Journal of Information Systems and Informatics
Vol. 5, No. 1, March 2023 e-ISSN: 2656-4882 p-ISSN: 2656-5935
DOI: 10.51519/journalisi.v5i1.456 Published By DRPM-UBD

Information System Project Development Management Ratio Set Assy GP Using Scrum Method

Muchammad Abdulloh Munib[1], Ahmad Luthfi[2]

[1,2]Informatics Departement, Universitas Islam Indonesia, Yogyakarta, Indonesia
Email: [1]muchammad.munib@students.uii.ac.id, [2]ahmad.luthfi@uii.ac.id

Abstract

In April 2011, the term Industry 4.0 was introduced at the Hannover Fair. PT Yamaha Indonesia was an early adopter, implementing it in their piano manufacturing process. To achieve production targets, it is necessary to monitor the production series, including the assembly of piano components into a complete unit. SAP, a software platform, is used to improve efficiency, with one of its modules being K-STAFF, which has four derivative applications: K-Master, K-Ticket, K-Score, and K-Tiptop. However, the current production process is monitored through scanning input using a SAP derivative application, which is not visualized in the production area, leading to failed targets. To address this issue, a system is required to visualize input scan results to enable direct monitoring of the production process and achieve production targets. As a result, PT Yamaha Indonesia developed the Ratio Set Assy Grand Piano system using the SCRUM method. This system includes an MIS that monitors the ratio set of piano, visualized with Apache E-Charts, manages planning, and identifies priority spare parts in real-time. This research contributes to the development of a more efficient and effective production process.

Keywords: Industry 4.0, Manufacturing, Ratio Set Assy Grand Piano, Scrum

1. INTRODUCTION

At this time digital transformation has been carried out by many industries [1, 2]. The rapid advancement of technology is the cause of the 4th industrial revolution [3]. The series of production in this industry involves various types of digitally connected technologies which are believed to be able to increase productivity [4]. In research conducted by Eka Satya [4], there have been three previous industrial changes, namely trains and steam engines which were discovered in 1750 to 1930. In 1870 to 1900 chemicals, electricity, communication equipment, and oil were discovered. The internet, computers and mobile phones were invented from 1960 to the present day. In the changing era of Industry 4.0, there has been relatively

significant progress in the industrial sector where the use of information technology is not only in business models, but in the entire industrial value chain.

Manufacturing is one of the sectors that has had a lot of positive impacts from the industrial revolution 4.0. This industrial implementation can provide clients with goods output that focuses on individual processes in a relatively short time, such as mass customization and flexibility [5]. Previously, unavailable connectivity made similar results relatively difficult to achieve. After entering the Industry 4.0 period, manufacturing is more competitive, measurable, and rich in knowledge because it is integrated with information and communication systems [6].

Yamaha Indonesia is a company engaged in the manufacturing industry in making pianos. The process of making pianos at the company is generally divided into 3 sequences of processes where each is managed by a department. First, the wood working department is responsible for the process of forming raw wood into the shape of piano components. Second, the painting department is responsible for the component coloring process. And third, the assembly department is responsible for organizing the components into a piano unit. The assembly department is divided into 2 sub-departments, namely The Assy UP Department and The Assy GP Department. Upright Piano (UP) and Grand Piano (GP) are the 2 models of pianos produced by the company. The Assy UP Department is in charge of assembling Upright Piano (UP) type pianos, while the Assy GP Department is in charge of assembling Grand Piano (GP) type pianos.

The assembly process in the assy gp department is divided into 3 work center areas, including G130, G150 and G200. Each of these work center areas assembles complementary piano sub units. Each sub-unit that has been assembled will go through a process of taking the results carried out by the PIC (Person in Charge) in their respective work center areas. The retrieved data will be entered into the K-STAFF system. K-STAFF is a production module, one of the applications from the SAP module. The system assists the departmental control process in designing monthly targets that will be forwarded to the production departments, including the assy gp department.

