BUSINESS PROCESS MANAGEMENT IN ACADEMIC AFFAIRS FOR DIGITAL TRANSFORMATION

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ARTICLE HISTORY
Received: 24 March 2023 **Revised:** 12 April 2023 **Published:** 24 April 2023

ABSTRACT
In the VUCA world, old-school management is insufficient for an organization to survive in the market. "Digital Transformation" became a priority to avoid disruption, especially in education. Nowadays, higher education institutes like universities face a decreasing number of students due to the coming of education outsourcing players, which are more convenient to attend. Here is where "Digital Transformation" has its role. But it is neither just bringing the classroom online nor using software to make a university digital. This research presents an idea to transform a bureaucratic university in Thailand, starting with academic affairs, the university's most minor but crucial part. Applying "business process management" to “the counting-house process”. Which is not only the core process of academic affairs but also the core process of all bureaucratic organizations. By modeling the process with a BPMN diagram and solving all of its “bottlenecks” with the use of ECRS^{+IT} to create the “process prototype” with an IT solution. But When the "electronic counting house system" the IT solution of the process, seems to exist but is useless due to its user-hostile, then the process prototype which is the final product of this research has to be combined with the feedback from system users and paired with the use of extreme programming in the long-term system development plan to evolve the system from the electronic counting house system to be the virtual working place of the university as a first step for digital transformation. This bundle of the process prototype and extreme programming suggestions will be able to apply not only to the university but to any bureaucratic organization that has the problem with the delay of operation, the problem with the existing electronic counting house system, or may just want to transform itself to be digital.
Keywords: Digital Transformation, Business Process Management, Lean Management, Academic Affairs, Electronic Counting House System

CITATION INFORMATION: Jantrit, S. (2023). Business Process Management in Academic Affairs for Digital Transformation. *Procedia of Multidisciplinary Research, 1*(4), 18.

INTRODUCTION

Nowadays, the digital movement has caused a big challenge to the existing organization to survive, especially in education which is directly impacted by the coming of the internet and digital technology. In 2020 the OECD (The Organisation for Economic Co-operation and Development) predicted the 4 scenarios of future education which are driven by digital technology (Fuster & Burns, 2020) including:

1) the number of participants in formal education will be expanded.
2) formal education will be disrupted by education outsourcing.
3) the school has new roles in civic engagement and social innovation.
4) Self-education by using of online database.

In Thailand, education outsourcing is starting to disrupt formal education like universities. Causing the decreasing number of new students at 5.5 percent each year. (NSO,2021) The situation is forcing the university to transform itself to be digital to avoid disruption. To start the research, I randomly choose a national university in Thailand, alias N University that has a bureaucratic working context which is more challenging to transform to be the case study in this research. My start question is "How do I transform a university?", and when the answer is "to manage the existing process as a first step of digital transformation" (Fischer et al., 2020). So, this research will focus on "business process management" to create the starter bundle of a business process prototype with information technology suggestions for those who would like to transform their university to be digital.

LITERATURE REVIEWS

The conceptual framework of this research is formed by these 4 components.

Theme of Bureaucracy

Due to the bureaucratic working context of N University's academic affairs, this research has to be themed by Max Weber's "6 Principles of the Bureaucracy" (Weber, 1921) including:

1) The principle of official jurisdictional area.
2) The principles of office hierarchy and channels of appeal.
3) The management of the modern office is based upon the "files".
4) Office management is usually presupposed through training in a field of specialization.
5) Official activity demands the full working capacity of the official.
6) Office management follows general rules.

Business Process Management Theories

As the main purpose of this research is to manage the existing business process of academic affairs for digital transformation. So, the core theory of this research is the set of business process management theories including business process redesign (1990), business process improvement (1991), and business process re-engineering (1993).

For my 9 months limited time of research, I've found that the "Business Process Redesign" which is presented by Davenport & Short in 1990 is the most suitable. This theory is not about redesigning the whole organization, but it is to choose just one critical process with "the bottleneck" to redesign and make it a prototype of the process, which can later be adapted to the whole organization. To address the critical process with bottleneck, Davenport & Short suggested using "the high-impact approach". It is to look for the process with high cost, long period, poor output quality, or poor work-life quality, all of these are characteristic of the bottleneck. Then the critical process will be redesigned with the use of information technology to manage the bottleneck and the final process will be the prototype for continuous improvement.

