, especially in the logistics area.

To reduce the chance of work accidents in the logistics area, one of PT. TMMIN's efforts is to implement a milkrun truck driver readiness check on each truck logistics partner before delivering items to PT. TMMIN. Driver readiness checks are conducted by checking the driver's health/body condition, safety equipment, truck condition, and personal protective equipment. Most truck driver accidents are caused by improper body conditions. Truck drivers with unhealthy physical conditions have a risk of having a work accident 4 times higher than drivers with healthy physical conditions [4]. So, checking the body condition is the most important part when checking the driver's readiness.

PT. TMMIN strives to improve the quality of driver health checks through logistics partners with integrated records. Currently, each logistics partner has its own standards in conducting checks. In addition to different assessment criteria, most logistics partner companies still use paper as a media for recording check results. Based on observations of 9 logistics partners cooperating with PT. TMMIN, there are 6 logistics partners who record manually using paper. This makes the records of inspection results not properly archived and not directly connected to logistics partner customers if unhealthy driver cases. Therefore, PT. TMMIN developed the Logistics Driver Tenko System (ORIENT) application. Hopefully, health history data is integrated and can be utilized properly to make decisions.

The ORIENT application is a system that can facilitate users in recording driver health check results in real-time. ORIENT can show a graph of driver health history data trends, making it easier for users to make decisions. With this application, assessment criteria that were initially different can be standardized for all logistics partners working with a company. ORIENT is built as a web-based application that can be accessed through an internet browser and is responsive to any device to support easy access for users.

Operational business activities in the logistics area are very dynamic. Therefore, need a system that can adapt to the demands in the field. In the developing process, the ORIENT application requires a method that can adjust the needs that are available in these business activities. Modern technology is becoming increasingly sophisticated as a result of societal progress in order to address a variety of issues. Technology advancements have led to the emergence of numerous methodologies that are now used as tools in software project development to solve complex problems [5]. The agile method is a project development method that starts from the planning phase to the deployment phase iteratively and incrementally throughout the project cycle. Agile has the ability to adapt changes without excessive rework thereby reducing large additional costs in the software development process [6]. Agile has several frameworks that can assist in project development, which include Scrum, Extreme Programming (XP),

Feature Driven Development (FDD), Test Driven Development (TDD), Dynamic Software Development Method (DSDM), KANBAN [7].

In this study, the author using Scrum as a framework that have value principles of agile methods and primarily for developing complex products and system. This research explained that the Scrum method is suitable to be used in this project, since the characteristics of complex business processes with the requirement of flexible and fast development can be done effectively and efficiently [8]. Scrum has an iterative and incremental nature by defining its mechanism as a module that can be developed in small parts iteratively [9]. Scrum is also a flexible model that can be applied in any industry and project because it can be used in small and large projects [9]. The Scrum framework consists of Scrum roles, Scrum artifacts, and Scrum events [10]. This research contributes to the process of analyzing needs to system development to PT. Toyota Motor Manufacturing Indonesia in achieving company goals. This research is expected to provide an overview of how the Scrum method is implemented directly in the development of a project.

2. METHODS

2.1. Analysis and Plan Method

The data collection techniques used in this research are observation, interview/discussion, and literature study. In collecting data, the researcher conducted the following steps: (1) Observation of business processes that occur in the problem area. Business process mapping is done by analyzing the stakeholders involved in the business process so that the business processes undertaken by each stakeholder can be identified. (2) Interviews and discussions about business processes with stakeholders. This technique aims to get material for making modules required by stakeholders so that application development is based on requirements. (3) Literature study by reviewing several references related to software development methods, Scrum implementation, and journals related to the Scrum framework in application development. This technique is used to support ORIENT application research to be developed with the right framework. The output of the data collection results is modeled with a business process flow diagram.

