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RESEARCH ARTICLE

The Waste Reduction Caused by Delays in Registration Fee Revenue Recognition Process: A Case Study of Public University in Thailand

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ARTICLE INFO	ABSTRACT
	The process of revenue recognition in registration fee recognitions is crucial for the financial resource management of public universities in Thailand. Delays in this process may result in waste of both resources and time. This research aims to investigate the factors contributing to waste resulting from delays in the registration fees revenue recognition process in Thai public universities and to propose guidelines for reducing such waste. The study utilizes a mixed-methods research approach, collecting quantitative data through a questionnaire from a sample group of 140 participants and qualitative data through observation and small group interviews with 27 key informants. The quantitative data is analyzed using structural equation modeling, while the qualitative data is analyzed using tree diagrams and how-how analysis. The findings indicate that factors such as staff, users, systems, technology, and information systems contribute to waste resulting from delays in the registration fee revenue recognition process. The study proposes guidelines to reduce waste, leading to an average reduction in processing time from 43 to only 32 days (standard was 30 days), representing a decrease of 25.58 percent. The results of this research that operational efficiency, staff capability, user engagement, process simplification, and technological enhancement significantly impact the efficiency of the revenue recognition process. The proposed strategies, supported by the tree diagram and how-how analysis, demonstrate a substantial improvement in reducing process time, thus enhancing overall efficiency and user satisfaction.

INTRODUCTION

With a rising global urbanization and population, there was a growing need for more effective ways to manage financial and natural resources to move towards sustainable development. The population in the world was 7.6 billion in 2017 and was estimated to rise to 9.8 billion in the year 2050, thereby creating more significant pressure on the usage of resources of water, energy, and raw materials (Debrah et al. 2021). On the other hand, this exploitation led to higher carbon emissions and increased construction and other waste, which created significant environmental problems. However, 55% of the world's population already lives in urban areas, and that percentage is expected to rise to 68% by 2050, placing additional strain on urban infrastructure as well as the resource

and financial management of the waste that results from these resources (Zhang et al. 2022).

In the global context, the revenue recognition process of the registration fees for the public universities, such as Maha-chulalongkorn-Rajavidyalaya University (MCRU) in Thailand, is considered a pivotal point for the management of financial resources. Being one of the top public universities in Thailand, MCRU has extended its educational outreach to 11 campuses and a large number of affiliated institutions, where this optimal management of the registration fee revenues can support financially these diversified educational activities—be it faculty recruitment, learning spaces development, or research initiation (Kiatwattanawisarn, 2022). However, like in most other institutions, MCRU suffers setbacks. In this very important revenue recognition process, delay has been a significant setback. The process currently takes an average of 43 days. This significantly over-exceeds the set standard, which stands at 30 days (Treasury and Assets Division, MCRU, 2023). This kind of setback can be criticized for poor efficiency in financial management. It can delay timely preparation of income budgets and future resource planning (Charoenrad et al. 2021). Urban management and infrastructure development are also full of inefficiencies and delays in processes that also lead to costly budgets, with a lot of waste of resources.

Waste reduction and improvement in financial management require timely and efficient revenue recognition. Thus, need beget the cry for specific research in this area. Although other studies have been done touching on revenue recognition from the budget management to impacts of technology in revenue recognition, only a few studies have been carried out to reduce waste caused by the delays in revenue recognition. This study through the application of the SEM seeks to identify the factors leading to these delays and come up with effective strategies to minimize waste thereby improving the registration fee revenue recognition process of MCRU and perhaps, other institutions facing similar challenges. (Hoang & Fogarassy, 2020).

Luangcharoenrat et al. (2019) further added that the level of significance of these factors would enable stakeholders in the construction industry to tailor effective strategies in the reduction of waste.

Companies are therefore in a position to increase efficiency, reduce costs, and lessen environmental burdens related to activities in construction. From the study, Srijuntrapun et al. (2022), concludes that the process of food waste reduction is holistically integrated with the food distribution process. The study finds there are significant differences related with hotel size in the 7-step food distribution process. The average distribution process of large hotels is higher than the one of medium and small hotels. The findings also show that the hierarchy of food waste management motivates the hotel business sector to implement food waste reduction by ensuring the operations in the hotel achieve Corporate Social Responsibility (CSR) goals in the form of Creating Shared Value (CSV). In this case, CSR is striving to align corporate and social values. Debrah et al. (2021) add to this with their literature synthesis, which is, the systematic review on Solid Waste Management (SWM) in developing countries from 2010 to 2019, noted important findings with regard to environmental knowledge, awareness, attitude, and practice mainly among students and teachers in developing countries. In general, students from both secondary and tertiary educational levels have a positive attitude toward their environment and are relatively highly aware of issues to do with their surroundings, which indicates the theoretical knowledge and concern that the youth have toward environmental problems.

