

# **Application of Lean Concepts Increase Efficiency in The Merit Scholarship for Undergraduate Process : Case Study of Scholarship Subdivision**

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## **Abstract**

This research examines the process for merit scholarships for undergraduate students, focusing on the scholarship subdivision within the student affairs division of Suranaree University of Technology. The issue identified was the delay in receiving scholarships for students. The study aimed to 1) Examine the process of merit scholarships for undergraduate students, 2) Employ the fishbone diagram tool to scrutinize the factors contributing to students receiving scholarships that delay and 3) Aim to minimize the duration of the process for merit scholarships for undergraduate students. The research employed the following methods: 1) Record the work procedures as a flow process chart, 2) Observation of the work procedures of the general administration officers of the scholarship subdivision, 3) Analysis of problems through a fishbone diagram, and 4) Enhancing the process for merit scholarships to undergraduate students through the application of the ECRS technique. The findings attributed the primary cause of the students receiving scholarships to delay procedural intricacies. Consequently, these issues were addressed by implementing the ECRS technique to streamline operations and reduce processing time. A comparison of the process for merit scholarships for undergraduate students, before and after the enhancement revealed a decrease in average processing time from 7,119 minutes (14.83 days) to 6,075 minutes (12.65 days), signifying a 14.66 percent improvement.

## **Keywords**

Lean Concept, Flow Process Chart, Fishbone diagram, and ECRS

## **Introduction**

The merit scholarship for undergraduate students is one of the grants administered by the scholarship subdivision within the student affairs division. It is designated for undergraduate students in the regular program from their second year onward, provided they maintain a cumulative grade point average (GPAX) of at least 3.25, one scholarship is granted per program. Successful applicants will have their credit fees waived for the semester they apply for the scholarship. The scholarship is applicable for up to 9 semesters, except for medicine and dentistry programs, which allow for up to 15 semesters. To apply, students must submit their application to their respective program of study,

which will then select recipients each semester based on specific criteria. A memorandum listing the recipients will be forwarded to the scholarship subdivision for announcement purposes. According to the 2022 satisfaction assessment of services related to merit scholarships for undergraduate students, 28 students, constituting around 12% of the 238 scholarship awardees, engaged in a survey. The results of the assessment are detailed in Table 1.

Table 1. Issues with satisfaction surveys

Issues with satisfaction surveys	Average	Percent	Standard Deviation	Criteria for Evaluation
1. Public Relations Accessibility.	4.50	90.00	0.69	High Level
2. The facilitation of service reception is convenient, accompanied by transparent and explicit information.	4.54	90.71	0.58	Highest Level
3. The staff demonstrates attentiveness, impartial treatment, and a strong commitment to serving all individuals.	4.54	90.71	1.04	Highest Level
4. The services rendered are precise, comprehensive, and responsive to the specified requirements.	4.61	92.14	0.50	Highest Level
5. Service Provision Overview.	4.39	87.86	0.99	High Level
Total	4.51	90.29	0.76	Highest Level

Satisfaction level the criteria are as follows:

- 4.51 – 5.00 means the highest level of satisfaction.
- 3.51 – 4.50 means a high level of satisfaction.
- 2.51 – 3.50 means moderate satisfaction.
- 1.51 – 2.50 means low level of satisfaction.
- 1.00 – 1.50 means least level of satisfaction

From Table 1, the satisfaction services level of merit scholarship services for undergraduate students of the scholarship subdivision was notably the highest level, with an average of 4.51 (90.29 percent). Additionally, the satisfaction level of public relations accessibility a high level, an average of 4.50 (90.00 percent). The facilitation of service reception is convenient, accompanied by transparent and explicit information the highest level of satisfaction, with an average of 4.54 (90.71 percent). Moreover, the staff's attentiveness, impartial treatment, and strong commitment to serving all individuals were rated at the highest level, with an average of 4.54 (90.71 percent). Furthermore, the services rendered are precise, comprehensive, and responsive to the specified requirements at the highest level, with an average of 4.61 (92.14 percent). The service provision overviews a high level, an average of 4.39 (87.86 percent). In alignment with the key performance indicator (KPI) requirement the average satisfaction level of students receiving merit scholarships for undergraduate students should not be less than 4.20 per semester.