To facilitate the visualization of the screen display, the author designed a screen mockup based on the business process flow diagram. Mockup design is a realistic visual design that represents the function of the product [11]. This mockup becomes a reference for developers when programming. In this research, the mockup was designed using Figma design tools. Figma is a digital design and prototyping tool that connected to cloud enable users to collaborate synchronously.

2.2. Development Method

After the data is collected, the Scrum framework can be implemented. Scrum is a framework that works on the principle that user requirements change frequently and all of these needs are unknown at the start of the project. It is best suited for environments when customer needs regularly change and when the exact amount of work cannot be calculated [12]. Scrum defines 3 components consisting of Scrum Role, Scrum Event, Scrum Artifact [13].

2.2.1 Scrum Role

1) Developer, the role of developers in the scrum team is to develop products according to the Definition of Done. Also, developers in the ORIENT development case consist of the roles of Project Manager, Quality Assurance, System Analyst, and Programmer. The development team is committed to producing product increments from each sprint [13].
2) Product Owner, this role is responsible for maintaining the business value of the product to be developed. The product owner represents the needs of the stakeholders which then are written in the product backlog document. Therefore, the product owner also has the responsibility to sort the product backlog according to importance, ensure the product backlog is easy to understand, and deliver product goals [13].
3) Product Owner, this role is responsible for maintaining the business value of the product to be developed. The product owner represents the needs of the stakeholders which then are written in the product backlog document. Therefore, the product owner also has the responsibility to sort the product backlog according to importance, ensure the product backlog is easy to understand, and deliver product goals [13].
4) Scrum Master, the Scrum master assists all roles in understanding scrum theory and practice according to scrum guide. The Scrum Master is responsible for the effectiveness of the Scrum Team, such as helping developers focus on creating high-value increments that meet the Definition of Done, helping find techniques for explaining Product Goals and managing effective Product Backlogs, planning and advising on Scrum implementation in the organization [13].

2.2.2 Scrum Event

1) Sprint Planning, in this event the scrum team plans the tasks that will be done in 1 Sprint. Before determining, the product owner has discussed product backlog items according to importance and how they relate to product goals so that when developers choose tasks, they already understand the capacity for 1 sprint. The output of this event is the sprint backlog, Sprint goal, and estimated tasks [13].

2) Daily Scrum, the purpose of the daily scrum is to determine the daily task planning of the selected sprint backlog and ensure progress so that it remains in line with the sprint goal. In this event, only developers and scrum masters are involved. The developer is responsible for selecting the daily plan to work on that day and the scrum master guides and assists the daily scrum. The duration of the daily scrum is 15 minutes. Daily scrum can be a forum to discuss if there are issues on the previous day so the obstacles can be identified and decisions can be made quickly [13].

3) Sprint Review, sprint Review aims to check the results of work in 1 sprint and determine the next adaptation. At this event all scrum teams are involved and able to invite stakeholders. Sprint review is conducted for a maximum of 4 hours for 1 month sprint and is held on the last day of the sprint. The Scrum team makes a presentation regarding the tasks that have been completed in 1 sprint based on the acceptance criteria. This event is held to get feedback from stakeholders so that the Product Backlog can be adjusted to meet new requirements [13]. This event is held to find ways to improve quality and effectiveness in the next sprint.

4) Sprint Retrospective, the Scrum team reviews the previous sprint process from several aspects related to individuals, tools, interactions, and DoD so can identify improvements to increase effectiveness. The scrum retrospective time limit is 3 hours for 1 month sprint and this event is used as a sprint closure. Participants in the retrospective are the scrum team and stakeholders who are only invited by the scrum team [13].

2.2.3 Scrum Artifact

1) Product Backlog, product backlog is an organized list of modules to be able to develop the application. This product backlog is the responsibility of the product owner in its creation because the product owner has the business value of the product that wants to be developed. Product backlog items can be decomposed into more specific and accurate tasks after having a discussion with the product owner [13].

