

Implementing Scrum in Executive Information System at University

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Abstract: Executive Information System is a type of system that provides information about reports generated by the system, assists executives in making necessary decisions, and provides easy access to information from both internal and external sources. This system aims to help specific organizations solve problems. The objective of this research is to design and develop a web-based executive information system that can provide access to student, faculty, and program data at the Faculty of Economics, Garut University, with data visualization in the form of graphs and numbers using the Scrum method. The Executive Information System can provide a real-time overview of data for executive-level individuals, namely the faculty leaders. Scrum is the development methodology used, with stages such as product backlog, sprint, daily scrum meeting, sprint review, and sprint retrospective. The results of this research have produced an Executive Information System that provides data on students, faculty, and programs. This system features functions such as filtering, drilldown, and importing. Testing results indicate the successful achievement of sprints on time or even ahead of schedule, and the team was able to meet targets in each sprint. In this research, the Scrum method has been effectively utilized in creating the executive information system. Therefore, this method can be employed to develop similar executive information systems in the future.

Keywords: Data; Executive Information System; Scrum Method;

INTRODUCTION

In the era of Industry 4.0, technology has become embedded in everything, including education, social aspects, and culture (Anindia Putra & Kartini, 2019). The improvement in the effectiveness and efficiency of human operations is an influence on the development of information technology (Andika et al., 2023). Communication technology can help deliver information quickly and accurately. However, it's important to note that the information needs of executives differ from those of operational staff (faculty members). The information needs of executives should be presented in an easily understandable and informative format, such as graphs and numbers (D. A. Prabowo et al., 2020). The information needs of executive-level individuals require an information system capable of visualizing data to provide a real-time overview for decision-makers, namely the leaders of the Faculty of Economics. Therefore, an executive information system is needed to address this issue. An executive information system is a computer-based system that provides information to executive levels (Maliky & Tanti, 2023). In this research, the scope of the executive system is to assist the leadership within the environment of the Faculty of Economics at Garut University in obtaining information about students, including data on new students, active students, scholarship students, graduate students, students on leave, students on maximum leave, students with maximum study periods, and final project students, as well as data on faculty members, faculty research data, and curriculum data within the Faculty of Economics at Garut University. The executive information system can provide reports in various graphic formats as

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needed (A. Prabowo & Suryayusra, 2021). Many organizations, both private and government, rely on executive information systems.

At the Faculty of Economics, Garut University, the Scrum method is employed to develop a web-based Executive Information System. Scrum, a popular system development methodology, is intended to provide significant added value quickly through an adaptable, iterative, rapid, flexible, and successful approach (Andika et al., 2023). According to Schwaber & Sutherland (Schwaber & Sutherland, 2022), the Scrum framework activities include the product backlog, sprint, daily Scrum meeting, sprint review, and Sprint Retrospective, consisting of 21 backlog items with a sprint phase targeting development within a 60-day timeframe (Nugraheni, 2023).

According to several studies, the Scrum method is highly effective in application development, making it applicable for similar application development in the future (Pomalingo & Tobing, 2023). The Scrum method is highly effective in application development and can be utilized by communities developing applications in learning stages, such as students. The application development or creation time is very short, typically only 1 to 2 months, as this method has a product backlog containing features that need to be worked on or are most important (Pamungkas et al., 2022). The research conducted (Toni, 2019) explains that the goal of the study is to create an academic framework for the Executive Information System (EIS) that considers various elements and challenges in research. The result is a system framework consisting of data and application architecture. The objective of this research (Rantung et al., 2020) is to create an Executive Information System (EIS). This research produces a web-based EIS application product. This research can serve as a reference framework for EIS development in Indonesian universities. The methodology used in the research is the Framework for Applied System Thinking (FAST).

LITERATURE REVIEW

Executive Information System

A system designed for executives or high-level management in a company or organization is called an Executive Information System (EIS). This system only displays graphics and reports about the entire business processes of the company. One type of information system, which consists of various data sources in the form of summaries, is used by senior management to monitor performance, assess, and develop business strategies. It is also referred to as an Executive Support System (ESS) (Putra & Kartini, 2019).