To achieve the target of the process control department, the assy gp department has its own mechanism to meet the target. In simple terms, the assy gp department carries out daily accumulations with a special formula through the excel application. It seems that this method does not completely solve the problem. With this mechanism, the assy gp department cannot see the accumulated results automatically and track them due to delays in the assembly process. From the results of the internal audit, these two problems were the cause of the failure of the daily target which should have made up 80% and only realized 30% -45% of the daily target. This mechanism is included in the company's kaizen (continuous improvement) list. From this problem we need an information system monitoring

the results of the assembly in the assy gp department. The main purpose of the system is to help achieve daily or monthly targets in assembling piano units.

From the results of initial observations, it is assumed that the system will receive quite a variety of data. Data visualization functions to produce a summary of information so that readers can understand the data briefly and precisely. In accordance with its main purpose that data visualization is used to facilitate understanding by connecting information so that it is easy, clear and precise through several ways such as tables, diagrams and so on to users [7]. Data visualization through pictures and diagrams is assumed to be easier for readers to understand the data [8]. Variant data that changes relatively often demands accuracy in choosing the type of graph to be displayed. Apache ECharts is a JavaScript plugin that makes it easy for developers to display visual charts. In addition to supporting many graphical models, Apache ECarts can adapt to system needs, namely presenting column charts, line charts, tables in one frame.

In project development, management methods are very influential in determining the achievement of project objectives. Over time, project development experienced many challenges which ultimately demanded high flexibility to achieve customer satisfaction, because of this the Scrum methodology emerged [9]. This study explains that the Scrum method is very appropriate to be implemented on the project, the characteristics of complex business processes with flexible and fast development demands can be carried out effectively and efficiently [10]. The programming language used in this development is PHP and the database uses MySQL. This research contributes to the process of needs analysis to system development to assist the assy gp managerial department in achieving company targets.

2. METHODS

There are sequential stages carried out in this study as shown in Figure 1. The explanation in Figure 1 is as follows:

1) Problem Identification Stage and Needs Analysis Stage, the first two stages, the author uses qualitative methods to be able to identify problems and analyze needs more comprehensively and in depth. There are two techniques that are used, namely monitoring techniques (observation) and interviews. Monitoring (observation) techniques are used because they can be used for the development and discovery of information in a wider scope [11]. Meanwhile, interview techniques can produce information that is more in-depth, rich, and open because informants have the opportunity and freedom to express their views, thoughts and feelings [12]. The two techniques can support each other in some special circumstances. Often found problems that look simple when observing, but appear complex after interviews.

2) Design Stages, the author uses the prototype design method. The prototype is used as a benchmark for the system to be developed and at the same time distinguishes between demonstration and exploration functions [13].

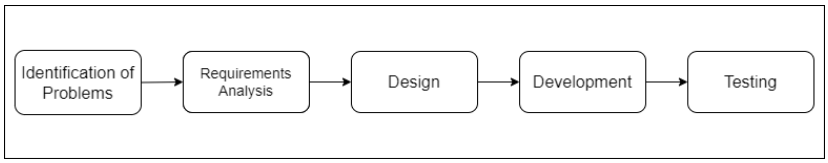

Figure 1. Research flow

UCD (Use Case Diagram) serves to illustrate programming on the system. UCD can provide an initial picture related to the user's relationship with the designed system [14].

3) Development Phase, the author uses the scrum method in project development management. Scrum is a procedure for software development that implements agile principles [15]. Agile and Scrum have a complementary relationship. Agile contains principles for solving problems quickly and easily adapting to change. Scrum is a series of activities by binding these principles. Unlike the waterfall which requires gradual and linear activities, scrum is more able to solve complex and changing problem models at one time [16]. Teams in scrum or called scrum teams have proven that teamwork is more effective even when faced with complex problems. There are 3 specific accountability that exist in the scrum team [17]. The following is an explanation of the three accountabilities. PO (product owner): Define details and optimize product value; SM (scrum master): confirms that the scrum team is working according to the scrum guide; DT (development team): complete the PBI that has been given by the PO. In achieving optimal results, the scrum team works according to the scrum work guidelines as referred to in Figure 2.