2) Sprint Backlog, sprint backlog is a product backlog that has been selected by developers in sprint planning and is ready to be developed in that sprint [13]. The Sprint Backlog is updated throughout the Sprint and managed by developer so that can achieve sprint goal. These additional items are tasks that are included in the selected backlog. A Sprint Goal is the goal of a Sprint. Even though the Sprint Goal is the Developers' commitment, it provides flexibility in the work required to achieve it. The Sprint Goal also encourages the Scrum Team to work together rather than with individual initiatives.

3) Increment, each sprint produces an increment product. An increment product is a product improvement towards the goal product. A task can be called as an increment when it meets the DoD. The entire Increment is presented at the Sprint Review thus supporting empiricism [13].

3. RESULTS AND DISCUSSION

3.1. Business Process Flow

The design phase from the results of data collection by analyzing and planning produces a design document with a Business Process Flow Diagram model. In the development of ORIENT at PT. Toyota Motor Manufacturing Indonesia, design process is represented by using Business Process Flow to describe what functions exist in the health checking business process and the stakeholders involved in the process. The results of this design phase are business processes that are modeled with a Business Process Flow Diagram in Figure 1.
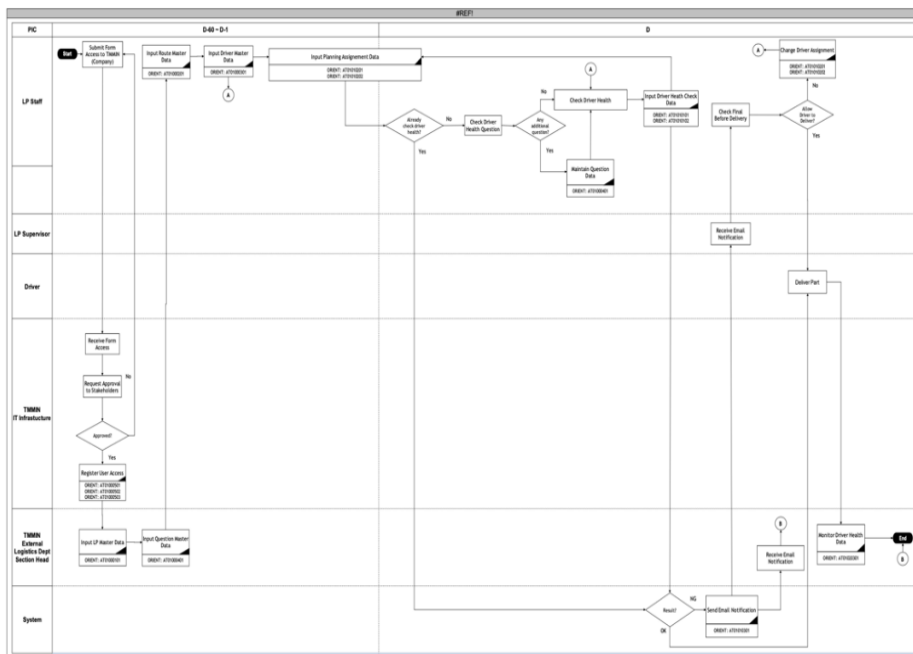
Figure 1. Business Process Flow Diagram ORIENT