This is a study core to academic development and operational efficiency at MCRU and is also a model for other public universities and urban entities facing the same financial and environmental efficiency challenges. The findings will provide practical insights and recommendations that should contribute significantly to improved practice in resource management within the context of the difficulties in responding to global demographic shifts and urbanization.

The study conducted by Phonchi-Tshekiso et al. (2020) in Lobatse, a town in the south of Botswana, addresses the pressing issues and challenges of Solid Waste Management (SWM) within the framework of public and private sector interplay. This study provides an in-depth analysis of how such privatization can affect the efficiency and quality of waste management services through the lens of

political economy and household perceptions. The inclusion of the private sector in waste management has led to tangible improvements in service delivery. Specifically, there was an increase in the frequency of waste collection and an enhancement in the overall quality of waste management services. This shift has helped to alleviate some of the financial and resource constraints faced by the Lobatse Town Council, which had previously struggled to manage waste effectively due to limited funding and resources.

Objectives of the Study

- To examine the factors contributing to waste resulting from delays in the registration fee revenue recognition process at a public university in Thailand.
- To propose guidelines for reducing waste caused by delays in the registration fee revenue recognition process at a public university in Thailand.

Research hypotheses

The hypotheses of this research are as follows:

H1: Factors related to staff significantly impact the waste resulting from delays in the registration fee revenue recognition process.

H2: Factors related to service users significantly influence the waste resulting from delays in the registration fee revenue recognition process.

H3: Factors related to system processes significantly contribute to the waste resulting from delays in the registration fee revenue recognition process.

H4: Factors related to technology and information systems significantly affect the waste resulting from delays in the registration fee revenue recognition process.

LITERATURE REVIEW

Waste is any process or activity has non value, that included any action that does not add value to the product or process can be considered waste. The waste caused by delays is the use of waiting time that causes unreasonable spending, waiting for materials, labor, information, equipment, etc. (Sadiku et al. 2023). Soliman (2022) has confirmed that the waste caused by delay, these was a process of waiting that does not add value to the customer or the customer is not willing to pay for it. Considered not adding value and should be improved a value-free process that needs to be eliminated.

Revenue recognition in higher education is an important accounting policy to ensure that the financial situation of the institution is presented properly. Revenue recognition, both in Thai Financial Reporting Standards (TFRS) and in International Financial Reporting Standards (IFRS), dictates that revenues are recognized whenever services are rendered, irrespective of when payments are received. This is especially the case in higher education relative to tuition and registration fees, which are the primary sources of revenue for universities (Smith & Doe, 2019; Thai Accounting Board, 2020). International Financial Reporting Standards (IFRS) is broad-reaching and Thai Financial Reporting Standards (TFRS) is more directive, and more regulatory in nature for accounting in the education sector in Thailand (Qureshi, 2022; Kanval et al., 2024)

Delays in administration processes, specifically in the recognition of revenue, may result from, among other reasons, inaccuracies in manual data entry, reliance on outdated technology, or long approval hierarchies. This could give a wrong reflection of an institution's financial reporting and could result in financial statements not being a true reflection and thus negatively impacting budget preparation and allocation (Allioui & Mourdi, 2023). Similarly, in the dynamic world of educational funding, if institutions have to depend on the timely collection of fees to fund operating and capital expenditures, delays only serve to make the financial situation even more stressful (Dynarski et al. 2022).

The technological solutions, in the shape of Enterprise Resource Planning (ERP) systems, are being increasingly used by educational institutes to improve administrative waste reduction in financial operations. Process reengineering, along with lean administrative practices, has also been associated with the effectiveness of waste reduction by a reduction in the duplication of actions, thereby resulting in the best possible utilization of resources. Studies related to administrative efficiency have also underpinned the fact that these technological and methodological improvements are associated with better accuracy of financial processes and higher levels of staff satisfaction due to reduced clerical work (Zhang et al. 2024).

Administrative processes within the higher education sector in Thailand are infused with a cultural, regulatory, and operational mix of challenges that impact the effectiveness of the system. Public universities in Thailand are frequently bogged down by a plethora of regulations and the country's cultural attributes, driven by efficiency and sustainability in the administrative system (Chaiya & Ahmad 2021). These calls for an individualistic approach towards the study and bring a change in the Thai universities so that the enhancements can align with the local expectations and at the same time meet world-class standards.

Empirical studies play a much less consequential role; they provide evidence-based insights for policy and practice changes. In the theoretical frameworks under exploration, it has been demonstrated that Lean Management, TQM, and TOC hold the potential for improving not only efficiency but also effectiveness in educational administration through the focus on value creation and continuous improvement. More specifically, their application includes the diagnosis and curing of inefficiencies in a structured manner, which bodes well for their application in Thai higher education (Aichouni et al. 2023).