But it's not only the "Business Process Redesign" that has been applied to this research. From the "Business Process Improvement", H.J. Harrington categorizes the organization's process into "Production Process" and "Business Process". The production process is "any process that

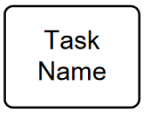
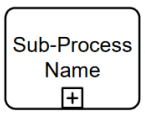
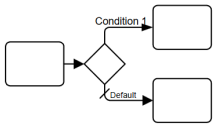
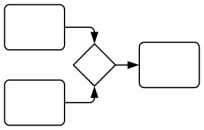
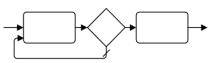
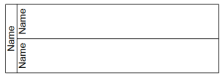
comes into physical contact with the hardware or software that will be delivered to an external customer". And the business process is "All service processes and processes that support production processes". These definitions will help to categorize the structure and processes of academic affairs.

the "Business Process Re-Engineering" by Hammer & Champy will be less involved in this research, due to the objective of the theories that aim for structural dramatic results. Which will cause an undesirable impact on the organization's structure. So, only its characteristic of "the simplified business process" will be applied in this research.

BPMN Modelling language

The modeling language is the tool to analyze and redesign the process. There are 6 best-known languages for business process modeling in 2022, including ANSI, EPC, BPMN, UML, VSM, and DFD (Mosser et al., 2022) But there are only 2 languages that are up to date and certified to apply ISO standards (OMG, 2022). They are BPMN and UML languages. And after a comparison of notations, I have found that BPMN's notation is more suitable for business process modeling. There are some of the notations that will be used in this research (Table 1):

Table 1 BPMN 2.0.1 Notations (Adapted from OMG, 2022)

Notation	Element	Description
	Start	Process start indicator
	End	Process end indicator
Notation	**Element**	**Description**
	Task (Atomic)	An atomic activity that is included within a process
	Sub-Process	A set of tasks within a process
	Normal Flow	Paths of Sequence Flow attached to the boundary of Start, End, Task, or Sub-Process.
	Exclusive	a branching point where alternatives are based on conditional expressions contained within the outgoing Flows. Only one of the Alternatives will be chosen.
	Merging	The exclusive combining of two or more paths into one path.
	Sequence Flow Looping	A Sequence Flow connected to an "upstream" object[1].
	Pool	A Pool is the graphical representation of a Participant in a Collaboration.
	Lanes	A Lane is a sub-partition within a Pool and will extend the entire length of the Pool.

Note: [1] An upstream object is an object that has an outgoing Sequence Flow that leads to a series of other Sequence Flows

Bottleneck Management Methodologies

One of the important parts of redesigning the business process is to manage the bottleneck to improve overall performance. From an article by McKinsey & Company, there are 2 categories of bottleneck management (performance improvement) methodologies, including Lean Management and Agile (Raedemaecker et al., 2022).

Lean Management has its origin in 1945, by Taiichi Ohno from TOYOTA. It is the combination of Just In Time (JIT) and Autonomation (automation with a human touch). The core of this theory is "KANBAN" (Sign Board) and the elimination of Waste (Ohno, 1998). The theories in this category are including, TQM, Six Sigma, ECRS, Kaizen, and SMED.

In this research, the ECRS (Elimination-Combine-Rearrangement-Simplification) is the most suitable due to its concept that directly deals with the bottleneck. It is to eliminate (the waste), combine, and re-arrange (the task) to make Simplification of the overall process (Smalley, 2020). This method is usually combined with the use of information technology, as sometimes it appears as ECRS^{+IT}. So, it is ECRS^{+IT} that will be used to eliminate bottlenecks and build the prototype.

For the Agile, it will be involved only in the role of the suggested methodology to improve the Electronics Counting House System, as it is beyond the limitation of this research and it is the development team of N University's ICT center who will use this in the improvement. But what I suggested to them in this research is "Extreme Programming" (XP). Extreme Programming is a method in software development, that will use "Feedback" to evolve the system in a very short time (Beck, 1999). So, when the Electronics Counting House System of N University is user-hostile, then Extreme Programming which is based on user feedback will be the most suitable solution.

From the literature review, the conceptual framework can be drawn as shown in Figure 1.

