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Process Improvement of Academic Advising for Engineering Students with GPAX Below 2.00: A Case Study at Suranaree University of Technology

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Abstract

The undergraduate student retention rate at the School of Engineering, Suranaree University of Technology, declined from 79.23% in the 2022 academic year to 73.41% in 2023. Risk analysis indicated that this issue was primarily associated with students having a Cumulative Grade Point Average (GPAX) below 2.00. To address this problem, the School requires low-performing students to meet with academic advisors prior to course registration. However, the existing paper-based advising process resulted in delayed submissions, excessive processing time, and inefficient data retrieval. The objective of this study was to improve the academic advising process for students with GPAX below 2.00, reduce administrative workload, and enhance convenience for students and faculty members. Lean principles were applied to identify operational waste, supported by Pareto charts and fishbone diagrams for problem and root cause analysis. Process improvement was conducted using the ECRS principles, along with the development of an online database and web-based system for recording advising information. Results showed that the processing time per task was reduced from 6,900 seconds to 3,540 seconds, representing a 49.69% reduction. In addition, 86.60% of students reported satisfaction and perceived the advising process as beneficial.

Keywords
ECRS, Productivity Improvement, 7WASTES, Lean Management.

1. Introduction

According to the risk assessment of Suranaree University of Technology for the fiscal year 2024, it was found that the retention rate of undergraduate students has declined, while the dropout and withdrawal rates have continuously increased. This issue has been identified as the most critical risk facing the university. One of the main causes is the increasing number of students with a grade point average (GPA) lower than 1.80 in each academic semester (Suranaree University of Technology, 2024).

One of the key approaches to risk management is effective academic planning with guidance from academic advisors. Academic advisors play an essential role in supervising and providing guidance to students, including assisting them in resolving academic and personal problems, career planning, and adaptation to university life. Therefore, the Institute of Engineering has established a policy requiring students with a cumulative grade point average (GPAX) below 2.00 to meet with their academic advisors every semester. This meeting must take place within 10 days after the beginning of the semester. The purpose is to allow advisors to initially evaluate the appropriateness of course registration before students confirm their enrollment for the semester (Available: https://www.facebook.com/EngineeringSUT/?locale=th_TH, Accessed June 26, 2025).

However, the current problem associated with the advisory meeting activities for students with a cumulative grade point average (GPAX) below 2.00 is that the monitoring and recording of advisory meeting activities lack a systematic process. Most records are documented through paper-based forms or non-continuous reports, which leads to several limitations, including

1. Communication channels between advisors and students, such as scheduling time and appointment arrangements.
2. Difficulty in verifying historical records.
3. Inconvenience in submitting supporting documents or evidence.
4. Inability to evaluate outcomes or conduct statistical data analysis.
5. Ineffective long-term monitoring of students' academic progress.
6. Inconsistencies in information among students, academic advisors, and administrative staff.

Therefore, the Institute of Engineering recognizes the need to develop a digital-based advisory meeting system to facilitate operational processes for students and staff. Such a system would enable continuous data collection, monitoring, and verification in real time. Moreover, it would establish a centralized database that supports policy analysis and the sustainable improvement of student support processes within the Institute of Engineering. This initiative is expected to reduce the risk related to student retention and enhance the overall quality of educational management at the university.

This research aims to improve the operational process by reducing the working time required by responsible staff and enabling immediate access to historical data. In practice, staff have encountered several operational challenges, including communication issues, complex procedures, difficulties in submitting supporting documents, excessive time spent on operational tasks and report compilation, and delays in retrieving historical information. Therefore, this study seeks to enhance operational efficiency, minimize waste, create value in the work process, and increase service satisfaction among users. The study begins with documentary analysis (Intrachim, 2015) of the advisory meeting process for students with a GPAX below 2.00. Operational data were experimentally collected from June 2024 to November 2025 by measuring the working time required for each activity. The study examines operational steps that contribute to process waste through time measurement of each process. Subsequently, the identified problems were analyzed using a Fishbone Diagram. Lean concepts were then applied to improve the process by identifying waste through the Seven Wastes framework and employing the ECRS (Eliminate, Combine, Rearrange, Simplify) principle as a tool for waste reduction.