The synthesis of literature indicated a clear trajectory toward the recognition of addressing administrative delays in revenue recognition as pivotal to reducing waste within a higher education institution. However, this research is still at the initial stage, especially while dealing with Thai public universities (Phrophayak, et al. 2024). Therefore, this remains an opportunity for an in-depth study to investigate the details of the implementation of internationally recognized best practices in a local context, focusing perhaps on culturally sensitive adaptation of waste reduction strategies.

METHODOLOGY

Design

This research employs a case study design. An explanatory sequential design, as proposed by Creswell & Plano-Clark (2018), is used to combine quantitative and qualitative data for a comprehensive understanding of factors contributing to waste resulting from delays in the registration fee revenue recognition process at a public university in Thailand. The conceptual framework is developed based on a review of relevant theories and research. The key variables in this research are categorized into four dimensions: staff, service users, system processes, and technology and information systems (Hormhuan & Ruangchoengchum, 2021; Toemjai & Chaichok, 2023; Karimi et al., 2017; Adenya & Muturi, 2017; Haule, 2020). The framework illustrates the clear relationships among these variables in the case study, providing a detailed interpretation of the phenomena and addressing the research questions, as shown in Figure 1, and research hypotheses.
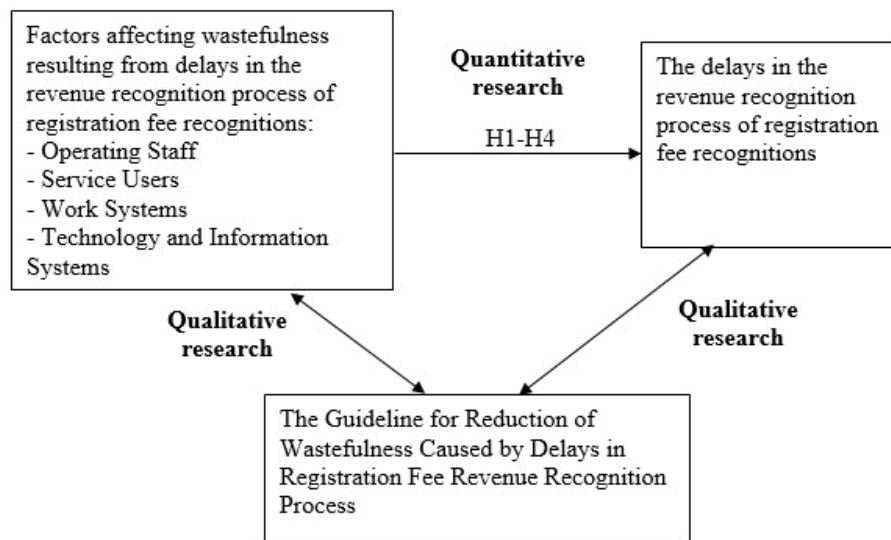

Figure 1: Conceptual framework

Participants

The participants for this study were meticulously chosen based on their direct involvement and experience in the registration fee revenue recognition process at public universities in Thailand. The selection criteria aimed to include individuals with sufficient knowledge and experience to contribute meaningful and insightful data relevant to the research objectives. The study comprised two distinct participant groups for its quantitative and qualitative phases. In the quantitative phase, 140 participants were included, a number determined by statistical guidelines to be at least ten times the number of items in the Structural Equation Model (SEM) analysis, ensuring the reliability and validity of the analysis outcomes. This diverse and representative sample included various public university representatives from across Thailand, chosen randomly to include a mix of genders, ages, and administrative roles, from clerical staff to department heads involved in registration fee processes. Simple random sampling minimized selection bias, giving each potential participant an equal chance of inclusion.

The qualitative phase involved 27 key informants selected for their extensive experience and strategic roles within the finance divisions of various public universities. All had at least one year of experience in the registration fee revenue recognition process, providing them with a deep understanding of the process nuances and related issues. These participants were chosen using purposive sampling to target individuals who were 'information-rich' due to their significant roles and experiences, enhancing the depth of understanding of the research topic. They provided quantitative data through structured questionnaires designed to assess factors influencing waste due to delays in the registration fee revenue recognition process and offered deeper qualitative insights through small group interviews. These discussions revealed their experiences, challenges, and perspectives on potential improvements, crucial for developing practical recommendations to enhance the efficiency of the revenue recognition process.