Based on the satisfaction assessment of merit scholarship services for undergraduate students of the scholarship subdivision in the academic year 2022, feedback was obtained from scholarship recipients through a questionnaire. The feedback included the following points: 1) The need for updated information across all communication channels, 2) The delay in announcing the scholarship results beyond the last day of tuition payment, 3) The relatively late compilation of course lists, approximately 1 day before the scholarship status is posted in the registration system, and 4) The suggestion to announce the scholarship results 2-3 days prior to the end date of tuition payment. Consequently, a total of 16 students (11 in the 1st semester of 2022, 3 in the 2nd semester, and 2 in the 3rd semester) received their scholarships approximately 3 days later than the scheduled announcement. The division of finance and accounting will arrange for the refunds to be issued to the affected students later.

Considering this scenario, the researcher aims to investigate the factors causing delays in awarding scholarships to students. The focus is on applying the Lean concept to enhance the efficiency of the merit scholarship application process for undergraduate students.

## 1.1 Objectives

1. Examining the process of merit scholarships for undergraduate students
2. Employing the fishbone diagram tool to scrutinize the factors contributing to students receiving scholarships that delay
3. Aiming to minimize the duration of the process for merit scholarships for undergraduate students

## 2. Literature Review

This section literature review, theory, and related research of applying lean concepts to increase efficiency by applying work study for the merit scholarship for undergraduate students process.

### 2.1 Lean Concept

The Lean concept originated in the 1980s from the Toyota production system (TPS), initially proposed by Taiichi Ono. This approach aimed to enhance work efficiency by minimizing waste in the process, thereby reducing production and operating costs. In contrast to Henry Ford's mass production theory, which emphasized cost reduction through increased product output, Toyota faced resource constraints that made such an approach unfeasible at the time. The concept gained global traction following its formalization as the lean production theory by Professor Dr. James Womack of the Massachusetts Institute of Technology in 1990 (Jantawong and Thunyachairat 2023). Lean Philosophy aims to reduce waste in organizations by improving the efficiency of their processes in order to have a continuous flow of production without interruption. Womack, J & Jones define 5 principles that serve as a base to

Lean. They are:

- Value – Represents the visible characteristics of a product through the eyes of the client. The bigger the value the better as it brings higher levels of satisfaction and customer loyalty. It's up to the companies to realize the customer's needs and seek to satisfy them.
- Value Stream – Consists of every activity from the planning to the commercialization of the product/service. It is up to the company to identify what the client values in order to maintain what brings value to the product and eliminate wastes in order to reduce costs and maximize profit.
- Flow - After eliminating wasteful activities, it is important to ensure that there is a continuous production flow within the company. Products must flow through the production system uninterruptedly, without waiting times, without stocks, without any type of waste.
- Pull – When using this system, a company only produces based on real demand. It allows the company to depend less on inventories, to produce in small lots, to synchronize with the entire supply chain, to have shorter lead times and to have a continuous flux of production and information.
- Continuous improvement – This principle seeks perfection. It is the conviction that it is always possible to improve the current state. It is the constant seeking of the best way to create value.

Although these five principles are considered fundamental, some authors defend that they have some flaws since they are only based on the chain of value and do not give enough importance to the creation of value. Having in mind the correction of this failure, the Lean Thinking community proposed the addition of the principles “Know the Stakeholders” and “always innovate” (Ribeiro et al., 2019; Bragança, 2012).

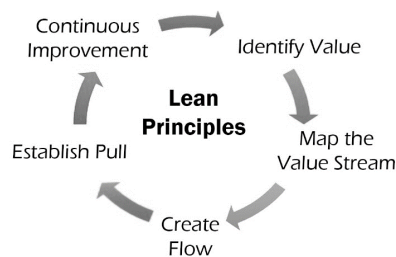


Figure 1. Lean principles (1stCraft, 2024)



## **2.4 ECRS Technique**

ECRS stands for Eliminate, Combine, Rearrange, and Simplify. It's a lean approach that systematically reviews processes to identify and eliminate waste, streamline operations, and enhance productivity. Specifically, the ECRS framework encourages the review of all process steps to determine their necessity, combine tasks that can be efficiently executed together, rearrange steps to optimize workflow, and simplify tasks to make them more straightforward. (Auesiritrakul and Ruangchoengchum 2024).