3.2. Mockup Design

After creating a business process flow diagram, the System Analyst also designs a mockup design using the Figma application. The use of Figma in this research is only used to help create mockup designs. The display of the Figma application for designing ORIENT is shown in Figure 2.
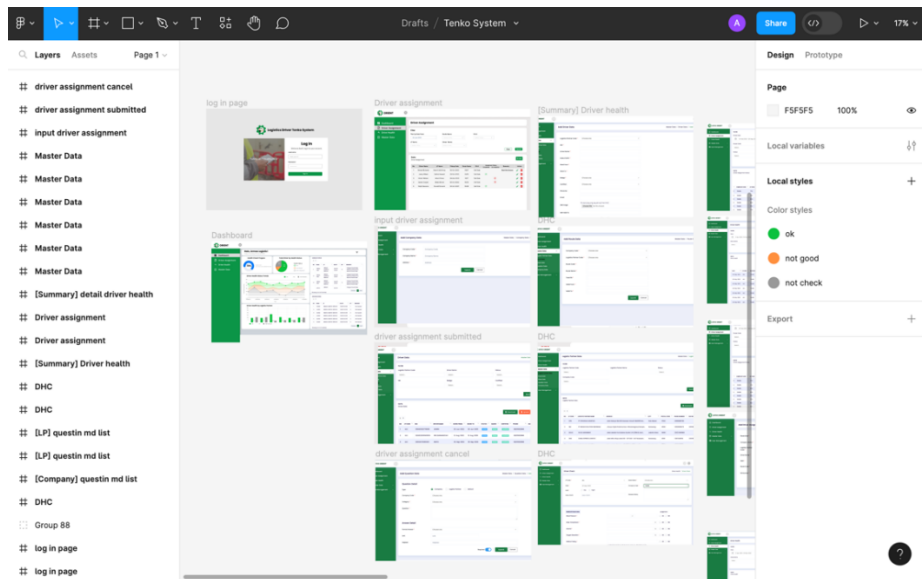
Figure 2. Design Mockup with Figma

3.3.   Implement Scrum in ORIENT

Based on the definition of the scrum guide, the author conducted the scrum framework stages as shown in Figure 3.
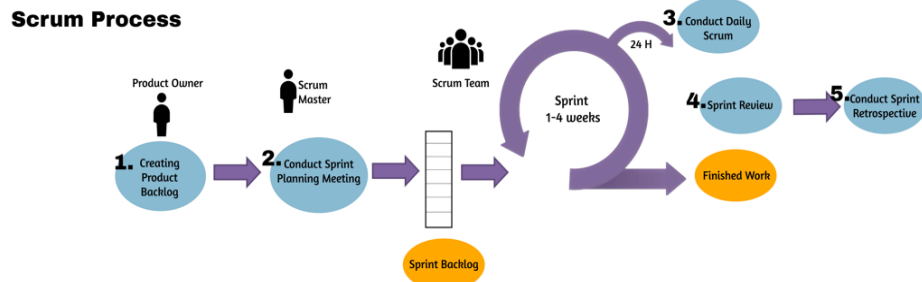

Figure 3. Business Process Flow Diagram ORIENT [14]

These are Scrum Framework stages based on Scrum Guides:

1) Creating Product Backlog, Creating a product backlog is the first stage in performing the scrum framework. The product owner is responsible for creating a backlog that represents the needs of stakeholders. In the research that has been done, the backlog list document column in the table contains ID, Epic, Actor, and Description as shown in Tabel 1. The ID column is to facilitate numbering in 1 backlog item. The epic column is filled with groups of features needed. The Actor column contains people who play a role in the

business process. The product backlog description column is made in the form of a user story to make it easier to define the "what", "who", and "why" of the feature. In practice, the product owner assisted by the developer, especially System Analyst, develops this document according to the information that has been conveyed through interviews and discussions. After the document is created, the System Analyst will reconfirm to make sure the backlog is what the product owner needs. The product owner decides which backlogs have a high priority to be done first.

Tabel 1. Product Backlog List

ID	Epic	Actor	Description
1	Dashboard	Admin	As an admin, I want to be able to filter and view data visualization from all LPs so that I can monitor the information inputted by LPs.
2	Dashboard	LP	As an LP, I want to be able to filter and view my company's information so that I can monitor my company's activities.
3	Driver Health	LP	As an LP, I can input driver medical, mental, fatigue and will display the trend or history as the final decision to determine the OK/NG status so that I can determine the driver can operate.
4	Driver Health	LP	As an LP, I canceled filling out the form so that the data is not inputted
5	Driver Health	LP	As an LP, I want to be able to search for driver health data that has been inputted.
6	Driver Health	LP	As an LP, I want to see the driver health that has been inputted.
7	Driver Health	LP	As an LP, I want to view, edit, input, delete driver health details
….	….	……	……
54	User Assignment	Admin	As an admin, I want to be able to add a new access user so that the registered user can access the system according to their role.
55	User Assignment	Admin	As an admin, I would like to be able to add a new access user so that the registered user can access the system according to their role.