Scrum

Scrum is an implementation of a project management framework for the iterative development of software. Scrum focuses on achieving project completion in a short period of time. Scrum is a team-oriented method that assigns specific roles with short timeframes, known as sprints, where the system gradually evolves and produces different products. Scrum is considered one of the most popular and effective methods. Its popularity stems from its perceived simplicity and its focus on software management (Andika et al., 2023). According to Schwaber & Sutherland (Schwaber & Sutherland, 2022), the Scrum framework activities include:

- a. Product backlog is a prioritized and ordered list of components needed to enhance the product. It is the sole source of work for the Scrum Team.
- b. Sprint is a defined time period for building consistency, typically one month or less. A new Sprint begins immediately after the conclusion of the previous Sprint. This Sprint consists of Sprint planning and Sprint backlog.
- c. Daily Scrum meeting is the Daily Scrum, during which the team discusses progress made the previous day, plans the work for the next day, and resolves any challenges.
- d. The Sprint Review's objective is to evaluate the results of the Sprint, determine future changes, and perform an analysis for each Sprint.
- e. Sprint Retrospective is the time allocated for the team to conduct a comprehensive evaluation and discussion of the previous Sprint cycle, with the aim of identifying areas that have been successful and areas in need of improvement to enhance quality and efficiency.

Data

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Data is a collection of information or statements obtained from observation, measurement, or research. Data can be in the form of numbers, words, symbols, images, or characteristics that describe an object, event, or phenomenon. Data can be used to generate information, knowledge, or solutions that are useful for users(Wahono & Ali, 2021).

Website

A connected document system used as a medium to display images, text, multimedia, and more on the internet is known as a website(Fahmi & Ariani, 2018).

METHOD

The Scrum methodology is used in designing the web-based Executive Information System at the Faculty of Economics, Garut University. The stages and activities that will be outlined in the stages of research are as follows.

Scrum Software Development Process

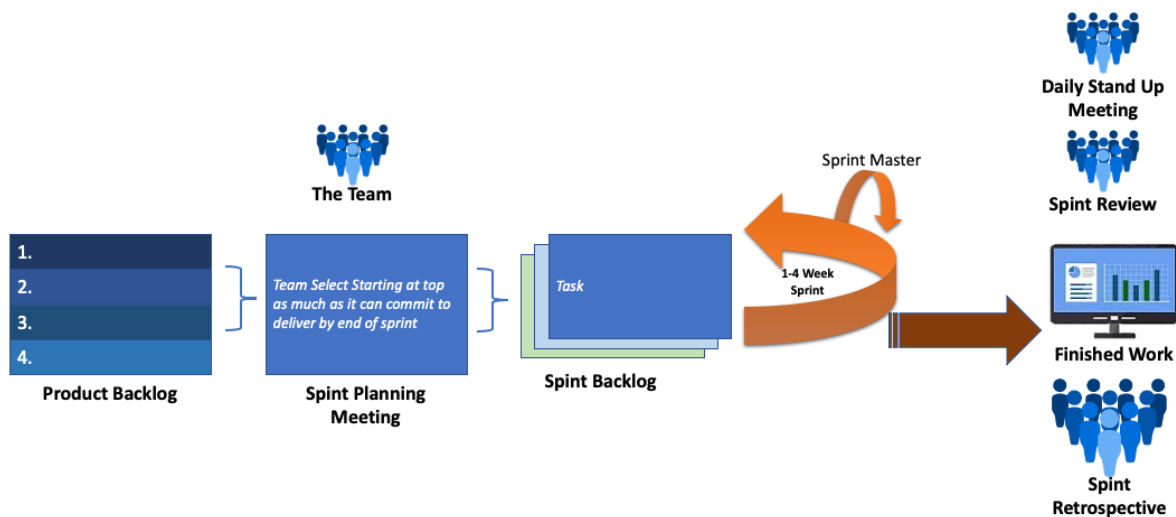


Fig 1 . Framework Scrum

Figure 1 represents the development method used in this research(Negi, 2019), which is the Scrum method (Warkim et al., 2020). The Scrum framework consists of several stages, each comprising several steps, such as product backlog, sprint planning and backlog, review, and retrospective. The product backlog determines the functionality or features that need to be provided in the executive information system(Wulandari et al., 2019). The determination of features is based on the results of system requirements analysis and user needs. Sprint planning is the work plan for each product backlog that has been divided into several parts (sprint backlog). The sprint review is the stage of creating the executive information system and involves testing with black-box testing. This method tests the functionality of the input and output of the software without considering its internal structure, thus avoiding system errors(Gusdiana et al., 2023). The final stage in the Scrum framework is the sprint retrospective, where the activity involves reviewing and evaluating the duration of the Scrum activities determined in the sprint planning stage to see if they are in line with the plan or not(Dwiki Reza et al., 2022).