1.1 Objectives

1.1.1. To improve the operational process and reduce the processing time of advisory meeting activities between students and academic advisors.

1.1.2. To develop a systematic database for recording and managing information related to students advisory meetings.

2. Literature Review

Process improvement based on the Lean approach is applied to solve operational problems through several systematic tools, including workflow analysis, Pareto diagrams, cause-and-effect diagrams (Fishbone diagrams), waste analysis using the Seven Wastes concept, and process improvement based on the ECRS principle (Wannaporn, Th., 2025).

2.1 Workflow

A workflow refers to a sequence of processes that are systematically defined to serve as guidelines for performing tasks in order to achieve the desired objectives or outcomes efficiently. The sequence of steps reflects the linkage between concepts, operational plans, and actual work practices. Clearly defined workflows help increase operational clarity, reduce redundancy, and support overall performance improvement (Hunpanich, N., & Burancharugul, P., 2021).

2.2 Pareto Diagram

The Pareto principle is widely used to prioritize problems and identify the most significant issues in a process. Pareto analysis begins by counting the occurrences of the factors of interest from the available data. These factors are then arranged in descending order according to their frequency, followed by the calculation of cumulative totals. However, the Pareto diagram cannot identify the root causes of problems; instead, it helps identify and select the major causes that should be addressed first (Tulaphon, N., 2015; Khonkan, M., & Worarat, S., 2019).

2.3 Fishbone Diagram

The Fishbone Diagram, also known as the Cause-and-Effect Diagram, is used to systematically analyze the root causes of problems. Possible causes are presented in a structure resembling the bones of a fish, which allows related factors to be grouped clearly. This tool also supports brainstorming among team members and helps improve understanding of work processes across different departments (Hunpanich, N., & Burancharugul, P., 2021).

2.4 Waste Analysis

Waste analysis is a key tool in Lean production systems that focuses on reducing non-value-added activities. This concept was developed to help identify and eliminate different forms of waste that directly affect operational efficiency, cost, and product quality. The Seven Wastes are categorized as follows: (1) Overproduction, (2) Inventory, (3) Transportation, (4) Motion, (5) Processing, (6) Delay, and (7) Defects (Wannaporn, Th., 2025).

2.5 ECRS Principle

ECRS is a principle used for improving work processes and increasing operational efficiency. It focuses on eliminating unnecessary tasks, combining related activities, rearranging process sequences to reduce operational time, and simplifying procedures to make work processes easier and more efficient (Nuntiya, B., 2021).

3. Methods

This study examines the sequence of operational processes and working procedures. The research begins with collecting data on the workflow before process improvement. The collected data include the number of operational activities, the time required for each activity, and the number of participants in each semester. The purpose is to analyze and redesign the operational process by integrating technology to support the activities more effectively. Lean principles were applied to improve work efficiency. The research procedures are as follows:

1. **Data collection:** Historical operational data were collected from four academic semesters, including working time for each activity and user satisfaction levels.
2. **Time analysis:** The working time data were analyzed using a Pareto diagram to identify the most significant activities affecting the overall process time.
3. **Process analysis:** The workflow was analyzed using the Seven Wastes concept to identify non-value-added activities, and the root causes of problems were further analyzed using a Fishbone Diagram (Cause-and-Effect Diagram).
4. **Process improvement:** The operational process was improved using the ECRS technique (Eliminate, Combine, Rearrange, Simplify). Descriptive statistics were then applied to analyze and compare the working time after improvement with the working time before improvement.

4. Data Collection

This research employed documentary analysis to examine the process of organizing advisory meetings for students with a cumulative grade point average (GPAX) below 2.00. Operational data were collected during the period from June 2024 to November 2025. The data collection involved time measurement of each operational activity and user satisfaction evaluation. The research procedures were conducted as follows:

1.) Analysis of the current workflow: The existing operational procedures were examined to identify activities that contribute to process inefficiencies. Time measurements were conducted for each operational step, and the collected time data for each activity were analyzed to determine the primary causes of delays using a Pareto diagram.