2) Defining the Sprint Backlog at the Sprint Planning Meeting, Sprint planning is held after the product backlog has been created. At sprint planning, the scrum team will determine the backlog that will be worked on during 1 sprint according to the priorities set by the product owner and according to the capacity of the developer team. The backlog list that has been selected by the developer is called the sprint backlog. The scrum team in this research uses the ClickUp project management application to help compile the sprint backlog so that other developer teams can collaborate in real time as shown in Figure 4. If there are changes from other developer teams, ClickUp will automatically update so that monitoring of project progress can be seen by all developer teams.

The Scrum Master will guide the sprint planning to be positive, productive, and not exceed the time limit. The development team, especially the System Analyst, is in charge of analyzing the backlog so that it can be breake down into smaller tasks that make it easier for programmers to work in a short time with low complexity. From the tasks that have been created, there are acceptance criteria that must be achieved by programmers in order to produce an increment value at the end of the sprint. Simultaneously, the Quality Assurance role also develops test scenarios for testing. The project manager in this event is responsible for the entire project per sprint so that the PM has the right to assign point weights to each task and together with the System analyst analyze the deadline for each task according to the load.

Figure 4. Sprint Backlog

3) Conducting Daily Scrum, daily Scrum in this study was conducted every day for 15 minutes from 9am. This activity is conducted standing (Standup meeting) and is attended by developers and scrum masters only. In the daily scrum, the discussion that is carried out is the obstacles or constraints that were faced yesterday, the tasks that have been done yesterday, and the tasks that will be done today. In the ClickUp application, the development team must go

through the steps defined by the project manager before the task is finally completed according to the acceptance criteria. The step columns are To-do, In progress, Fixing, Done, Completed, and Closed. During the Daily scrum, developers will select tasks to be worked on today by moving tasks that were originally in the sprint backlog to the To-do column (ready to work on). The Project Manager will monitor the task on the board in the ClickUp application as shown in Figure 5.
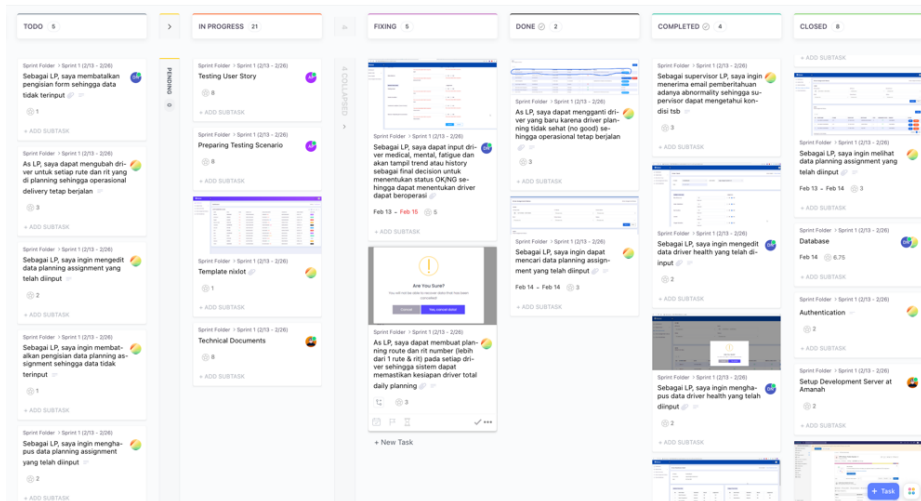