RESULT

This research has resulted in an Executive Information System that provides student, faculty, and program data, equipped with features such as filtering, drill-down, and data import to facilitate decision-making for leaders. The executive information system includes menus for student data, faculty data, and program data. Each menu is accompanied by a drill-down feature. In the student data menu, there are options to display student information such as new students, active students,

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students under scholarship programs, graduates, students on leave, students on maximum leave, students with maximum study periods, and students currently working on their final projects. The faculty data menu includes a drill-down feature, offering options to display faculty information and faculty research data. The program data menu presents curriculum information.

To facilitate the development of executive information systems in universities, there are subtopics included in the process of designing and creating executive information systems. Below is an overview of the stages of designing and building an executive information system using the Scrum method:

Product Backlog

The product backlog stage is the first stage in the Scrum methodology for system design. The product backlog is created to generate backlog items to be implemented during coding. Activities in the product backlog stage include designing use case diagrams and determining backlog items. Here is a description of the activities in the product backlog stage:

Designing Use Case Diagrams

The use case diagram is used to understand the functions of the executive information system and who can use it. The following is a use case diagram for the executive information system:

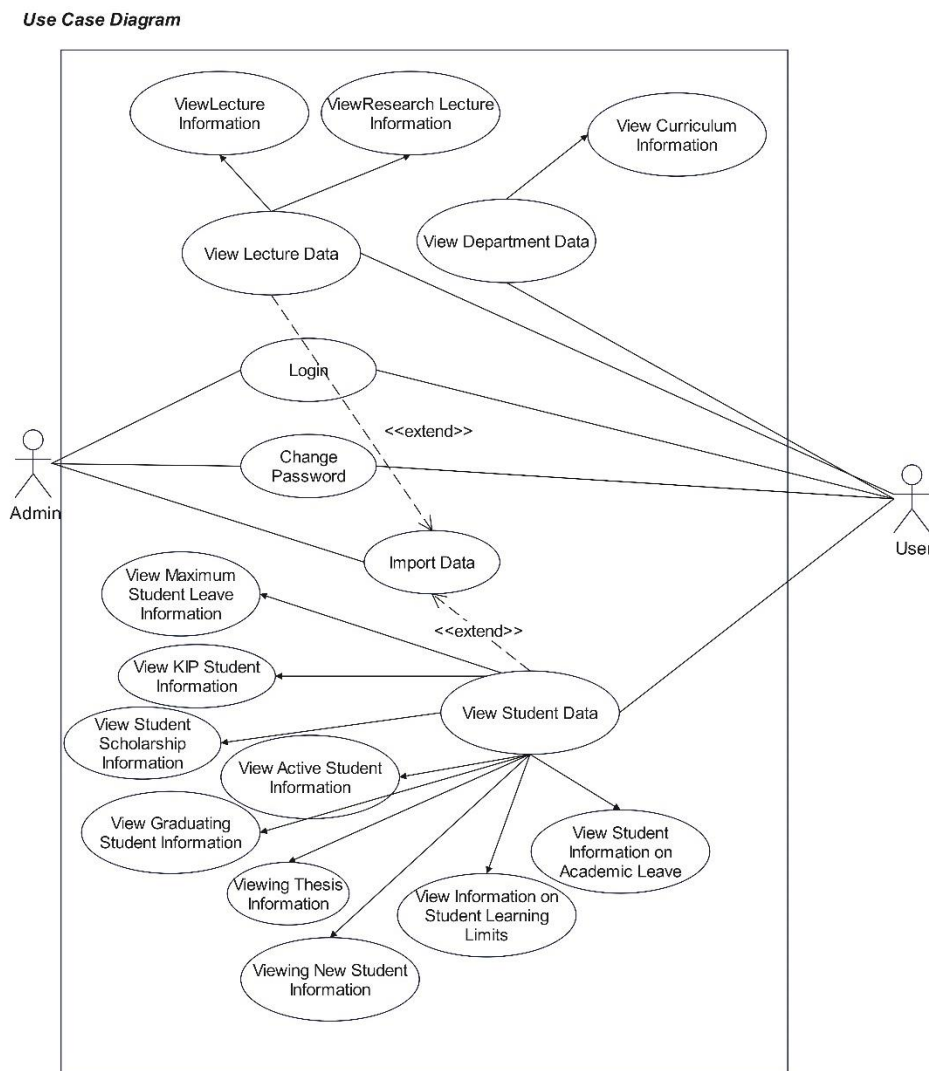


Fig 2 Use case Diagram Executive Information System

*name of corresponding author



In Figure 2, the design of the use case diagram for the executive information system shows that there are two parties involved: the administrator and the user. The administrator can perform login, data import, and change the password for the executive information system. On the other hand, the user, who is the leader of the Faculty of Economics at Garut University, can perform login and view student data information, including new students, active students, students under scholarship programs, graduate students, students on leave, students on maximum leave, students with maximum study periods, students currently working on their final projects. They can also view faculty data information, faculty research data, and curriculum information for the program of study.

Determining Backlog Items

The following are the backlog items generated after creating the business processes, which comprise a list of all the requirements or features desired in the product development.

Table 1 Backlog Item

| No | Backlog Item | Information |
|----|--|-----------------|
| 1 | Dashboard | Backlog item 1 |
| 2 | Login Page | Backlog item 2 |
| 3 | New Student Data Information Page | Backlog item 5 |
| 4 | Active Student Data Information Page | Backlog item 6 |
| 5 | Bidikmisi Student Data Information Page | Backlog item 7 |
| 6 | Scholarship Student Data Information Page | Backlog item 8 |
| 7 | Graduate Student Data Information Page | Backlog item 9 |
| 8 | Leave of Absence Student Data Information Page | Backlog item 10 |