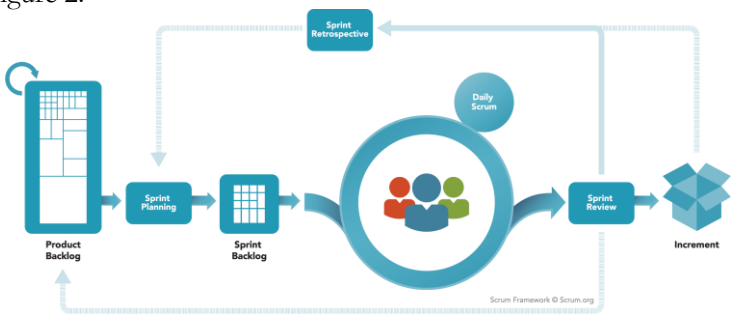

Figure 2. Scrum activity flow
(Source: www.scrum.org)

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

4) Testing phase, the writer uses black-box testing. The test is carried out at the end of each sprint. Testing is one of the important activities to reduce the potential for fatal errors.

3. RESULTS AND DISCUSSION

3.1 Requirements Analysis

Technology-based solutions are a priority at PT Yamaha Indonesia to solve problems that occur. There is a major problem involved in this study, namely the failure of the assy gp department in achieving the piano assembly target. From the analysis performed, the problem arises from the use of excel in achieving the piano assembly target. Limitations in Excel's capabilities create new problems, such as incorrect data input which results in inaccurate calculations. In addition, the inability of the excel application to connect to the internet results in data not being presented in real time.

The Assy Grand Piano Ratio Set System is a web-based system developed to monitor the achievement of piano assembly targets in the assy gp department. There are 2 types of users who have different roles in the application, including:

1) Managerial, responsible for determining the strategy in achieving the piano assembly target.
2) Person in Charge (PIC), responsible for taking results that take place in each work center area.

To understand system requirements, use case diagrams are used so that the developed system has appropriate functions. Figure 3 is the UCD on the Ratio Set Assy GP System.

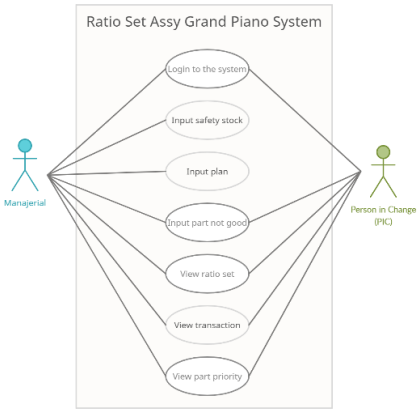

Figure 3. UCD ratio set assy grand piano system

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

3.2 Scrum Methodology

Scrum has activity guidelines that the Scrum team can use to run sprints. The following describes the activity:

3.2.1 Sprint Planning

Sprint planning is a collaborative meeting activity by the Scrum team to discuss the product backlog which will eventually become a work plan during the sprint [16]. The product backlog is an arrangement of the list of product owners needed to improve a product and as the sole source of work for the Scrum team [16]. The product backlog generally contains user stories as shown in Table 1. User stories are determined by the assy gp department as the product owner and are compiled from the level of needs that are the top priority. In sprint planning activities, the scrum team ensures that the specified product backlog is in accordance with the sprint goal. The results of the sprint planning activities are different in order of priority. These changes occur after considering time efficiency to achieve a minimum of application functions.

Tabel 1. User story

No	Role	I want …	So that …
1	Managerial, PIC	see live piano assembly set ratio data	it's easy to see progress
2	Managerial, PIC	looks at part priority data in real time	to find problematic parts earlier
3	Managerial, PIC	separates piano parts with not good and good status in order	to know for sure the ratio set that is ready to be assembled
4	Managerial, PIC	Login	PIC can access the system
5	Managerial	control over the data that appears on part priority	can make it easier to make a strategy
6	Managerial	setting monthly targets	can automatically compare the actual total with the piano plan
7	Managerial, PIC	looks at the history of taking results carried out by the PIC in all work center areas of the assy gp department	can assist in the audit process if needed

Tabel 2. Product backlog list

Priority	Role	I want …	So that …	Sprint	Time (Week)
7	Managerial, PIC	see live piano assembly set ratio data	it's easy to see progress	1	2