## **2.5 Related Research**

Kuaites et al. (2020) This study the objective of the study was to reduce the waste of working processes in hotel service industry. The Flow Process Chart was used to analyze the working process and flow of material, staff, and equipment from the first process to the final process. In addition, Flow Diagram was used to analyze the working situation and transporting route by investigating the maids working in both double-bed and twin-bed Standard Economy rooms for independent hotels. Then, ECRS Technique was applied to reduce waste and improve working efficiency by doing fieldwork, observing, time-counting, and interviewing. The result found that the double-bed room reduced 3 transporting activities and 1 inspecting activity. The time before improvement was 26.36 minutes per room, and was reduced to 25.28 minutes per room after improving its efficiency. The twin-bed room reduced 5 transporting activities and 1 inspecting activity. The time before improvement was 29.06 minutes per room, and was reduced to 25.51 minutes per room after improving its efficiency. The service cost was reduced to 9,000 Baht per month, or 108,000 Baht per year.

Waiyanet and Madonkha (2022) The research is to study the possibility of the implementation of robotic process automation (RPA) to decrease the processing time in the pre- custom' s documentation process in export-import companies; a case study of ABC Co., Ltd. Currently, there are a number of delays and high human errors in the document validation process, especially transferring information from mater bill of lading (B/L) to any relevant documents for completing the customs process. Moreover, the aforementioned steps include a variety of information, documents, and many items that must be recorded and validated daily. Moreover, such procedures have still been processed by validators, causing a remarkable proportion of human errors and time-consuming. Therefore, this research aims to study the guidelines on the features and capabilities of RPA to decrease documentation time and human errors, leading to noticeable improvements in working methods in new ways. The results showed that spending time in invoices recording to the central system at destination customs significantly decreased from 61.21 minutes to 8.26 minutes. Validation processing time considerably inclined from 80.34 minutes to 6.45 minutes, providing the total process time substantially decreased from 252.63 minutes to 121.73 minutes.

Pertiwi and Astuti (2020) The Assembly line is the assembly process that is carried out based on the order of the production process in the production line. The problem that is often found in assembly lines is bottleneck conditions where some material piled up at the station. This situation indicates an imbalance in the production line. The improvement of the work method is one of the effective ways that increase line efficiency. This study presents an increase in line efficiency by improving working methods in a washing machine assembly line of PT.X. The study aimed to increase the value of line efficiency by improving work methods. In this study, improvements were made using the line balancing method and the Eliminate, Combine, Rearrange, Simplify (ECRS) concept. The results that have been done, the obtained value of line efficiency for washing machine products is 76.76%. This value has not reached the company's productivity target of 99.50%. Therefore, it is necessary to improve the assembly line to increase the value of product production. The proposed improvements made with improvements to the work methods on the assembling line obtained 89.38% results is to increase the amount of line efficiency by improving work methods.

### **3. Methods**

#### **3.1 Research Methodology**

There were steps of the research methodology are presented as follows.