Figure 5. ClickUp Project Management Tools

4) Conducting Sprint Review, the sprint review is held on the last day of the sprint. In this study, the sprint review was conducted for 3 hours by presenting the results of work in 1 sprint (2 weeks). project manager and system analyst presented to the product owner and stakeholders. The points that will be presented are:
   a) Sprint Summary (summary of work in 1 sprint)
   b) Sprint Backlog (backlog done in 1 sprint)
   c) Burnup Chart (graph used to see performance in 1 sprint) as shown in Figure 6. Burn-up chart is to visually represent progress over time. This chart is a variation of the Burn-down chart commonly used in Scrum. It simply illustrates the weekly completion of work, allowing us to track our advancements on a temporal basis [15]
   d) Demo of work results according to the test scenario as shown in Figure 7.

Stakeholders are able to share feedback from overview of the implementation in 1 sprint. These inputs will be reviewed in the sprint retrospective.
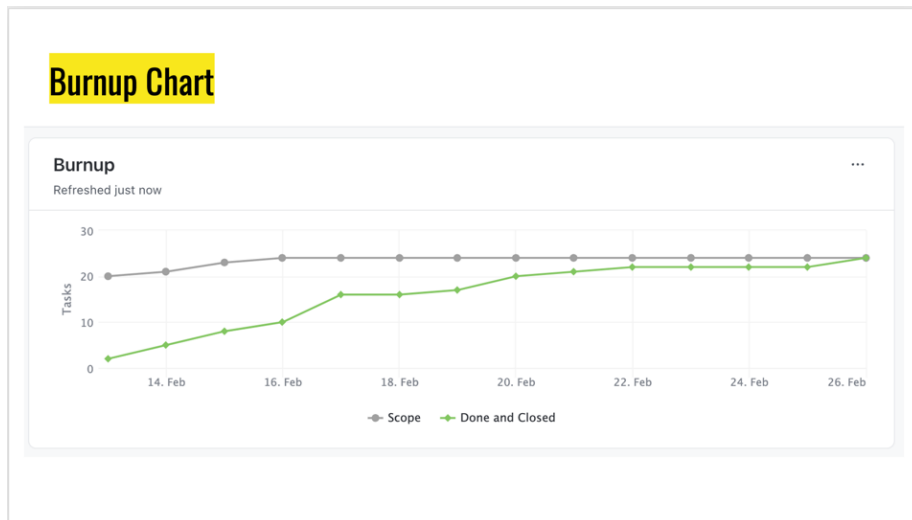
Figure 6. BurnUp Chart ClickUp Sprint 1

Figure 7. Skenario Test Sprint 3

5) Conduct Sprint Retrospective, sprint Retrospective arranged as a closing sprint. In this study, the sprint retrospective took around 2 hours for 1 sprint. All roles can share feedback to improve the effectiveness and efficiency of the scrum framework implementation. This activity reviews the feedback from the sprint implementation overview after the sprint review. If there are additions or changes to the backlog or sprint activities that need to be improved, they will

be followed up in the next sprint. Participants who can attend this event are all scrum teams and stakeholders invited by the product owner.