| 9 | Maximum Leave of Absence Student Data Information Page | Backlog item 11 |
| 10 | Maximum Study Period Student Data Information Page | Backlog item 12 |
| 11 | Final Project Student Data Information Page | Backlog item 13 |
| 12 | Active Faculty Data Information Page | Backlog item 15 |
| 13 | Faculty Research Data Information Page | Backlog item 16 |
| 14 | Curriculum Information Page | Backlog item 18 |
| 15 | Data Import | Backlog item 19 |
| 16 | Filter Feature | Backlog item 21 |

Sprint

Activities conducted during the sprint stage include sprint planning and sprint backlog. Here is a description of the sprint activities:

After preparing the product backlog, sprint planning is carried out. Subsequently, the objectives and missions of each feature are evaluated through the Scrum process by determining the time required for the implementation of each feature. The following table shows the sprint planning:

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Table 2. Sprint Planning

| No | Fitur | Estimated Day | Level of Complexity |
|----|--|---------------|---------------------|
| 1 | Dashboard | 5 | High |
| 2 | Login Page | 5 | High |
| 3 | New Student Data Information Page | 5 | High |
| 4 | Active Student Data Information Page | 5 | High |
| 5 | Bidikmisi Student Data Information Page | 5 | High |
| 6 | Scholarship Student Data Information Page | 5 | High |
| 7 | Graduate Student Data Information Page | 5 | High |
| 8 | Leave of Absence Student Data Information Page | 5 | High |
| 9 | Maximum Leave of Absence Student Data Information Page | 5 | High |
| 10 | Maximum Study Period Student Data Information Page | 5 | High |
| 11 | Final Project Student Data Information Page | 5 | High |
| 12 | Active Faculty Data Information Page | 5 | High |
| 13 | Faculty Research Data Information Page | 5 | High |
| 14 | Curriculum Information Page | 5 | High |
| 15 | Data Import | 5 | High |
| 16 | Filter Feature | 5 | High |

Explanation: 1 Day = 8 working hours

In Table 2 of sprint planning, the estimated completion time for the feature is set at 5 days with a high level of complexity. Subsequently, in the sprint backlog, a list of user-prioritized requirements with predetermined working hours is created. In this section, features identified in the product backlog and sprint planning are completed.

Table 3 Sprint Backlog Item

| No | Sprint | Activity | Estimated Time (Hours) |
|----|-----------------------------------|--|------------------------|
| 1 | Dashboard | Interface Design | 40 |
| | | Coding | |
| | | Testing | |
| 2 | Login | Create Database | 40 |
| | | Interface | |
| | | Coding | |
| 3 | New Student Data Information Page | Interface Design | 40 |
| | | Filter (Year, Level, Faculty, Study Program) | |
| | | Database | |
| | | Coding | |
| | | Testing | |

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Sprint 3 involves backlog item 3, which is creating a page for new student data information with a total of 5 activities and an estimated time of 40 hours. The interface design in backlog item 4 presents data visualization in the form of graphs and numbers, equipped with filtering features based on year, level, faculty, and program of study, which can facilitate leaders in viewing information. After Sprint 4 is completed, Sprint 4 continues with backlog item 4, creating a page for active student data information, until Sprint 16, which involves backlog item 16, creating filtering features.