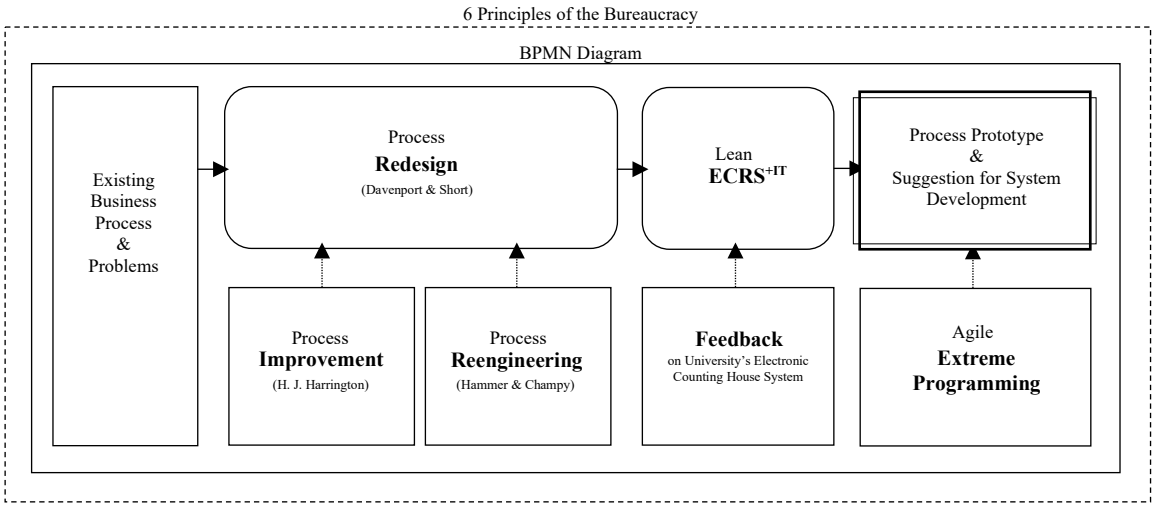


Figure 1 Conceptual Framework

RESEARCH METHODOLOGY

As this research is qualitative research with the purpose to build a process prototype for the digital transformation of academic affairs. The necessary is the in-depth data of existing processes. To access the data, I took the method of "Complete Participant Observation" (Gold, 1958) by working as a staff in the academic affairs of a faculty at N University for 2 years.

To avoid bias in my research, I also use the "In-Depth Interview" (Showkat, 2017) to collect more data for comparison. I chose the head of each academic affairs to be the representative of their faculty. As they have to supervise the overall process of academic affairs and deliver the policy of faculty to other academic affairs staff, they are the ones who can provide in-depth data from both the higher and lower office. The size of the sample is 5 persons from 30, based on "Theoretical Saturation" (Strauss & Corbin, 1998) and the accepted minimum size of the sample in qualitative research (Dworkin, 2012). The data from all 5 samples are in the same way, but after the modeling of the process, I found that I need more structural data and data on University's electronic counting house system. So, I continued to interview the Division of Academic Service's director for the structural data and the ICT center's director for the electronic counting house system.

After I received all of the necessary data, the next is to analyze the data with the method of "Qualitative Data Analysis" (Dudovskiy, 2022). Then apply those data to the conceptual framework, by modeling the existing process with a BPMN diagram and managing the bottleneck with $ECRS^{+IT}$. But when the solution for the redesigned process is similar to N University's electronic counting house system but no one uses it, I had to collect more data about the system by interviewing the Office of Information and Communication Technology's director and feedback on the system from all of the 5 samples, to find out the reason why the system has not been used. These data will be used to build the process prototype. And for the efficiency of the prototype, all feedback collected from the samples had been analyzed and synthesized into the suggestion for electronic counting house system development to be attached to the process prototype for the continuous improvement of the process.

RESEARCH RESULTS

Structure of the N University Academic Affairs

N University is a national university with branches. There are 31 faculty with academic affairs and all of those are under the Division of Academic Service's supervision. Each faculty has been divided into 4-5 subunits on average and always included academic affairs as one of its subunits.

In this Research, I collected data on the existing process from 6 faculty using the "Complete Participant Observation" and "In-Depth Interview". For the privacy of the samples, I replaced the title of each sample with the codes. Code "O" is for the faculty I collected data with complete participant observation, and codes "I-01 to I-05" are for the faculties I collected data with an in-depth interview. Each sample had been chosen randomly from each field in the university and has characteristics that are different from the others as shown in Table 2.