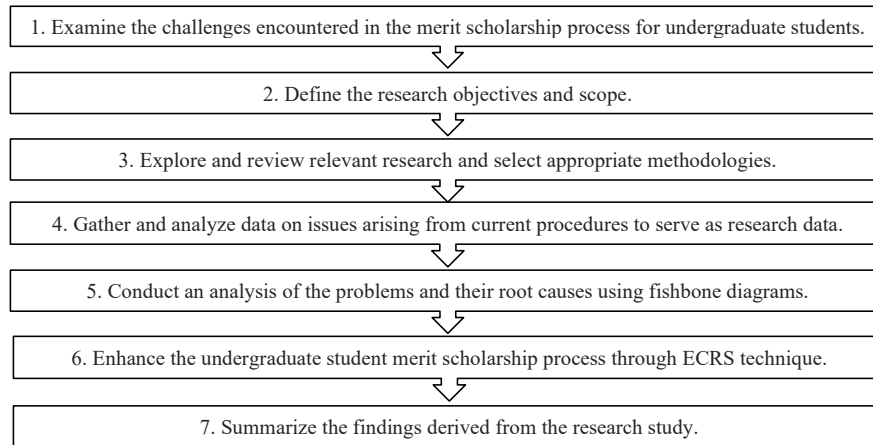


Figure 4. Research Methodology

#### **3.2 Study the Process of Merit Scholarship for Undergraduate Students**

##### **3.2.1 Study through work procedures**

Study the work procedure for merit scholarships for undergraduate students according to the work procedures specified in the quality procedures, document code: QP-SCH-01 of the scholarship subdivision. and record the work procedures as a flow process chart (before improvement), as detailed in Table 2.

##### **3.2.2 Observation of the work procedures of the general administration officers of the scholarship subdivision**

Observation of the work procedures of the general administration officer responsible for merit scholarships for undergraduate students. during the scholarship application periods in the 2nd and 3rd semesters of the 2023 academic year.

##### **3.3 Analysis of problems through a Fishbone Diagram**

An analysis of the problems with merit scholarships for undergraduate scholarship applicants who received their scholarships late is presented through a fishbone diagram, as depicted in Figure 5.

##### **3.4 Enhancing the process for merit scholarships to undergraduate students through the application of the ECRS technique.**

The study revealed that certain procedures were found to be cumbersome, complex, and unnecessary. As a result, Table 3 demonstrates the process improvements that could be addressed by utilizing the ECRS technique.

### **4. Data Collection**

#### **4.1 Record the work procedures as a flow process chart (before improvement)**

Based on the examination of the work procedures outlined in section 3.2.1, it can be recording the work procedures as a flow process chart (before improvement) as follows:

Table 2. The work procedures in a flow process chart format (before improvement)

No.	Responsible Individual	Work Procedures	Duration (min)	Symbol					Task Value	
				○	⇒	□	D	▽		
1	General Administration Officer, Scholarship	Draft a memorandum to announce the schedule for the admission of merit scholarships for undergraduate students.	94	●					VA	
2	General Administration Officer, Scholarship	Create public relations media for the recruitment of merit scholarships for undergraduate students.	15	●					VA	
3	Students	Submit proof of their scholarship application for your program of study.	2,400				●		NNVA	
4	General Administration Officer, Program	Receive and review students' applications along with their attachments to verify eligibility.	480			●			VA	
5	Program	Evaluating and selecting candidates for the scholarship according to the specified criteria.	480			●			VA	
6	General Administration Officer, Program	Prepare a proposal memorandum for the head of program/dean of program for signing.	60	●					VA	
7	Head Program/Dean of Program	Sign the memorandum.	480				●		NNVA	
8	General Administration Officer, Program	Submit a memorandum listing the students who have received merit scholarships for undergraduate students to scholarship division.	960		●				NNVA	
9	General Administration Officer, Scholarship	Review the memorandum, proof of students' scholarship applications and prepare university announcement. A proposal will be made to the vice president for student development and alumni relations for signing announcement.	140			●			VA	
10	Vice President for Student Development and Alumni Relations	Sign the announcement.	480				●		NNVA	
11	General Administration Officer, Scholarship	Record the status of scholarship recipients in the registration system (REG).	45	●					VA	
12	General Administration Officer, Scholarship	Prepare public relations media regarding the list of students who have received merit scholarships for undergraduate students for the semester.	30	●					NNVA	
13	Students	Received scholarships.	1,440				●		VA	
14	General Administration Officer, Scholarship	Copy of the announcement and submitted the original announcement to division of correspondence, documents and legal affairs.	15					●	NNVA	
Total					5	1	3	4	1	
Total duration: 7,119 minutes										

Remark: Working hours: 08.30 – 16.30 hrs., 8 hours/day. The average time spent in the work process is 7,119 minutes, 14.83 days (the calculation formula is (7,119 minutes/60 minutes)/8 hours).

#### 4.2 Analysis of problems through a fishbone diagram

Figure 5 of the fishbone diagram illustrates the primary and contributing factors behind students receiving scholarships that delay.