Data collection

The study employs an explanatory sequential design, as outlined by Creswell & Plano-Clark (2018), beginning with quantitative methods, followed by qualitative methods, and concluding by integrating qualitative insights to enhance the understanding of the quantitative findings (see Figure 2).
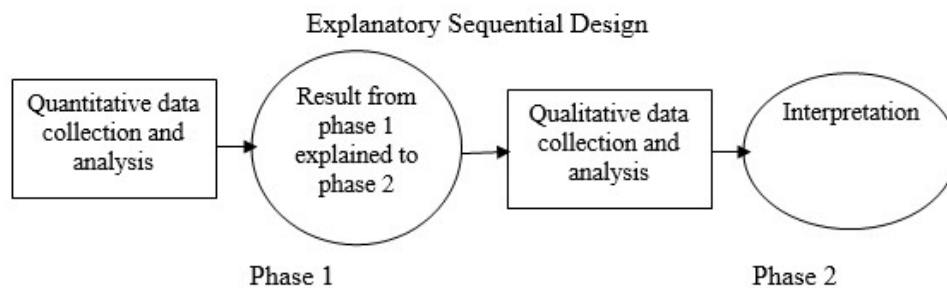

Figure 2: Explanatory sequential design. Source: Adapted from Creswell & Plano-Clark (2018)

Phase 1

By using a questionnaire as the data recognition tool the quantitative data collection phase is started. The unit of analysis is at the organizational level, focusing on a representative of public universities in Thailand. The sampling method used is simple random sampling, and data is collected from a sample group of 140 participants. This sample size is determined to be at least 10 times the number of items in the Structural Equation Model analysis (Kline, 2023). The questionnaire comprises 14 questions related to causal factors influencing waste resulting from delays in the registration fee revenue recognition process. The observed variables fall into four categories: Operating Staff (OS), Service Users (SU), Work System (WS), and Technology and Information Systems (TI) (Hormhuan & Ruangchoengchum, 2021; Toemjai & Chaichok, 2023; Karimi et al., 2017; Adenya & Muturi, 2017; Haule, 2020). Respondents rate the importance of each variable on a 5-point scale ranging

from very low (1), low (2), moderate (3), high (4), to very high (5), as suggested by Mitra (2021).

Phase 2

This is qualitative research data collection phase. Data is collected through small group interviews with the target group to explore guidelines for reducing waste resulting from delays in the registration fees revenue recognition process. The primary informants, comprising 27 key informants, are selected based on specific criteria. These key informants are employees with experience in the registration fees revenue recognition process, particularly from the Finance Division of public universities in Thailand., with a minimum of 1 year of experience. The selection process follows a purposive sampling technique.

Data analysis

For the quantitative data analysis, the researcher employs Confirmatory Factor Analysis (CFA) to confirm the measurement model (Finch, 2019) previously constructed (Figure 3). Subsequently, SEM is utilized to identify factors influencing the waste resulting from delays in the registration fees revenue recognition process at the public university in Thailand. The analysis is conducted using the AMOS Version 26 software (licensed by Khon Kaen University). Several statistical indices are established as benchmarks for model adequacy. These include a significance level (p-value) of the Chi-square greater than 0.05 ($p > 0.05$), a relative Chi-square (χ^2/df) less than 2.00, Comparative Fit Index (CFI) greater than 0.95, Goodness of Fit Index (GFI) greater than 0.95, Adjusted Goodness of Fit Index (AGFI) greater than 0.90, Root Mean Square Error of Approximation (RMSEA) less than 0.05, and Root Mean Square Residual (RMR) less than 0.05 (Subudhi & Mishra, 2020; Thakkar, 2020).
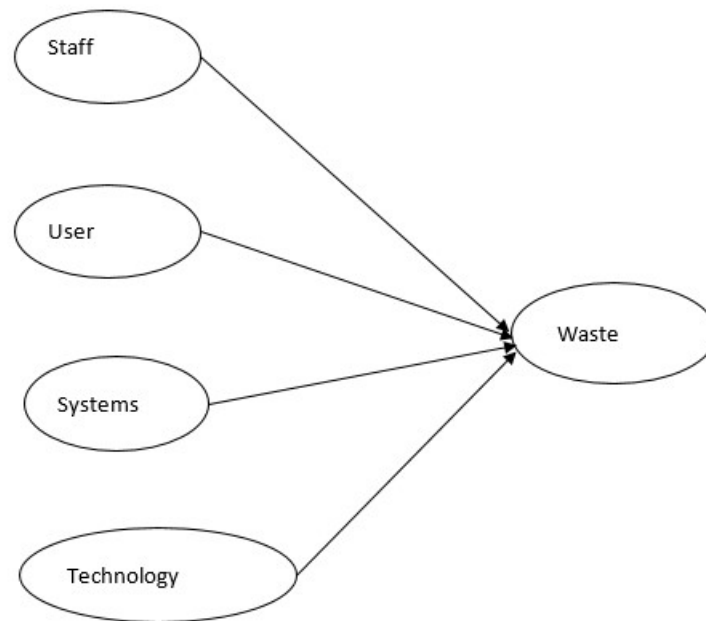

Figure 3: Measurement model

The qualitative data analysis resulting from participatory observation and subgroup interviews is analyzed using a tree diagram and how-how analysis. This approach aims to propose guidelines for reducing waste caused by delays in the registration fees revenue recognition process at the public university in Thailand.