Table 2 Summary of each sample's characteristics

	O	**I-01**	**I-02**	**I-03**	**I-04**	**I-05**
Field	Interdiscip.	Soc. Sc.	lang.	Sci. Technol.	Interdiscip.	Health Sci.
Population						
Faculty Members	11	93	64	112	16	67
Overall Students	400	5,000	350	3,500	500	1,000
Academic Affairs Staffs	5	8	5	10	5	9
Degree Options & Services						
Bachelor's Degree	✓	✓	×	✓	✓	✓
Master Degree	✓	✓	✓	✓	✓	✓
Doctoral Degree	×	✓	✓	✓	×	✓
Certificate	×	✓	✓	×	✓	×
Online Courses	✓	✓	✓	✓	✓	×

	O	I-01	I-02	I-03	I-04	I-05
Academic Services /Talk Session	✓	✓	✓	✓	✓	✓
	O	**I-01**	**I-02**	**I-03**	**I-04**	**I-05**
Field	Interdiscip.	Soc. Sc.	lang.	Sci. Technol.	Interdiscip.	Health Sci.
Other Management Factors						
Numbers of Subunits	4	13	5	11	5	5
Cross-Campus Management	×	✓	✓	✓	×	✓
Sub-Academic Affairs on each campus	×	✓	×	×	×	✓
Extra Responsibilities[2]	×	×	×	✓	×	✓

Note: [2]Academic Affairs in some faculty is combined with other subunits like Student Affairs, International Affairs, Research, or Laboratory

But when it comes to the micro scale of each sample, all of the samples have the same structural pattern. According to Harrington's definition of the process, academic affairs can be categorized into the "Production" team and the "Supporting" team. The production team is included all of the faculty members (Lecturer) who have physical contact with their program's curriculum and teaching, which are the product and service of faculty. While the supporting team is included all of the academic affairs staff who have to support the production team and provide other supporting services to students. The process that the supporting team has to be involved in is the "Business Process". The overall structure of academic affairs is shown in Figure 2.

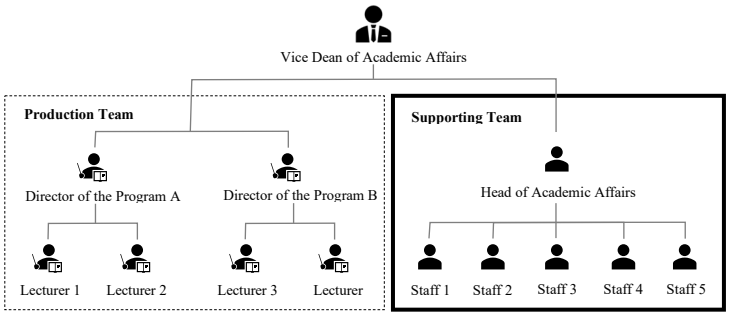


Figure 2 The Structure of a Faculty's Academic Affairs at N University

To address the "Critical" process, I use the overlaying of 2 theories. The first is "6 Principles of the Bureaucracy," and the second is "the High-Impact Approach." And the result is the process of document approvals, which is the core process of any bureaucratic organization that every staff has to do, to request approval before starting the project or sending the document in the name of the faculty. This process is usually called "the counting house process." (Figure 3)

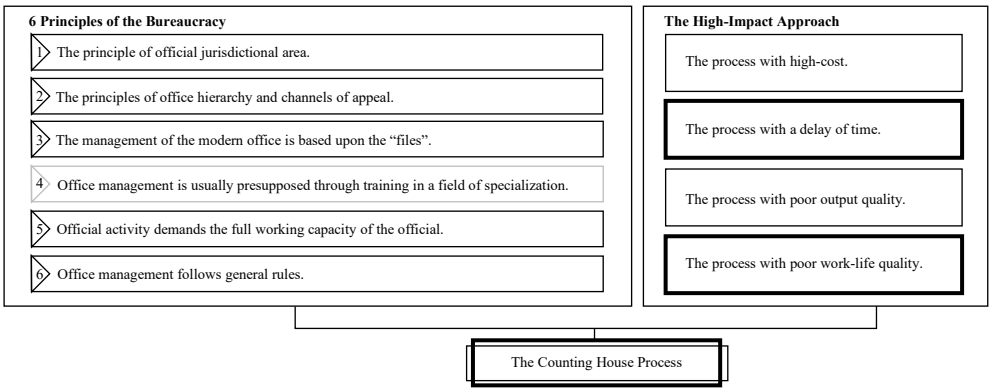


Figure 3 The Overlaying of Theories to Address the Critical Process

Process Analysis with BPMN Modeling

To analyze the process, it has to be modeled in a proper language. In this research, I took a BPMN diagram to model the counting house process. As it is shown in Figure 4)