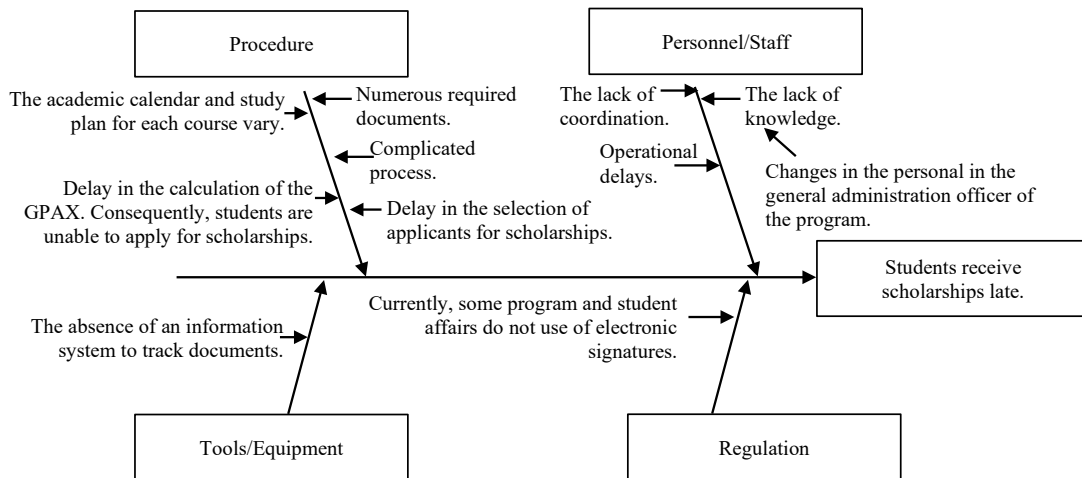


Figure 5. Analysis of problems through a fishbone diagram.

#### 4.3 Enhancing the process for a merit scholarship for undergraduate students through the ECRS technique.

After analyzing the process of scholarship for undergraduate students, it became evident that certain steps are overly complex. Therefore, streamlining the process by implementing the ECRS technique, as outlined in Table 3.



Table 3. Enhancing the process for merit scholarships for undergraduate students through ECRS technique

ECRS technique	Work Procedures (before improvement)	Details Update
Eliminate	Preparing a memorandum to announce the schedule for undergraduate merit scholarship applications and circulating it to the program, it was found that there were a significant number of supporting documents, including announcements, scholarship criteria, scholarship application forms, and more, totaling 204 documents. These were sent to all 34 programs, averaging around 6 documents per program.	To minimize the number of documents sent to program, students can now access various and download documents like announcements, scholarship criteria, and application forms directly from the scholarship website. The scholarship subdivision submits memorandums to announce the schedule for accepting applications for undergraduate merit scholarships to a program, averaging 2 copies per program, totaling 68 documents. This approach helps in reducing the time required for document preparation for submission.
Combine	There are no specific steps for improvement.	There are no specific details for improvement.
Rearrange	The procedure for recording the status of scholarship recipients in the registration system (REG). requirement for the university announcement document the recipients of merit scholarships for undergraduate students, to bear the endorsement of the vice president for student development and alumni relations. Only upon obtaining this endorsement can the scholarship status be officially recorded in the registration system (REG). Consequently, beneficiaries of the scholarships will not have their scholarship status, coded as 719: merit scholarships for undergraduate students (exemption of credit fees), This delay in updating the scholarship status may result in students receiving their scholarships late and being obligated to first settle the tuition fees with the payment.	Recording coded as 719: merit scholarships for undergraduate students (exemption of credit fees) once the students have been approved by the program of study and verified by the general administration officer of the scholarship. This will enable their scholarship status to appear in the registration system (REG), relieving them from paying tuition fees as per the payment calendar announcement. Subsequently, the general administration officer, scholarship. will prepare a university announcement listing the recipients merit scholarships of undergraduate student for submission to the vice president for student development and alumni relations for signature.
Simplify	The general administration officer, program. forwarded a memorandum to the scholarship division containing the list of undergraduate students who were awarded merit scholarships, along with the necessary documentation of their scholarship applications. Due to transportation constraints, the documents could not be delivered within the given timeframe as they had to adhere to the university's building-to-building delivery schedule, which consists of morning and afternoon rounds.	To minimize wait times, it is suggested that general administration officers in the programs scan documents, such as a list of students awarded academic merit scholarships for undergraduate students, along with the students' scholarship applications, using SUTMail on the Microsoft Office 365 system. This enables the scholarship subdivision to review the documents promptly before the original copies are submitted via the scheduled document delivery service.