Validation of tool reliability and data credibility

For the quantitative research, the researcher employed cronbach's alpha coefficient (α) analysis to assess the reliability of the questionnaire, yielding a value of 0.86. This value indicates good quality and usability (Sekaran & Bougie, 2020). In the qualitative research, the credibility of the data was examined using the triangulation method. This involved

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considering and comparing data from different data recognition methods, such as participatory observation and subgroup interviews. By gathering data through diverse methods, the aim was to ensure consistency, completeness, and credibility in understanding the registration fees revenue recognition process.

RESULTS

The Confirmatory Factor Analysis (CFA) was employed to confirm the grouping of variables into four-factor groups. These groups consist of 1) staff, 2) users, 3) systems, and 4) technology.

Table 1: Sample correlations of the measurement model of factors influencing waste resulting from delay in registration fee revenue recognition processes in a Thai public university

	X3	X2	X1	X6	X5	X4	X10	X9	X8	X7	X12	X11
X3	1.000											
X2	.668	1.000										
X1	.737	.652	1.000									
X6	.595	.544	.623	1.000								
X5	.588	.519	.604	.587	1.000							
X4	.587	.483	.615	.618	.683	1.000						
X10	.401	.373	.468	.418	.507	.378	1.000					
X9	.488	.442	.507	.455	.492	.376	.780	1.000				
X8	.392	.369	.364	.389	.469	.354	.707	.719	1.000			
X7	.369	.371	.356	.395	.546	.424	.596	.634	.728	1.000		
X12	.505	.387	.400	.350	.373	.341	.445	.471	.405	.312	1.000	
X11	.550	.487	.572	.487	.414	.404	.418	.505	.369	.464	.610	1.000

Table 1 represents correlation coefficient between waste-occurring factors, labeled as X3, X2, X1, and so on, and caused by delays in recognizing registration fee revenue at a Thai public university. The correlation values are on a scale of between -1 and 1. A value close to 1 suggests a strong positive correlation in such a way that one variable is increasing with the variable; a value close to -1 suggests a strong negative correlation in such a way that one variable increases the value but is tending to show a downward trend in the other. A value close to zero suggests no linear correlation. It indicates that X1, X1 with X3 = .737, and X3 have a strong positive correlation in relation to alternating factors, in the sense meaning the factors are very alike to each other or their effect is really parallel to the process. However, all tendencies in connection of variables with X3 are likely to have a lower relationship, with X2, X2 with X3 = .668, to be exactly, and showing a weaker relationship or source of influence.

Table 2: Results of fit indices analysis for the adjusted model

Model Fit Index	Standard	Observed Value	Evaluation
χ^2 /df (48.68/44)	< 2.00	1.106	Pass
CFI	> 0.95	0.996	Pass
GFI	> 0.95	0.955	Pass
AGFI	> 0.90	0.903	Pass
RMSEA	< 0.05	0.049	Pass
RMR	< 0.05	0.042	Pass

Table 2 presents the results of the adjusted model indices; they possess a very favorable fit for the most important measures employed in structural equation models. Each index attains or just passes its respective threshold, further denoting that the model is very robust regarding conformance to data and the representation of underlying theory or constructs the model implies.