3.4. Logistics Driver Tenko System (ORIENT) Application

After going through 3 sprints (6 weeks), the ORIENT application becomes an application that already has features based on product owner and end-user requirement, exclude additional and improvement features. PT. TMMIN will deploy and release the application to end users after sprint 3. If there are additional features and changes that will occur in the future, ORIENT development will continue until the next sprint and doing deployment phase after the sprint is complete. This cycle will continue iteratively until there are no additions or improvements to the application. An example of the orient application that has been developed can be shown in the following Figure 8.
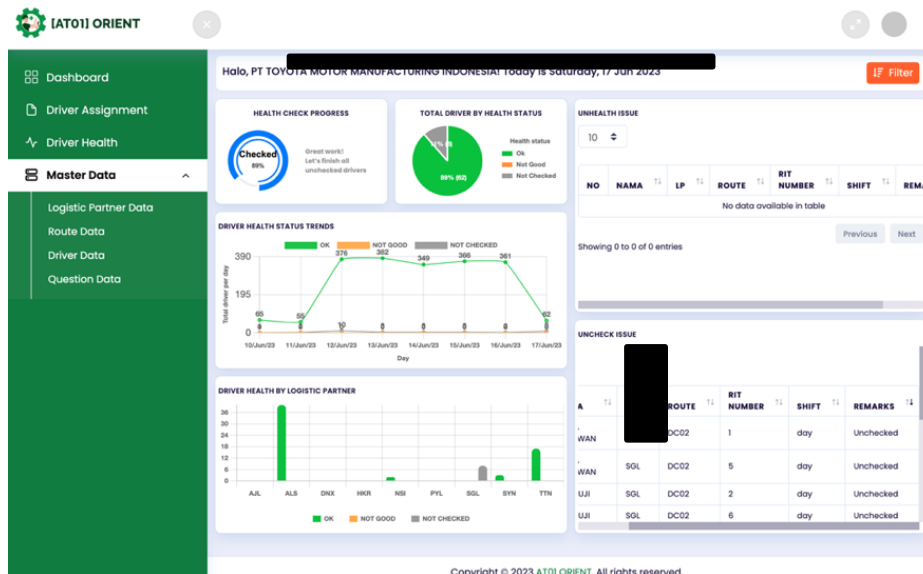

Figure 8. ORIENT Application

The successful application of the Scrum framework in the development of the ORIENT application has proven to be effective and in line with the guidelines outlined in the Scrum guide. The incorporation of sprints has streamlined task management and improved overall efficiency. The emphasis on team collaboration has facilitated prompt task completion based on priorities, resulting in optimal outcomes. Click Up project management tools have been utilized to enable real-time collaboration and progress monitoring within the Scrum team. Various additional components, such as mockups, business process diagrams, and burnup charts, have contributed to the design of the application. The dynamic nature of

the logistics business process allows for frequent changes and feature additions, which the Scrum framework effectively addresses. The ORIENT application development follows a repetitive and incremental process consisting of five stages, ensuring the production of a product that effectively meets user requirements.

Future research can focus on enhancing the development process of the ORIENT application. Integration of advanced data collection methods, such as machine learning algorithms or artificial intelligence, can improve data gathering and analysis, leading to more accurate insights and decision-making. Incorporating user research and feedback through surveys, interviews, and usability testing can contribute to continuous improvement and an exceptional user experience. Establishing a comprehensive evaluation framework is crucial to assess the impact and effectiveness of the ORIENT application in improving occupational safety and health within logistics operations. Tracking key performance indicators, analyzing accident data, and conducting regular assessments can measure the application's effectiveness in reducing incidents and promoting driver well-being.

4. CONCLUSION

Scrum framework has been effectively applied in the development of the ORIENT application, streamlining task management, promoting team collaboration, and ensuring efficient progress monitoring. Incorporating additional components such as mockups and burnup charts enhances the application design, while the dynamic nature of the logistics process is addressed through the framework's adaptability. Future research can explore advanced data collection methods and user-centric design principles to further enhance the application. Establishing a comprehensive evaluation framework is crucial to assess the ORIENT application's impact on improving occupational safety and health within logistics operations.

REFERENCES

[1] V. K. N. Wangi, E. . Bahiroh, and A. Imron, "Dampak Kesehatan Dan Keselamatan Kerja, Beban Kerja, Dan Lingkungan Kerja Fisik Terhadap Kinerja Karyawan", *J. Manaj. Bisnis.*, vol. 7, no. 1, pp. 40–50, Mar. 2020.