## 5. Results and Discussion

### 5.1 The result study of the process for merit scholarship for undergraduate students

From Table 2, the total duration of the work procedures is 7,119 minutes, which equates to approximately 14.83 days, as summarized in Table 4.

Table 4. Summary of the process for merit scholarship for undergraduate students (before improvement)

Flow process chart			
the process for merit scholarship for undergraduate students (before improvement)	Symbol	Number of Activities	Duration (minutes)
	○ Operation	5	244
	⇒ Transportation	1	960
	D Inspection	3	1,100
	□ Delay	4	4,800
	▽ Storage	1	15
Recorder: Thatsani Yaemmanat	Total	14	7,119

### 5.2 The results of the observation of the work procedures of the general administration officers of the scholarship subdivision

Upon observation of the work procedures of the general administration officers of the scholarship subdivision, who is responsible for managing merit scholarships for undergraduate students, it was determined that there are 7 work procedures as outlined below:

1. Draft a memorandum to announce the schedule for the admission of merit scholarships for undergraduate students, including relevant attachments, and disseminate it to various programs.
2. Create public relations media for the recruitment of merit scholarships for undergraduate students through the scholarship website and the suranaree university of technology scholarship Facebook.
3. Review the memorandum, proof of students' scholarship applications.
4. Issue university announcement regarding the list of recipients of merit scholarships for undergraduate students, to be reviewed and signed by the vice president for student development and alumni relations.
5. Record the status of scholarship recipients in the registration system (REG).
6. public relations media regarding the list of students who have received merit scholarships for undergraduate students on the website and Facebook.
7. Keep a copy of the announcement and submitted the original announcement to division of correspondence, documents and legal affairs.

### 5.3 The results of analysis of problems through a fishbone diagram

Based on study was conducted to investigate the causes of students receiving scholarships that delay. The analysis, depicted in Figure 5. through a Fishbone Diagram, identified the implementation process as the primary cause of the problem. Issues were traced back to the preparation of the memorandum and the scheduling of the scholarship application announcement, which involved a substantial amount of documentation and waiting for the receipt of various program applications for the scholarship. Additionally, difficulties were encountered in recording the status of scholarship recipients in the registration system (REG). and obtaining the necessary signatures from the vice president for student development and alumni relations for the list of scholarship recipients. As a result, this investigation proposes improvements to the undergraduate scholarship awarding process utilizing ECRS technique, as detailed in Table 3.

### 5.4 The results of enhancing the process for merit scholarships to undergraduate students using ECRS technique

The improvement results can be showcased in Table 5 as depicted below:

Based on the findings of the improvement in the process for merit scholarships to undergraduate students using the ECRS technique, the work procedures can be outlined in the form of a flow process chart, as illustrated in Table 6.

Table 5. The improvement results using the ECRS technique

ECRS technique	Work Procedures (before improvement)	Work Procedures (after improvement)	Improvement Results
Eliminate	The distribution of 204 documents, including documents and memorandums, among 34 programs has been done, with an average of 6 documents per program.	The scholarship subdivision is distributing memorandums to announce applications, with an average of 2 copies per program, totaling 68 documents.	The document preparation time can be reduced by 29 minutes by reducing the document quantity by 136 documents.
Rearrange	The university announcement lists scholarship recipients, who must be approved by the vice president for student development and alumni relations before their status can be recorded in the registration system (REG), potentially causing students to receive scholarships late.	The scholarship's general administration officer must approve students' qualification reviews, then record their status in the registration system (REG) before preparing university announcements and offer for the vice president's signed.	Students who receive scholarships within the designated application schedule are exempt from paying tuition fees according to the announced payment calendar.
Simplify	Experiencing delays in document delivery, causing the inability to submit the list of memoranda and supporting documents from various programs on time.	The program's general administration officer is responsible for scanning, submitting documents via SUTMail for review by the scholarship subdivision, recording scholarship status, and submitting original documents using the scheduled document delivery service.	The Scholarship Division's General Administration Officer can swiftly verify initial documents, enabling the recording of scholarship status for students who have received the scholarship according to the application schedule.