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

Priority	Role	I want …	So that …	Sprint	Time (Week)
6	Managerial, PIC	looks at part priority data in real time	to find problematic parts earlier	2	1
5	Managerial, PIC	separates piano parts with not good and good status in order	to know for sure the ratio set that is ready to be assembled	3	1
4	Managerial, PIC	Login	PIC can access the system	3	1
3	Managerial	control over the data that appears on part priority	can make it easier to make a strategy	3	1
2	Managerial	setting monthly targets	can automatically compare the actual total with the piano plan	4	1
1	Managerial, PIC	looks at the history of taking results carried out by the PIC in all work center areas of the assy gp department	can assist in the audit process if needed	5	1

In developing this project, a development team of 3 people collaborated to complete sprint backlog items within 2 months. Apart from these activities, there is a special activity namely User Acceptance Testing (UAT) which is carried out for 1 month. User Acceptance Testing (UAT) is a validation process between products and sprint goals through product inspection and testing [17]. The type of User Acceptance Testing (UAT) test used is beta testing where testing takes place in the field to validate function, compatibility, and product reliability. User Acceptance Testing (UAT) activities are carried out outside the sprint because the testing process must be carried out at a special time, namely when the company is stock taking. Stock taking is the process of stopping production to match the actual number of goods with the number of goods recorded in the system.

3.2.2 Sprint Activity

- Sprint 1 (dashboard feature), the sprint backlog prioritizes dashboard features so that users can see progress as shown in Figure 4. This feature compares the

actual completed piano units compared to the targeted piano units within a 3 month period. This time adjusts the company's business processes. In addition, this feature displays stock availability information in each work center area as shown in Figure 4 below. The ratio set information for each work center area makes it easier for users to see the progress of the assembly in more detail.

Figure 4. Dashboard page display

After development is complete, testing on sprint 1 is carried out and gets valid results as shown in Table 3.

Tabel 3. Blackbox testing results from sprint 1

Test Class	Test Order	Test Scheme	Valid Output	Test Output	Validation
Dashboard page	Displays global ratio set and WCA information	1. Click the ratio set menu	Displays global ratio set and WCA information	The system can display global and WCA ratio set information	Valid
Dashboard page	Displays the details of the constituent details	1. Click the ratio set menu 2. Click the builder details	Displays detailed information about the constituent details	The system can display detailed information on the constituent details	Valid

- Sprint 2 (feature plan), from the sprint backlog, the feature plan is in the second priority position. This feature is used by managers to input plan data in the form of excel obtained from the process control department. Excel data

import carried out by managerial will automatically be inputted by the system. The system will always accumulate D+2 (Days+2) piano plans to compare with actual piano totals. The D+2 (Days+2) provisions are part of the ongoing business process provisions. The plan features are shown in Figure 5. Table 4 shows that Sprint 2 is valid in testing.

Tabel 4. Blackbox testing results from sprint 2

Test Class	Test Order	Test Scheme	Valid Output	Test Output	Validation
Plan page	Display data plans	1. Click the plan menu	Displays piano plan data information.	The system can display the piano plan data.	Valid
Plan page	Import piano plans	1. Click import 2. Chosen files 3. Click preview 4. Click import.	Record all plan data and accumulate piano plans every D+2.	The system can record all plans and accumulate piano plans every D+2.	Valid

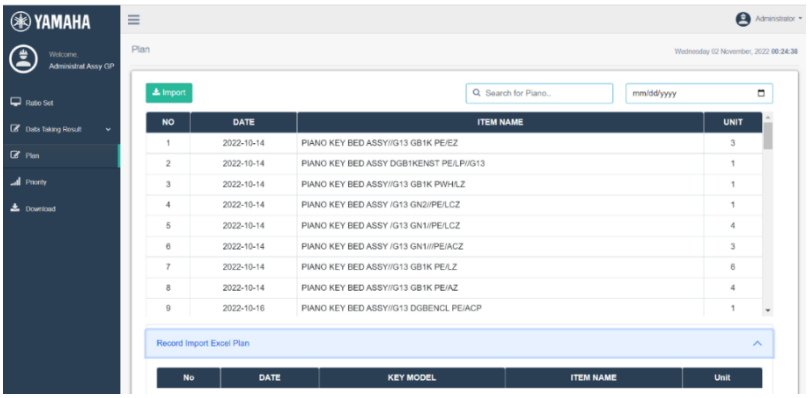

Figure 5. Plan page display

- Sprint 3 (NG features, part priority & safety stock). These three features were developed in the same sprint because they complement the minimum expected product functions. A more detailed explanation as follows:
  1) The NG feature is a feature used by the user to input piano components that are not in a good condition as shown in Figure 6. The category is determined from several points such as inappropriate shapes, painting defects, fractures, and so on.