[2] S. R. T.Handari, and M. S. Qolbi, "Faktor-Faktor Kejadian Kecelakaan Kerja pada Pekerja Ketinggian di PT. X Tahun 2019," *J. Kedokter. Kesehat.*, vol. 17, No. 1, pp. 90-98, 2021.

[3] P. Febriana, "RI Alami 265.334 Kasus Kecelakaan Kerja hingga November 2022," 2023, [Online]. Available: https://dataindonesia.id

[4] E. Sinaga, "Faktor-Faktor Yang Memengaruhi Potensi Kecelakaan Kerja Pada Pengemudi Truk Di Pt Berkatnugraha Sinarlestari Belawan Tahun 2015," *Universitas Sumatera Utara*, vol. 2, no. 1, pp. 2584–2600, 2015.

[5] Sunardi and S. Fadli, "Identifikasi Masalah Penerapan Metode Agile

(Scrum) Pada Pengembangan Perangkat Lunak Di Perguruan Tinggi." *J. Manaj. Inform. Sist. Inform.*, vol. 1, no. 2, pp. 14-18, 2018.

[6]   S. Al-Saqqa, S. Sawalha, and H. Abdelnabi, "Agile software development: Methodologies and trends," *Int. J. Interact. Mob. Technol.*, vol. 14, no. 11, pp. 246–270, 2020, doi: 10.3991/ijim.v14i11.13269.

[7]   R. V. Anand and M. Dinakaran, "Popular agile methods in software development: Review and analysis," *Int. J. Appl. Eng. Res.*, vol. 11, no. 5, pp. 3433–3437, 2016.

[8]   S. K. Ningrum and A. B. Cahyono, "Implementasi Scrum pada Manajemen Proyek Pengembangan Perangkat Lunak Pemesan Undangan (Studi Kasus: Paperlust)," *Automata*, 2019.

[9]   F. Hayat, A. U. Rehman, K. S. Arif, K. Wahab, and M. Abbas, "The Influence of Agile Methodology (Scrum) on Software Project Management," *Proc. - 20th IEEE/ACIS Int. Conf. Softw. Eng. Artif. Intell. Netw. Parallel/Distributed Comput. SNPD 2019*, pp. 145–149, 2019, doi: 10.1109/SNPD.2019.8935813.

[10]   T. Streule, N. Miserini, O. Bartlomé, M. Klippel, and B. G. De Soto, "Implementation of Scrum in the Construction Industry," *Procedia Eng.*, vol. 164, no. June, pp. 269–276, 2016, doi: 10.1016/j.proeng.2016.11.619.

[11]   E. Y. Koentjoro, M. P. Wangi, P. M. Effendi, K. Lebdaningrum, and D. C. Putro, "Prototype Design of Monitoring Comrade Application (Monitor Kawan) during the Work from Home Period," *Int. J. Comput. Sci. Secur.*, vol. 16, no. 1, pp. 1-8, 2022.

[12]   D. Kalyani and D. Mehta, "Study of Agile Scrum and Alikeness of Scrum Tools," *Int. J. Comput. Appl.*, vol. 178, no. 43, pp. 21–28, 2019, doi: 10.5120/ijca2019919318.

[13]   K. Schwaber and J. Sutherland, "Panduan Definitif untuk Scrum: Aturan Permainan," *Scrum.Org*, no. November, pp. 1–17, 2020.

[14]   U. Ependi, "Implementasi Model Scrum pada Sistem Informasi Seleksi Masuk Mahasiswa Politeknik Pariwisata Palembang," *J. Informat.: J. Pengemb. IT.*, vol. 3, no. 1, pp. 49-55, 2018.

[15]   Arafeen, "Improving Software Development Using Scrum Model by Analyzing Up and Down Movements On The Sprint Burn Down Chart: Proposition for Better Alternatives," *Int. J. Digit. Content Technol. its Appl.*, vol. 3, no. 3, 2009, doi: 10.4156/jdcta.vol3.issue3.15.