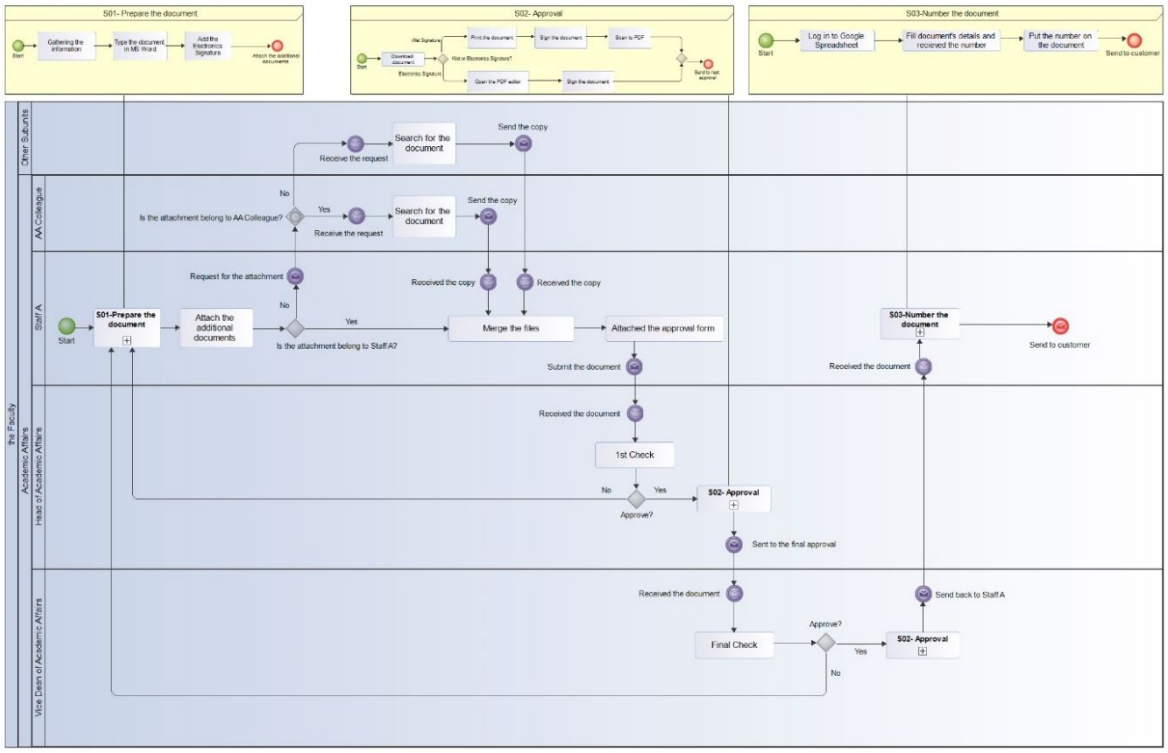


Figure 4 BPMN Diagram of the Counting-House Process

This process always starts with an academic affairs staff (Staff A) with the sub-process "S01-Prepare the document", which is to gather the information of the document of the project. Then type the document by using an application like MS Word and sign the name to identify the responsibility for the document.

But the document in the bureaucratic organization usually has to be attached to the related documents. In case the attachment belongs to staff A, it will be attached instantly. But if the attachment is belonging to the others either in the same subunits or not, the process will access the loop of the "Document Request", which has a range of looping time between 20 minutes to 3 days. Depending on how the owner keeps the document and the availability of the owner to search for it. After the end of this loop and all of the document is completely attached, the process can be continued to the next sub-process "S02-Approval."

The sub-process “S02-Approval” starts when the approvers received the document, mostly from their email or chat application. Then they have to download the document to their device and will either print the document out for the wet signature or open the PDF editor for electronic signature. And when they finish the approval, the approved document will be sent back to Staff A to submit for the next approval.
Normally for the routine document of operation, it will take only 2 levels of approval including the head of academic affairs and the vice dean of academic affairs. But in the case of some document, which has to take more than 2 levels of approval. The period of the overall process will be extended and the longest period of the overall process is 2 weeks.
After the approval is completed, the document will be sent back to Staff A to number the document with sub-process “S03-Number the document” and send it to the customer, who usually is the other office of the university.
The sub-process “S03-Number the document” is usually done with the Google Spreadsheet, by logging in and fill the document details to receive the number. Then put the number in the approved document before sending it to the customer.
From the diagram, there are 3 bottlenecks in this process as it is shown in Figure 5.