Journal of Information Systems and Informatics
Vol. 5, No. 1, March 2023
p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

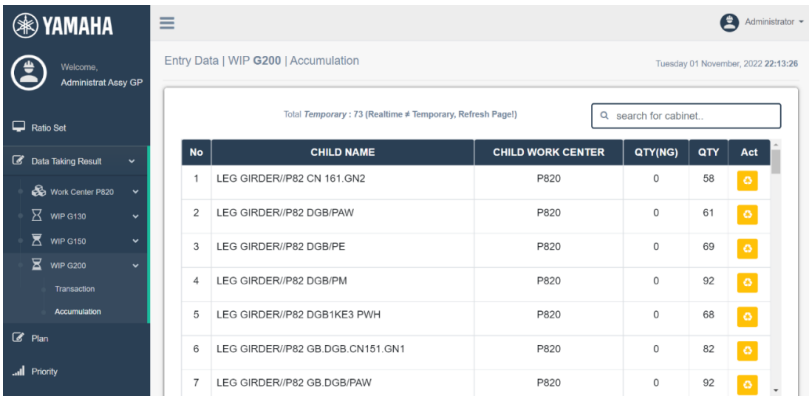

Figure 6. NG (not good) page display

2) The part priority feature is a feature displayed on the sanding buffing work center which contains an ordered list of priority parts that must be produced immediately. The list is visualized in tabular form in real time as referred to in Figure 7.

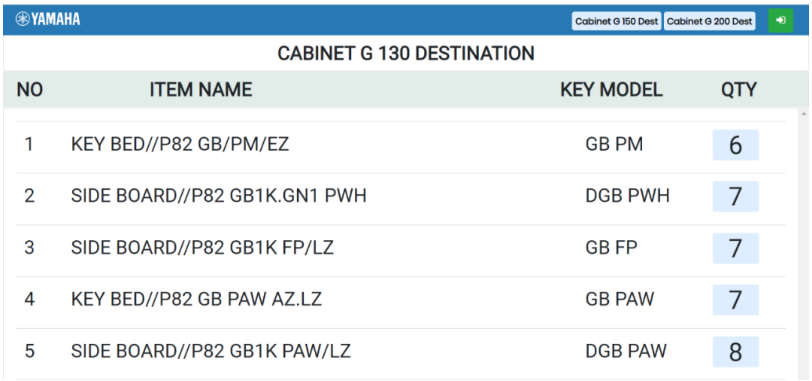

Figure 7. Part priority page

3) The safety stock feature is a feature used to control the minimum stock that must be actually available before being categorized as part priority. This feature is used by managers to make it easier to set strategies to achieve piano assembly targets. These features are as referenced in Figure 8.

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

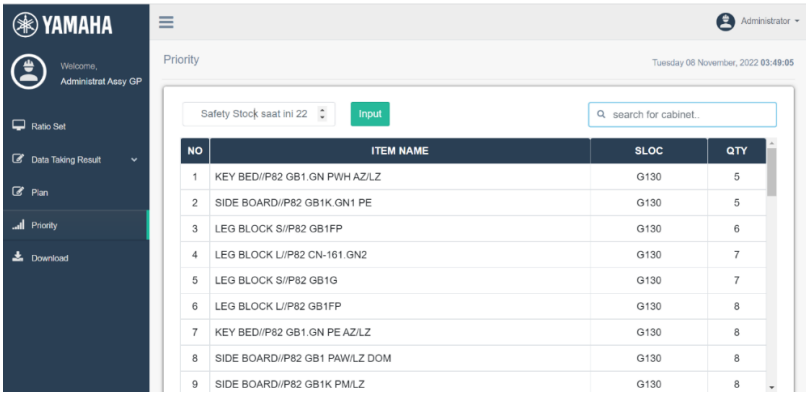

Figure 8. Safety stock page display

As with previous sprints, testing on Sprint 3 uses black-box testing and generates an overall validity value so that this feature can be used according to its functionality. The test output is as shown in Table 5.