Chi-square=48.681,df=44,p-value=.290, Chi-square/df=1.106,
CFI=.996, GFI=.955, AGFI=.903, RFI=.924, NFI=.963, TLI=.992,
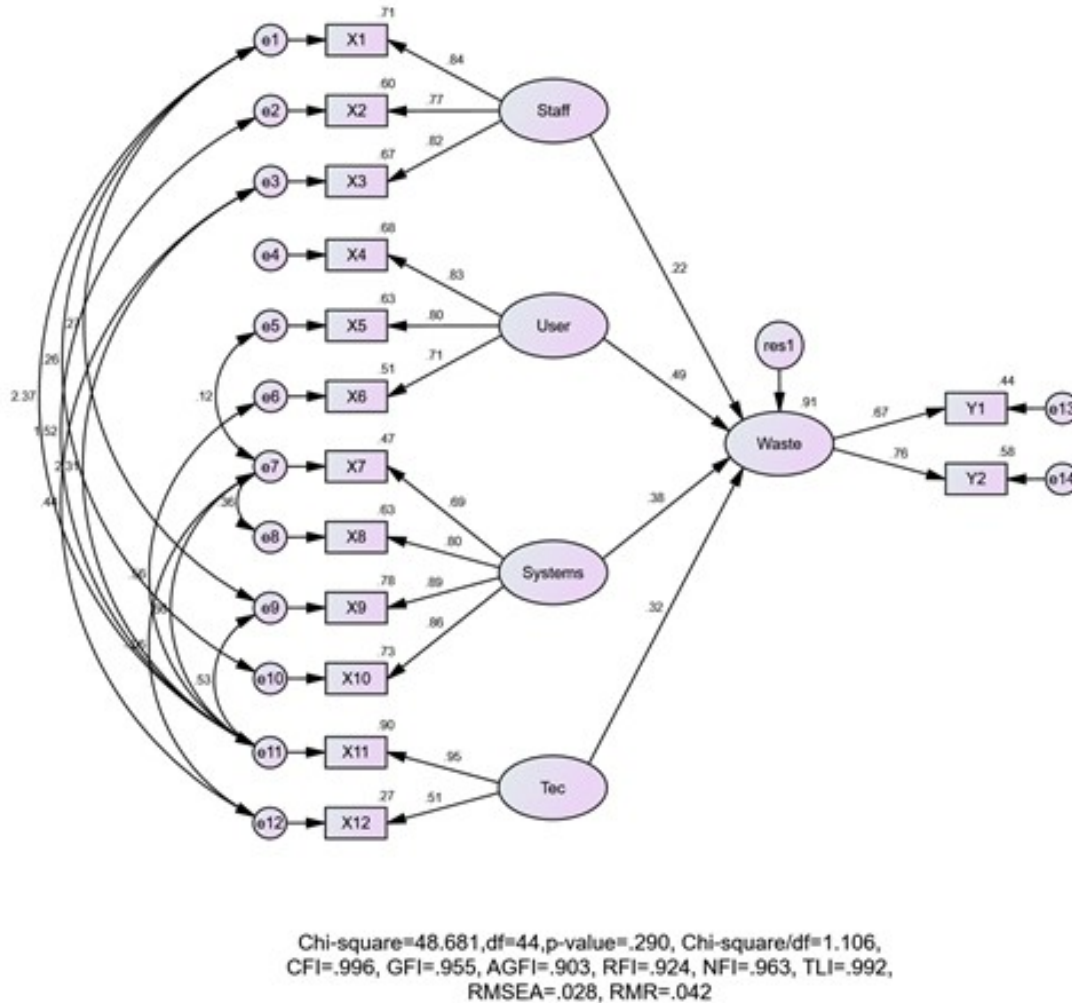RMSEA=.028, RMR=.042

Figure 4: Factors affecting the waste resulting from the delay in the registration fees revenue recognition process in a public university in Thailand

Staff factor

X1 The official recorded the wrong information. Not accurate and complete.

X2 The official was unable to send the document correctly, causing it to be returned to the sender for correction.

X3 Officers have many responsibilities.

User factor

X4 Students register and pay the registration fee late on the specified date and time.

X5 Students do not notify finance about payment of registration fees.

X6 Student lost registration fee payment documents.

Systems

X7 has a large number of procedures for operating according to regulations, rules, announcements, and orders, and is redundant.

X8 does not provide daily financial balance reports or why is it not current?

X9 Financial report has remaining amount. Does not match the money and cash account.

X10 lacks verification of money received in the system.

Technology and information systems

X11 network system crashes frequently.

X12 There is no use of technology and information systems to link information when students pay registration fees through banks with financial work.

Waste from Delay in revenue recognition process

Y1 has recognized income from registration fees beyond the specified period in accordance with specified regulations.

Y2 Increased time spent on revenue recognition processes results in lost opportunities for other operations.

Table 3: Results of the analysis of direct, indirect, and total effects between variables

Dependent Variable	The Waste Resulting from the Delay in the Registration Fees Revenue Recognition Process				
Independent Variable	DE	IE	TE	CR	*p*-value
Staff	0.223	-	0.223	2.581	0.010*
User	0.489	-	0.489	4.236	0.000*
Systems	0.379	-	0.379	3.481	0.000*
Technology and Information Systems: Tec	0.325		0.3251	2.364	0.018*

Note: DE means direct effect, IE means indirect effect, TE means total effect CR means *t*-value and * means *p*<0.01