Table 6. The work procedures in a flow process chart format (after improvement)

No.	Responsible Individual	Work Procedures	Duration (min)	Symbol					Task Value
				○	⇒	□	▭	▽	
1	General Administration Officer, Scholarship	Draft a memorandum to announce the schedule for the admission of merit scholarships for undergraduate students.	65	●					VA
2	General Administration Officer, Scholarship	Create public relations media for the recruitment of merit scholarships for undergraduate students.	15	●					VA
3	Students	Submit proof of their scholarship application for your program of study.	2,400				●		NNVA
4	General Administration Officer, Program	Receive and review students' applications along with their attachments to verify eligibility.	480			●			VA
5	Program	Evaluating and selecting candidates for the scholarship according to the specified criteria.	480			●			VA
6	General Administration Officer, Program	Prepare a proposal memorandum for the head of program/dean of program for signing.	60	●					VA
7	Head Program/Dean of Program	Sign the memorandum.	480				●		NNVA
8	General Administration Officer, Program	Scan the memorandum and the proof of students' scholarship applications and submit them via the SUTMail program. The original memorandum and proof of the students' scholarship applications submitted to the scholarship subdivision later.	970	●					NNVA
9	General Administration Officer, Scholarship	Review the memorandum, proof of students' scholarship applications.	60			●			VA
10	General Administration Officer, Scholarship	Record the status of scholarship recipients in the registration System (REG) and prepare university announcement. A proposal will be made to the vice president for student development and alumni relations for signing announcement.	60			●			VA
11	Vice President for Student Development and Alumni Relations	Sign the announcement.	480				●		NNVA
12	General Administration Officer, Scholarship	Prepare public relations media regarding the list of students who have received merit scholarships for undergraduate students for the semester.	30	●					NNVA
13	Students	Received scholarships.	480				●		VA
14	General Administration Officer, Scholarship	Copy of the announcement and submitted the original announcement to division of correspondence, documents and legal affairs.	15					●	NNVA
Total				4	1	4	4	1	
Total duration: 6,075 minutes									

Remark: Working hours: 08.30 – 16.30 hrs., 8 hours/day. The average time spent in the work process is 6,075 minutes, 12.65 days (the calculation formula is (6,075 minutes/60 minutes)/8 hours).

Comparative details illustrating the work procedures in a flow process chart format before and after improvement can be derived from Table 2 and Table 5, respectively, with Table 7 presenting the comparative analysis.

Table 7. Compare the work procedures in a flow process chart format before and after the improvement.

Flow process chart							
The process for merit scholarship for undergraduate students	Symbol	Before		After		Decrease in Time	
		Number of Activities	Duration (minutes)	Number of Activities	Duration (minutes)	Duration (minutes)	Percent
	○ Operation	5	244	4	170	74	30.33
	⇒ Transportation	1	960	1	970	-10	-1.04
	D Inspection	3	1,100	4	1,080	20	1.81
	□ Delay	4	4,800	4	3,840	960	20
	▽ Storage	1	15	1	15	0	0
Recorder: Thatsani Yaemmanat	Total	14	7,119	14	6,075	1,044	14.66

## 6. Conclusion

According to research, the findings attributed the primary cause of the students' receiving scholarships to delay procedural intricacies. Consequently, these issues were addressed by implementing the ECRS technique to streamline operations and reduce processing time. A comparison of the process for merit scholarships for undergraduate students, before and after the enhancement revealed a decrease in average processing time (Table 7) from 7,119 minutes (14.83 days) to 6,075 minutes (12.65 days), signifying a 14.66 percent improvement.

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### **Biographies**

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