Tabel 5. Blackbox testing results from sprint 3

Test Class	Test Order	Test Scheme	Valid Output	Test Output	Validation
Safety Stock Page	Update the safety stock variable	1. Enter safety stock figures 2. Click input	update safety stock data and filter piano items according to safety stock figures	The system can update safety stock data and filter piano components according to safety stock	Valid
Part Priority Page	Displays production priority parts in each WCA	1. Click the user navigation 2. click priority assy gp	Displays part priority information on each WCA	The system can display part priority information on each WCA	Valid
NG Page	Update NG and repair WCA (G130-G200)	1. Click action 2. Select update status 3. input QTY 4. Click updates	Re-accumulate total part items and display acc information	The system can re-acc total part items and display acc information	Valid

- Sprint 4 (taking result feature), a feature used by users to view the history of taking results (work center area G130-G200) carried out by Persons in Charge

(PIC) using the company's default system, namely K-STAFF as shown in Figure 9. The assy gp ratio set system retrieves the data through the task scheduler application. Task scheduler is an application used to schedule tasks automatically. By inserting an executable file that contains data taking rast in the K-STAFF database, the ratio set assy gp system will automatically receive similar data. This feature changes the company's habit of being ready to be audited at any time. The test results on sprint 4 were successful as shown in Table 6.

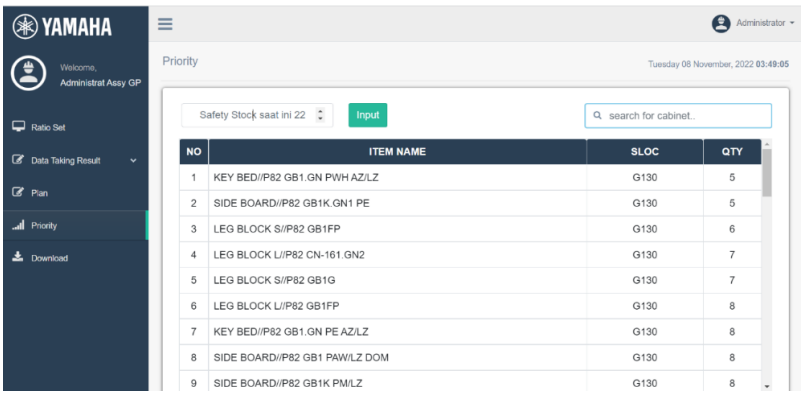

Figure 9. Taking result page display

Tabel 6. Blackbox testing results from sprint 4

Test Class	Test Order	Test Scheme	Valid Output	Test Output	Validation
Taking Result Page	Displaying WCA transaction data (P820-G200)	1. Click the WCA menu 2. click taking result	Display real-time TR information	The system can display real-time TR data	Valid

- Sprint 5 (login feature), a feature used by users to be able to access the system through the login feature as shown in Figure 10. In this feature the user will go through authentication and authorization mechanisms. There is one feature that does not require this mechanism, namely the part priority feature. This is because the page displayed does not have advanced controls. After completion of development, testing is carried out to ensure functionality as shown in Table 7.