Daily Scrum

The stage following the sprint is the daily Scrum, which involves discussions with the Scrum master. These discussions occur every working day to monitor performance and progress during the sprint and last for 15 minutes (Ritonga et al., 2021). The components discussed during the daily Scrum include the features that have been worked on, any challenges encountered during development, and the features to be worked on next.

Sprint Review

The sprint review is the stage of implementing the coding of the executive information system based on the sprint results. After the executive information system is built and operational, testing is conducted while considering the system's operational conditions using the black-box testing method.

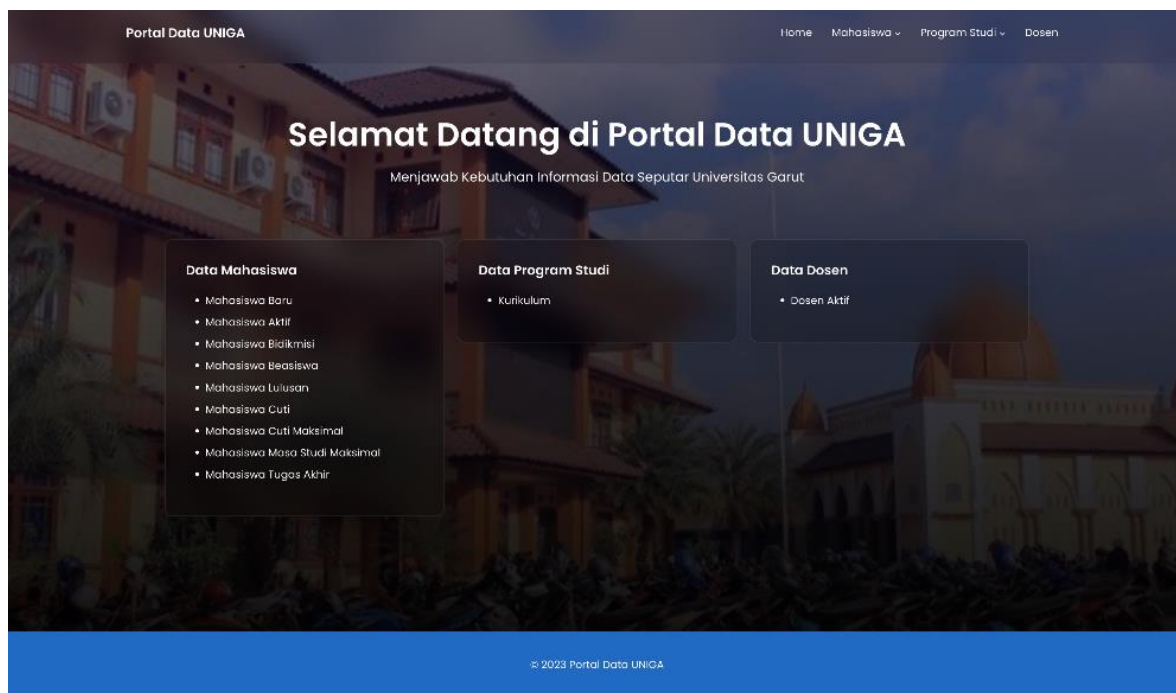


Figure 3 The Executive Information System Dashboard

Figure 1 displays the executive information system dashboard, presenting the student data menu, including new students, active students, Bidikmisi students, scholarship students, graduates, students on leave, students on maximum leave, students with maximum study periods, students currently working on their final projects, faculty data, faculty research data, and curriculum information for the program of study, which can be accessed by users.

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Figure 4 Lecturer Data Information Page

Figure 4 represents the Lecturer Data Information page, displaying lecturer data information presented in the form of graphs and numbers. Leaders can view information about the number of active lecturers based on the program of study.

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As a validation that the system built has met the user requirements, the final testing of this product development uses the Black Box Testing method. The results of the Black Box Testing for this Executive Information System are shown in Table 4. After conducting Blackbox testing, it can be concluded that all testing carried out has been in accordance with expectations. Each backlog has been resolved properly and produces the appropriate status, indicating that the system that has been built is ready to proceed to the next stage.