The Pareto principle, commonly known as the 80/20 rule, states that approximately 80% of the results are generated from 20% of the main causes. This means that if the critical 20% of the causes can be identified and effectively addressed, up to 80% of unnecessary time loss can potentially be reduced. Based on this principle, the workflow was investigated, and it was found that the process consists of four main activities. The working time required for each activity is presented in Table 1, which summarizes the main activities and their corresponding processing times. The analysis results are illustrated in Figure 1, which presents the Pareto diagram analyzing the time required for each operational process.

Table 1. Main Activities and Processing Time

Item	Activity	Time (Seconds)
Activity 1	Providing consultation and explaining the participation procedure (e.g., telephone, Line, or e-mail communication)	300
Activity 2	Verifying the accuracy and completeness of the submitted forms	1,800
Activity 3	Scanning the barcode and recording data from the advisor meeting confirmation form into Microsoft Excel for data conversion into student records	3,600
Activity 4	Preparing a summary report of the number of students who attended advisory meetings and comparing it with the target student list for the current semester	1,200
Total Time per Task		6,900

Note: The time presented in Table 1 does not include the duration of non-value-added activities, such as the time spent in advisory meetings with academic advisors and the consultation provided during the activity.

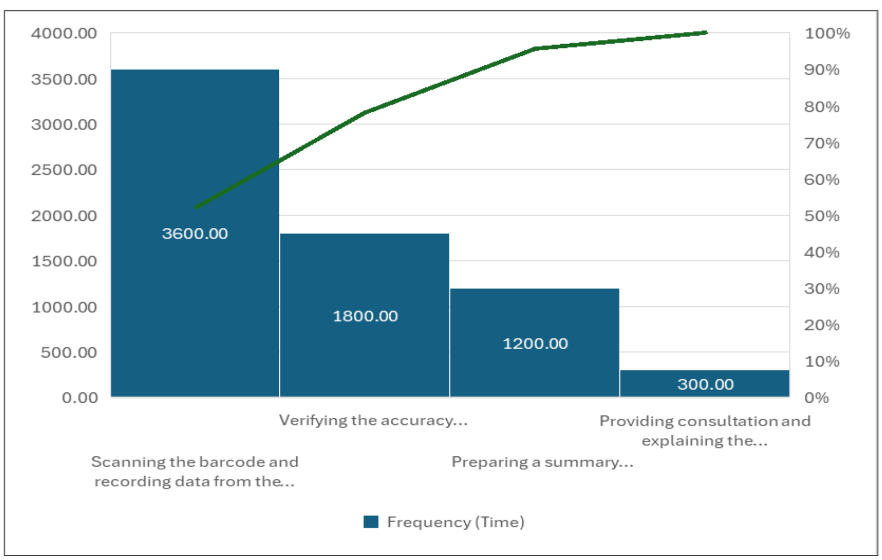

Figure 1. Pareto diagram showing the analysis of processing time (seconds) required for each operational process.

According to Figure 1**,** the main activities involved in the advisory meeting process for students with a cumulative grade point average (GPAX) below 2.00 indicate the presence of process waste. Among the four activities, Activity 3, which involves scanning barcodes and recording data from the advisor meeting confirmation forms into Microsoft Excel to convert the files into student data, requires the longest processing time. This activity takes 3,600 seconds per task, which is the highest among all activities. The long processing time is mainly due to the large volume of tasks and the need to scan barcodes individually in order to record and compile the information of students who participated in the activity. Since this step is a critical part of the process, it significantly contributes to delays in the overall workflow.

2.) From the collection of data on the number of students participating in the activity over the past two years**,** it was found that the number of participating students was relatively low. This information was obtained from the document forms submitted by students at the service counter in front of the Institute of Engineering**,** as shown in Table 2**.**

Table 2. Number of Students Participating in the Activity Over the Past Two Years

Academic Year	Academic Year 2565			Academic Year 2566		
	1	2	3	1	2	3
Number of Students Participating in the Activity (Persons)	324	403	405	324	368	467

3.) Problem Cause Analysis based on the collected data regarding the time required in the operational process, the Seven Wastes concept was applied as an approach to analyze and reduce waste within the workflow. The analysis was conducted according to the following categories:

1. Overproduction – Producing more work than necessary or performing unnecessary tasks, such as manually recording data through human data entry systems.
2. Waiting – Time lost while waiting for various process steps, such as waiting for appointment confirmation from academic advisors or waiting for the verification of form completeness. In some cases, repeated checking is required to ensure the accuracy of student information, such as student ID numbers.
3. Transportation – The transfer of documents between individuals, for example, sending forms to academic advisors for verification when the advisors are unavailable and returning the documents to the administrative staff.
4. Over-processing – Repeated checking and recording of documents. For example, when barcode scanning fails or when forms are incomplete and do not contain a barcode, staff must manually enter the data, resulting in redundant work.
5. Inventory – In this context, it refers to the excessive storage of documents, which may cause delays in document management or retrieval of historical records.
6. Motion – Unnecessary movement by students that does not create value, such as missing scheduled appointments or arriving late.
7. Defects – Errors occurring during the operational process that require rework to correct them, such as incorrect student information entry or missing documents, which may require the report to be revised and prepared again.

Based on the results of this analysis, the next step involved identifying the root causes of the problems using a Cause-and-Effect Diagram (Fishbone Diagram), as illustrated in Figure 2.

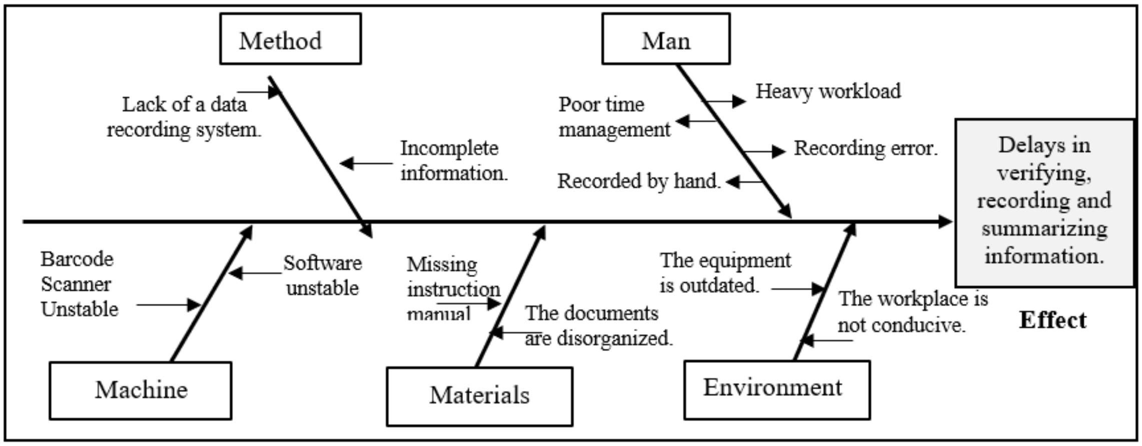

Figure 2. Fishbone diagram illustrating the causes related to Activity 3: barcode scanning and data entry from the advisor meeting confirmation form into Microsoft Excel for conversion into student data.

From the analysis of the factors influencing delays in Activity 3, which involves barcode scanning and recording data from the advisor meeting confirmation forms into Microsoft Excel to convert them into student data, the causes were analyzed based on the 4M1E framework (Man, Machine, Method, Material, and Environment). The main causes and improvement guidelines are summarized in Table 3.

Table 3. Summary of Main Causes and Improvement Guidelines

Cause	Sub-causes
Man	1. High workload of staff members. 2. Data entry errors due to manual recording, which may lead to mistakes and require repeated corrections, resulting in redundant work. 3. Poor time management, as staff may need to perform multiple tasks simultaneously, such as document verification and responding to student inquiries.
Method	1. Incomplete data caused by errors during file conversion, which may result in missing student ID numbers and require repeated corrections. 2. Lack of a systematic data recording system.
Machine	1. Unstable barcode scanner, which sometimes cannot read barcodes correctly. 2. Unstable software, particularly in downloading or processing documents.
Material	1. Lack of an activity guideline or manual, causing students to misunderstand the process. 2. Disorganized document arrangement due to the large volume of paperwork.
Environment	1.An unfavorable working environment. 2. Outdated or insufficient equipment.