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

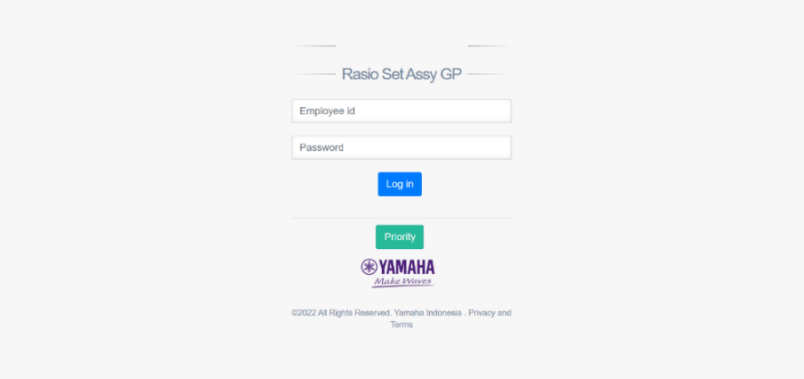

Figure 10. Login page display

Tabel 7. Blackbox testing results from sprint 5

Test Class	Test Order	Test Scheme	Valid Output	Test Output	Validation
Login Page	Valid data input	1. Input valid data 2. Click Log in	Enter on the dashboard page.	The system can enter on the dashboard page.	Valid
Login Page	Invalid data input	1. Enter invalid data 2. Click Log in.	A sweet alert "Login Failed" appears.	The system shows pop-up sweet alert "Login Failed"	Valid

3.2.3 Sprint Review (SR)

The third activity is performed at the end of each sprint activity. In this study, there were 5 sprint reviews. This activity involves the entire scrum team and relevant stakeholders to critique each item that has been developed. The output of this activity is the product owner validating each item that meets the DoD (Definition of Done). Of the 5 sprint review activities, items that have been developed by DT (Development Team) have generally been validated by the product owner as DoD so that they are included in the accumulated increments.

The maturity of the initial analysis through observation and interview techniques, along with the consistency maintained throughout the sprint duration, plays a crucial role in ensuring the success of the development process. By conducting a thorough analysis during the initial stages of the project, the Development Team can identify potential issues and address them proactively, which can prevent

major problems from arising later on. Moreover, consistent effort and focus throughout the sprint duration can help to minimize delays and ensure that the project remains on track. When the team members are committed to delivering high-quality work and are able to maintain their momentum throughout the sprint, it can lead to increased efficiency, improved productivity, and ultimately, the successful completion of the project. Overall, the maturity of the initial analysis and consistency during the sprint time are essential components of effective project development and can contribute significantly to its success.

3.2.4 Retrospective Sprint

Similar to the sprint review activity, the retrospective sprint occurs five times after the sprint review. During the first sprint retrospective, the Development Team identified solutions to problems that arose during the sprint. However, the team encountered suboptimal results when attempting to study complex business processes and develop main features simultaneously. To enhance the quality and effectiveness of their work, the team conducted brainstorming sessions three times in a single day during the second sprint. This approach proved to be effective, resulting in successful outcomes during the second through fifth retrospective sprint activities. As a result, no record was kept for these later activities, and the Development Team continued to refine their processes and improve their performance.

The research entitled "Information System Project Development Management Ratio Set Assy GP Using Scrum Method" has the potential to revolutionize the way the Assy GP Department approaches its piano assembly targets. By leveraging the power of web-based software solutions and the Scrum methodology, this project management tool provides a comprehensive set of features that address the unique challenges faced by the department. The black-box testing conducted on each sprint activity (5 sprints) revealed that the solution can deliver optimal values, which can significantly improve the department's productivity and efficiency. Moreover, the results of external testing through User Acceptance Testing (UAT) confirmed that the solution is feasible and can be integrated into the department's business processes seamlessly. Overall, this research provides a compelling solution that has the potential to transform the way the Assy GP Department approaches its assembly targets and achieve operational excellence.

4 CONCLUSION

This study uses the Scrum methodology in project development management in companies. The analysis conducted identified that business processes are complex and inconsistent as well as limited time demands fast and flexible development. As a result, project development management by the scrum method was chosen. The development which took 3 months with details of 2 months of series of

activities with scrum and 1 month of User Acceptance Testing (UAT) activities resulted in an information system of the Ratio Set Assy Grand Piano. The results of the UAT that were carried out did not have significant obstacles. This research proves that the Scrum method is proven to be able to solve problems that are complex, demand fast and adaptive. At the end of the research, the product owner concluded that the department's main problem, namely the absence of a system that directly visualizes data in the field, had found a solution. The Assy GP System Ratio Set has the main feature, namely the ratio set dashboard which displays piano set information in each work center area. This feature visualizes input scan data directly. From the results of UAT in the field, the Ratio Set Assy GP System can assist the department in achieving daily production targets. These results are at the same time proof that the system with the main features and several production supports has achieved the research objectives.