Table 4 Executive Information System Blackbox Testing

| Correct Test Results (Correct Data) | | | |
|---|---|---|------------|
| Input Data | What to expect | Observation | Conclusion |
| Fill in login details Example: Username: admin Password: admin | If the login data is valid then the admin will be logged into the system | Data login valid | Succeed |
| Upload data | If the data entered is complete and the field is correct | The entered data is complete and precise, the system processes the data for storage | Succeed |
| View active Student information by year | After filtering by year, the system will display active student information presented in graphs and numbers | The system displays graphs and numbers of active students by year | Succeed |
| Incorrect Test Results (Incorrect Data) | | | |
| Input Data | What to expect | Observation | Conclusion |
| Username dan password salah | The system may display an error notification | Display errors | Succeed |
| The uploaded file does not match or is incomplete | May display errors | Display errors | Succeed |
| Missing required information | May display errors | Display errors | Succeed |

Sprint retrospective

Sprint retrospective involves the activity of reviewing and evaluating the duration of Scrum activities as determined in the sprint planning stage to determine whether they are on track or not. The results of the retrospective evaluation are presented in graphical form, as follows:

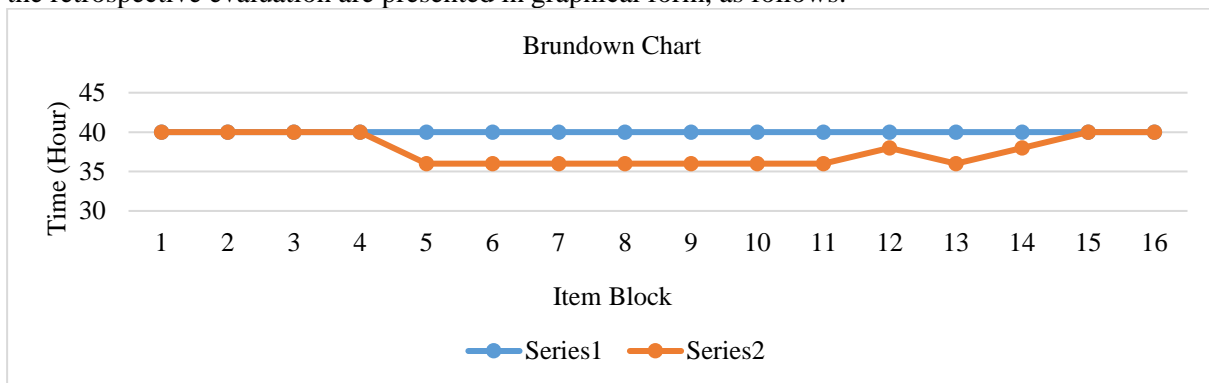


Figure 5 Brundown Chart

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In the above figure, you can see the estimated duration, where series 1 represents the time in the sprint planning stage, and series 2 represents the time in the sprint backlog stage. Sprint planning is scheduled for 80 working days for the executive information system with an estimated completion time of 1 day equals 8 working hours. Therefore, the total hours worked are 640 hours.

Based on the completed sprint backlog, the total completion time for the executive information system's features during 80 working days is 604, which is because some sprints went smoothly and were completed according to the schedule planned in the sprint planning stage. Some sprint backlogs were completed faster than sprint planning due to similarities in design, feature, and coding work with previous backlog items, resulting in a time difference of 36 hours.

DISCUSSIONS

Based on the results that have been outlined, it aligns with the objective of this research, which is to design and build a web-based executive information system that provides a current overview of data for executive-level users, namely the faculty leaders. This includes information on new students, active students, bidikmisi students, scholarship students, graduates, students on leave, students on maximum leave, students with maximum study periods, students currently working on their final projects, faculty data, faculty research data, and curriculum information for the program of study using the Scrum method. The total working time for this was 604 hours. This demonstrates that the implemented Scrum approach was successful in facilitating rapid and timely application development, allowing for the swift processing of application construction for the client (Andika et al., 2023; Setiawan et al., 2021).

CONCLUSION

Based on the findings, it can be concluded that the research objectives have been achieved. This research has developed an executive information system that can be accessed via the internet, which helps the dean of the Faculty of Economics obtain data such as student, faculty, and program of study information. In this research, the Scrum method was effectively utilized in creating the executive information system. Therefore, this method can be used to develop similar executive information systems in the future.

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