There is a direct effect value of 0.223 for the staff with the CR being 2.581 and *p*-value being 0.010 on the dependent variable. Effects from the users have a direct effect value of 0.489 with a CR of 4.236 and a *p*-value of 0.000. Systems have a direct effect of 0.379 with the CR being 3.481 and *p*-value being 0.000. The results show the direct effect of Technology and Information Systems (Tec) on the dependent variable is 0.325 with a CR of 2.364 and a *p*-value of 0.018.
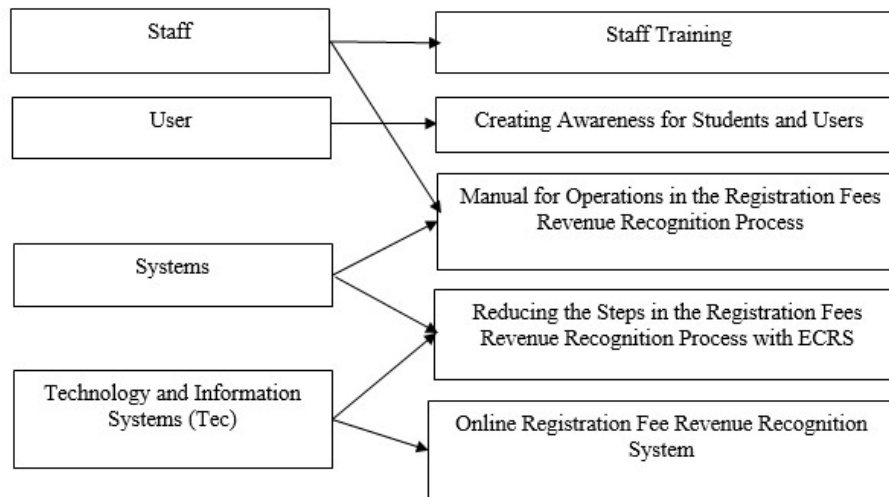

Figure 5: A tree diagram and how-how analysis results

The results of the tree diagram and the how-how analysis seek to resolve waste and delay issues within the process of recognizing registration fees by managing interventions across varying functional areas and stakeholders (Figure 5). Each solution targets a number of problems up the process—whether it has to do with operational efficiency, staff capability, user engagement, process simplification, or technological enhancement. Through these strategies, the institution probably hopes to achieve a more efficient, transparent, and user-friendly way to go about paying registration fees, while reducing waste and delays that can upset the financial operation and user satisfaction. The actions that each of the branches on the tree diagram gives are directed to these goals, and therefore it doubles up as a strategic tool for process improvement within the university.

Table 4: Comparison of the registration fees revenue recognition process time before and after the implementation

Comparison	Before	After	Difference	*t*- Value	*p* - Value
Registration fees revenue recognition process time (day)	43	32	11	17.02	0.00***

Note: *** Statistically significant at the 0.001 level

Table 4 presents a comparison of the registration fees revenue recognition process time before and after the implementation of the proposed strategies. Before the implementation, the process took 43 days on average, whereas after the implementation, it was reduced to 32 days. This represents a difference of 11 days. The statistical analysis shows a t-value of 17.02, with a p-value of 0.00, indicating that the reduction in process time is statistically significant at the 0.001 level.

DISCUSSION

The study investigates the relationship between various factors contributing to waste and delays in recognizing registration fee revenue at a Thai public university. It identifies strong positive correlations between certain factors, indicating significant mutual influence, while other factors exhibit weaker relationships.

In terms of direct effects, the study reveals that staff, users, and systems all significantly impact the efficiency of the registration fee process. The proposed solutions from the tree diagram and how-how analysis focus on improving operational efficiency, enhancing staff skills, increasing user involvement, simplifying processes, and leveraging technological advancements.

The effectiveness of these strategies is demonstrated by the substantial reduction in the time required to recognize registration fee revenue, signifying improved efficiency and user satisfaction. This finding is consistent with Hormhuan and Ruangchoengchum (2021), who reported that delays in financial document tracking are often due to a lack of departmental coordination, leading to inefficiencies. Issues related to incomplete document submission and corrections also align with Toemjai and Chaichok (2023), who highlighted the impact of system-related and staff-related factors on revenue recognition. Similarly, Karimi et al. (2017) identified technology and information systems as key influencers of revenue recognition in Embu County, Kenya. Adeny and Muturi (2017) also noted the influence of staff, control systems, and technology on revenue recognition in Kiambu County, Kenya, while Chadee et al. (2023) found that delayed payments by payers contribute to process delays.

Further supporting these findings, Luangcharoenrat et al. (2019) emphasized that understanding the significance of these factors enables stakeholders to tailor effective strategies for waste reduction, increasing efficiency, reducing costs, and lessening environmental burdens in construction. Srijuntrapun et al. (2022) highlighted the integration of food waste reduction with the food distribution process, showing significant differences based on hotel size and motivating the sector to implement Corporate Social Responsibility (CSR) goals through Creating Shared Value (CSV). Debrah et al. (2021) added that environmental knowledge, awareness, and attitudes are crucial in solid waste management, particularly among students and teachers in developing countries. This study is crucial for academic development and operational efficiency at MCRU and serves as a model for other public universities and urban entities facing similar financial and environmental efficiency challenges. The findings offer practical insights and recommendations for resource management, particularly in response to global demographic shifts and urbanization challenges.