4) Improvement Guidelines based on the collected data and the analysis of the root causes of the problems, the ECRS technique was applied to improve the operational process. This approach helps increase work efficiency and reduce the processing time required for the activities. The primary objective is to reduce operational time and improve the workflow of organizing advisory meeting activities. The improvement principles are described as follows (Figure 3-Figure 5):

1. Eliminate: Unnecessary processes or steps were removed. The traditional document submission and manual data recording processes were replaced with an online system by applying technology through Google Forms. This approach helps reduce redundant tasks and minimize errors in data recording.
2. Combine: Processes that can be performed simultaneously were combined to reduce task redundancy. In particular, Activity 2: verifying the accuracy and completeness of forms (1,800 seconds) and Activity 3: scanning barcodes and recording data from the advisor meeting confirmation form into Microsoft Excel (3,600 seconds) were integrated into a single process. Students are required to enter their information directly into the system, allowing data recording and confirmation to be completed simultaneously. This integration helps reduce the overall processing time.
3. Rearrange: A website was developed using the Google Sites platform to support advisory meeting activities. The website provides explanations of the procedures and requirements for scheduling appointments with academic advisors. Students can access the information at any time, which reduces waiting time when contacting staff or faculty members and improves communication efficiency.
4. Simplify: The data entry process was simplified by using Google Forms for information submission and Google Sheets for automatic data collection and database creation. This approach saves time, reduces redundant procedures, and enables efficient retrieval of historical data.

Figure 3. Google Form used for online document submission.

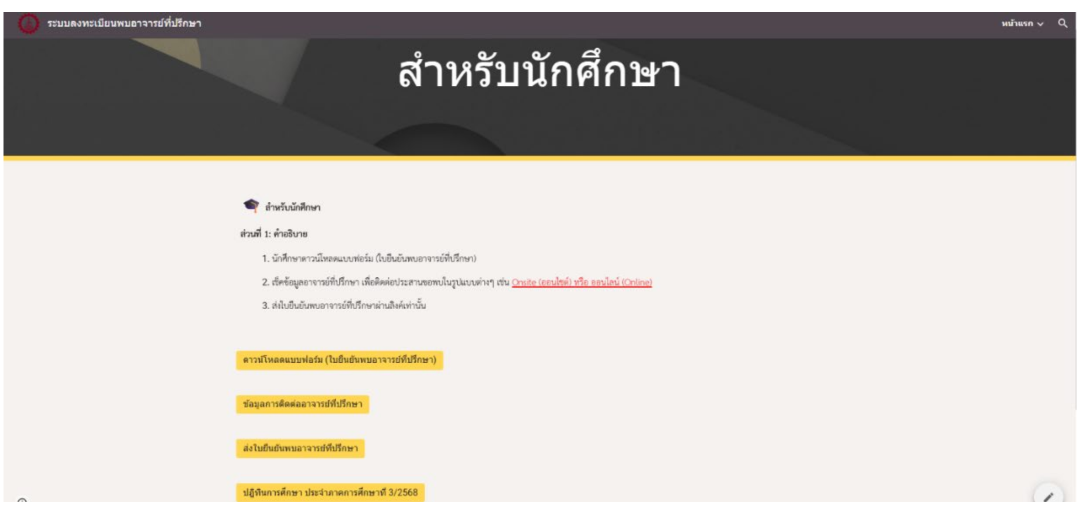

Figure 4. Website used to provide instructions and submit the advisor meeting form.