REFERENCES

[1] F. Zaoui and N. Souissi, "Roadmap for digital transformation: A literature review," in *Procedia Computer Science*, 2020, vol. 175, pp. 621–628. doi: 10.1016/j.procs.2020.07.090.

[2] A. Nurrosyidah, "Strategi Komunikasi Dalam Mengelola Perubahan Pada Transformasi Digital Perusahaan," *Scriptura*, vol. 11, no. 2, pp. 96–104, Dec. 2021, doi: 10.9744/scriptura.11.2.96-104.

[3] A. Chehri, A. Zimmermann, R. Schmidt, and Y. Masuda, "Theory and practice of implementing a successful enterprise IoT strategy in the industry 4.0 era," in *Procedia Computer Science*, 2021, vol. 192, pp. 4609–4618. doi: 10.1016/j.procs.2021.09.239.

[4] V. Eka Satya, "Strategi Indonesia Menghadapi Industri 4.0," 2018.

[5] M. Asif, "Are QM models aligned with Industry 4.0? A perspective on current practices," *Cleaner Production*, vol. 258, 2020, Accessed: Nov. 21, 2022. [Online]. Available: https://doi.org/10.1016/j.jclepro.2020.120820.

[6] M. Javaid, A. Haleem, R. P. Singh, R. Suman, and E. S. Gonzalez, "Understanding the adoption of Industry 4.0 technologies in improving environmental sustainability," *Sustainable Operations and Computers*, vol. 3, pp. 203–217, 2022, doi: https://doi.org/10.1016/j.susoc.2022.01.008.

[7] M. Fikri Abyadl, Sumarno, and Indrianawati, "Evaluasi Pembangunan Sistem Visualisasi Data (Studi Kasus: Pengelolaan Data pada Kementerian Dalam Negeri Indonesia)," *Institut Teknologi Nasional*, pp. 80–89, 2016.

[8] K. Kurniawan and D. Antoni, "Visualisasi Data Penduduk Dalam Membangun E-government Berbasis Sistem Informasi Geografis (GIS),"

Jurnal Sisfokom (Sistem Informasi dan Komputer), vol. 9, no. 3, pp. 310–316, Aug. 2020, doi: 10.32736/sisfokom.v9i3.828.

[9] N. Hadinata dan Muhammad Nasir, N. Hadinata, M. Nasir, U. Bina Darma, and J. Jenderal Ahmad Yani No, "Implementasi Metode Scrum Dalam Rancang Bangun Sistem Informasi Penjualan (Study Kasus : Penjualan Sperpart Kendaraan)," 2017.

[10] S. Kurnia Ningrum and A. Budi Cahyono, "Implementasi Scrum pada Manajemen Proyek Pengembangan Perangkat Lunak Pemesanan Undangan (Studi Kasus: Paperlust)," 2020.

[11] H. Hasanah, "Teknik-Teknik Observasi (Sebuah Alternatif Metode Pengumpulan Data Kualitatif Ilmu-Ilmu Sosial)," 2016.

[12] Z. Abdussamad, *Metode Penelitian Kualitatif*. 2021.

[13] E. Yanuarti, P. Studi Sistem Informasi, and S. Atma Luhur Pangkalpinang Jl Jend Sudirman Selindung Lama Pangkalpinang Provinsi Kepulauan Bangka Belitung, "Prototipe Sistem Informasi Seleksi Penerimaan Pegawai Tugas Belajar," *Jurnal Edukasi dan Penelitian Informatika (JEPIN)*, vol. 3, no. 2, 2017.

[14] D. Purnomo, M. Dio Revansa, N. Shahira, H. Zikra, and M. L. Hamzah, "Perancangan Sistem Informasi Penjualan Sayuran Berbasis Website," 2022.

[15] R. Gutama and T. Dirgahayu, "Implementasi Scrum Pada Manajemen Proyek Pengembangan Aplikasi Sistem Monitoring dan Evaluasi Pembangunan (SMEP)," 2021.

[16] K. Schwaber and J. Sutherland, *Panduan Scrum*. 2020.

[17] Sambas and I. Ripai, "Implementasi Dan User Acceptance Test (Uat) Aplikasi Integrated Library System (Inlis Lite) Di Mts Negeri 7 Kuningan," *ICT Learning*, 2022.