Additionally, Phonchi-Tshekiso et al. (2020) examined solid waste management in Lobatse, Botswana, demonstrating how privatization can enhance service delivery, increase waste collection frequency, and improve overall quality through better financial and resource management.

The study proposes five guidelines for reducing waste and delays in the registration fees revenue recognition process: developing an operations manual, staff training, streamlining the process using the ECRS method, implementing an online registration fee revenue recognition system, and raising awareness among students and users. These recommendations align with Sonutta and Ruangchoengchum (2020), who utilized a document tracking system via an application, and Karimi et al. (2017), Laokhompruttajarn and Janthamungkhun (2020), and Deithorn and Kovach (2018), who emphasized the role of information technology systems in income management. Hormhuan and Ruangchoengchum (2021) also employed the ECRS technique to eliminate non-value-added activities, ensuring document relevance and optimizing the money transfer method through the SCB Business Net system.

Practical and theoretical implications

The study offers significant practical and theoretical implications for enhancing operational efficiency in higher education institutions. Practically, it provides a clear roadmap for reducing process times and minimizing waste in the registration fee revenue recognition process through staff training, technological advancements, and process simplification using the ECRS method. Engaging stakeholders, such as students and staff, is also emphasized to foster a cooperative environment that supports timely and accurate information sharing. These guidelines are adaptable and can serve as a model for other universities and urban entities facing similar challenges. Theoretically, the study enriches the understanding of the interactions between various operational factors and their impact on process efficiency. It integrates operational efficiency, staff capability, user engagement, and technological enhancement into a comprehensive model applicable to different domains. The application of the ECRS method in higher education administration broadens its theoretical relevance, while the emphasis on stakeholder engagement supports stakeholder theory. Furthermore, the study contributes to the discourse on sustainable management practices by proposing strategies that reduce waste and improve efficiency. The comparative analysis with previous research across different regions enhances the theoretical understanding of global best practices in revenue recognition processes.

Limitations and future directions

The study has several limitations that should be considered. It is confined to a single public university in Thailand, which may limit the generalizability of the findings to other institutions with different administrative structures and cultural contexts. The data collection was constrained to a specific period, potentially overlooking temporal variations due to policy changes or economic fluctuations. Additionally, some data relied on self-reported measures, which can be subject to biases. The effectiveness of the proposed technological solutions may vary depending on the existing IT infrastructure and technological readiness of different institutions. Furthermore, the study primarily focuses on short-term improvements without extensive longitudinal data to assess the long-term sustainability of the strategies.

For future research, it is recommended to include a comparative analysis across multiple universities, both within Thailand and internationally, to enhance generalizability. Longitudinal studies should be conducted to understand the long-term impacts and sustainability of the proposed strategies. Examining the effects of educational policy changes and economic conditions on the efficiency of registration fee recognition processes could provide deeper insights. Future studies could explore the integration of advanced technologies, such as AI and machine learning, to further optimize administrative processes. A deeper analysis of user experience and satisfaction with the new processes and systems would help fine-tune the strategies to better meet the needs of students and staff. Investigating the role of interdepartmental coordination and communication could uncover additional areas for improvement. Additionally, considering the environmental and social impacts of the proposed strategies would align with broader sustainability goals in higher education.

CONCLUSION

This study has comprehensively analyzed the factors contributing to waste and delays in the registration fee revenue recognition process at a Thai public university. Through a detailed correlation and direct effect analysis, it has been established that operational efficiency, staff capability, user engagement, process simplification, and technological enhancement significantly impact the efficiency of the revenue recognition process. The proposed strategies, supported by the tree diagram and how-how analysis, demonstrate a substantial improvement in reducing process time, thus enhancing overall efficiency and user satisfaction. This is further corroborated by comparisons with previous research, highlighting the consistent influence of system and staff-related factors on revenue recognition across various contexts. The findings underscore the importance of targeted interventions in operational processes and the adoption of advanced technological solutions to streamline revenue recognition. The study also aligns with broader research on waste management and operational efficiency, emphasizing the need for integrated approaches and stakeholder

engagement to achieve sustainable improvements. This research provides valuable contributions to the field of resource management, offering actionable strategies to mitigate delays and enhance the efficiency of financial operations. It highlights the critical role of coordination, technology, and stakeholder engagement in achieving sustainable operational improvements.

Acknowledgements

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