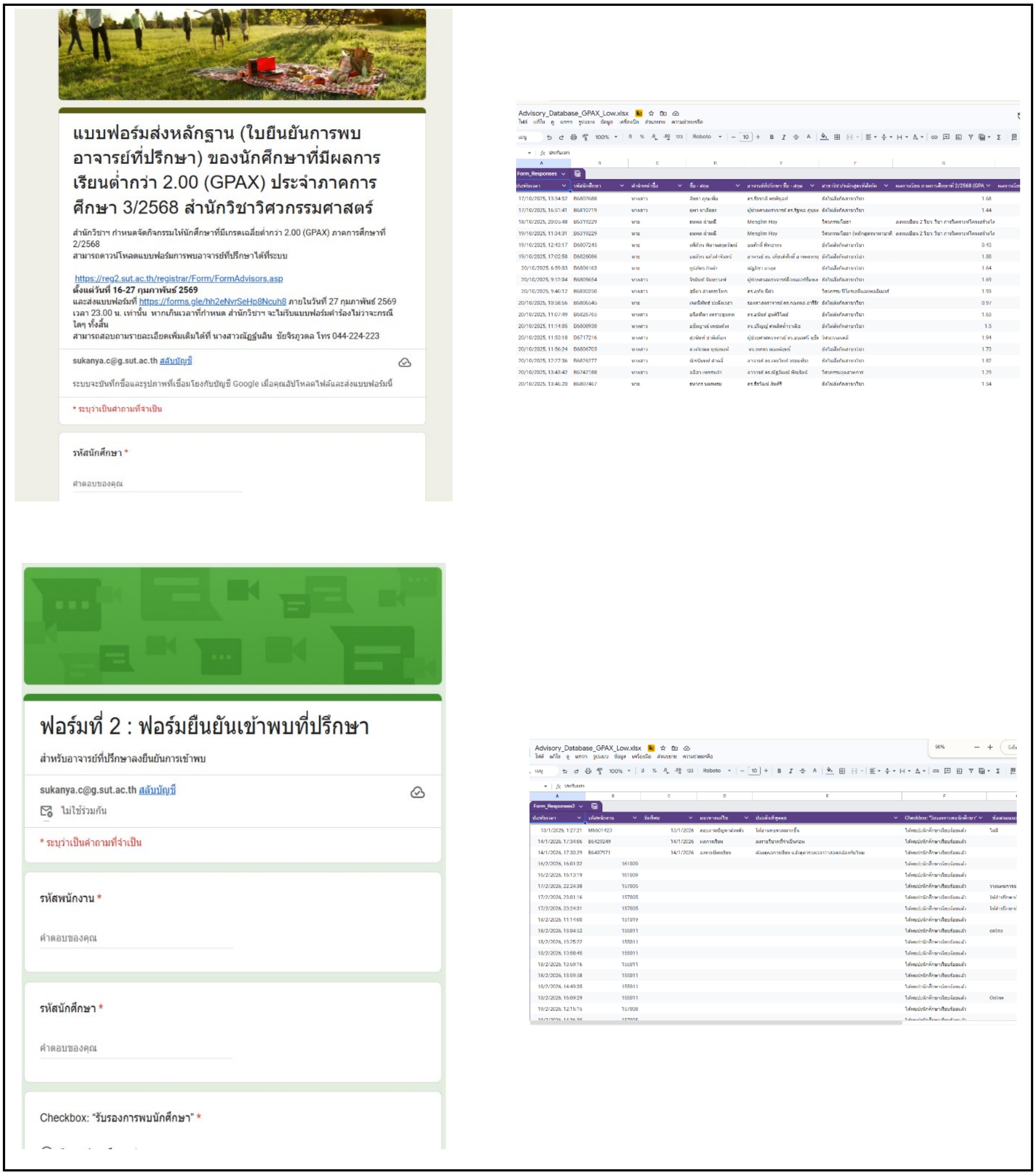

Figure 5. Data entry through Google Form and automatic data collection into Google Sheets.

5. Results and Discussion

Based on the process improvement using the ECRS principle, the results indicate that the operational workload and processing time of staff were significantly reduced. At the same time, the new system increases convenience for students and provides a more systematic approach to academic activity management. In addition, communication errors among stakeholders were reduced. As shown in Table 3 , which summarizes the comparison before and after the improvement, the revised process helps eliminate redundant verification and repeated data entry. Consequently, document management has become faster and more systematic. The information recorded in Google Sheets serves as a centralized database that can be efficiently managed and accessed. Users can immediately filter and search for the required information, making time and data management more convenient. Furthermore, the system allows instant retrieval of historical data, eliminating the need to manually search through document storage boxes when verifying information. In the past, such documents might have exceeded the storage retention period or required excessive time to locate. In addition, the implementation of the digital system has increased students' awareness of the importance of participating in the advisory meeting activity. The transition from a manual data entry system to a digital or online technology-based system simplifies the process and improves convenience for participants. As a result, students experience greater satisfaction when participating in the activity. The comparison of the operational process before and after improvement, measured in seconds, is presented in Table 4, which illustrates the reduction in processing time after the implementation of the improved system.

Table 4. Comparison of Processing Time Before and After Process Improvement

Item	Time Before Improvement (Seconds)	Time After Improvement (Seconds)
Activity 1: Providing consultation and explaining participation procedures (e.g., telephone, Line, or e-mail communication)	300.00	60.00
Activity 2: Verifying the accuracy and completeness of the submitted forms	1,800.00	900.00
Activity 3: Scanning barcodes and recording data from the advis meeting confirmation forms into Microsoft Excel to convert the into student data	3,600.00	1,800.00
Activity 4: Preparing a summary report of the number of students who met with academic advisors and comparing it with the target student list for the current semester	1,200.00	600.00
Total Time per Task	6,900.00	3,360.00
Time Reduction	3,540.00	
Percentage Reduction	51.30%	

2. Student Satisfaction Percentage the percentage of student satisfaction among participants in the activity was collected from Semester 1/2024 to Semester 1/2025. The number of participating students was 558 students in Semester 1/2024, 680 students in Semester 2/2024, 738 students in Semester 3/2024, and 779 students in Semester 1/2025, respectively. The results indicate that both the number of participants and the level of student satisfaction increased over time. This suggests that the improved system enhanced the accessibility and convenience of the advisory meeting activity. The evaluation results of student satisfaction are illustrated in Figure 6, which presents the satisfaction assessment of students participating in the activity.

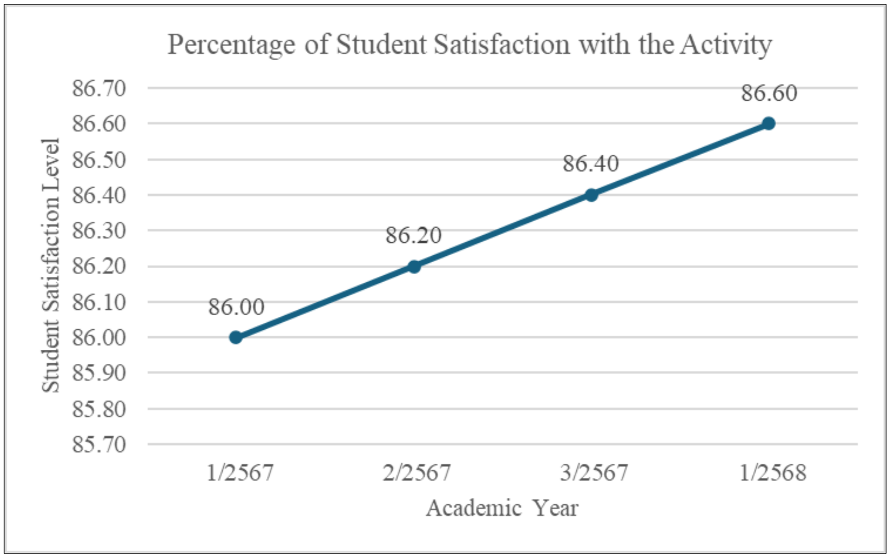

Figure 6. Student satisfaction evaluation of participants in the activity.

6. Conclusion
This research collected data on operational time and user satisfaction related to the advisory meeting activities. The analysis was conducted using Pareto diagrams to examine the statistical data on operational processing time. In addition, the Seven Wastes concept, which is a core principle of Lean, was applied to analyze and reduce waste in the workflow. The root causes of the problems were further identified using a Fishbone Diagram (Cause-and-Effect Diagram). The operational process was then improved using the ECRS principle to eliminate unnecessary tasks and combine redundant activities. Furthermore, an online database system and a supporting website were developed to reduce non–value-added steps in the process. After the implementation of the improvements, the results showed that the activity involving barcode scanning and data entry from the advisor meeting confirmation forms into Microsoft Excel for conversion into student records was significantly reduced. The total operational time decreased from 6,900.00 seconds per task to 3,360.00 seconds per task, resulting in a time reduction of 3,540.00 seconds, equivalent to 51.30%. In addition, the application of digital technology significantly improved student participation and satisfaction. The satisfaction level among students participating in the activity reached 86.60%, and the number of participants increased continuously. The system also enables immediate retrieval of historical data, eliminating the need for manual document searches. Moreover, document management has become easier and more systematic, reducing operational complexity and processing time. The improved system also contributed to increasing the student retention rate in the Institute of Engineering, which reached 74.40% in the 2024 academic year.

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