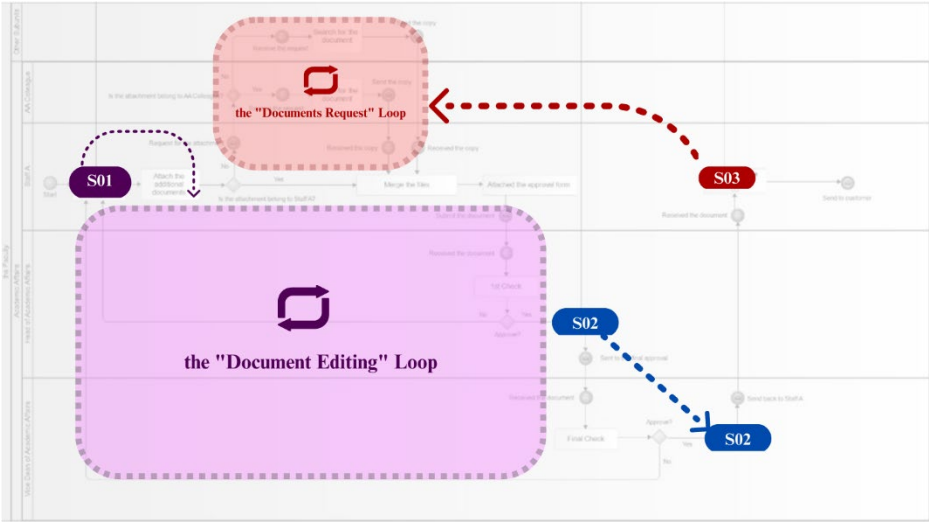


Figure 5 Bottlenecks of the counting-house process

: The problem with the sub-process “S01-Prepare the document” caused the “Document Editing” Loop in the process. The Loop will appear when the approver found any mistake on the document, it will be sent back to Staff A to edit it. The loop will end when there is no mistake on the documents. The problem on sub-process “S01-Prepare the document” caused the “Document Editing” Loop on the process. The Loop will appear when the approver found any mistake on the document, it will be sent back to Staff A to edit it. The loop will end when there’s no mistake on the documents.

: The problem on each sub-process “S02-Approval” cause more time consumed on the overall process.

: The problem on sub-process “S03-Number the document” causes the “Document Request” Loop on the process, due to the numbered document having been stored in each staff’s device after the document has been sent to the customer. So, when the other staff needs the attachment, they must ask the owner to send the copy to them.

Eliminating the Bottlenecks by using ECRS^{+IT}

After addressing process bottlenecks, the next step is to eliminate those bottlenecks by applying the ECRS^{+IT} on all of the 3 sub-processes. The details on each sub-process are as below.

1) S01-Prepare the document

(E+IT): Eliminate the “Type document in MS Word” task, and replace it with the “Automated Document Generation” system.
(C&S): Combine the tasks of placing both wet and electronic signatures, with the use of “Single sign-on” to auto-sign the document with the user’s name.
2) S02-Approval
(E+IT): Eliminate all of the tasks in this sub-process, and replace them with the “Approve” and “Disapprove" buttons.
(C&S): Combine the tasks of placing both wet and electronic signatures, with the use of “Single sign-on” to auto-sign the document with the user’s name. But with double authentication by typing the password or using the FACE ID.
3) S03-Number the document
(E+IT): Eliminate all of the tasks in this sub-process, and replace them with the “Automated Document Numbering and Storing” system.
(C&S): Connect all of the stored documents and provide the search systems for the staff. But also has to categorize the users with the documents, to limit the access of the staff only to their related documents.
From all of these solutions, there is a system in the N University that has the similarity to these solutions. It is the “electronic counting house system.” But there is no one using it in their counting house process. So, I have to learn more about the system to find out the reason why the system is not being used.

N University’s Electronic Counting House System

The electronic counting house system has been developed with the purpose to reduce the use of papers in the university. The system is included the functions of the “Automated Document Generation” and the “Automated Document Storing” system.
After the interview about the system, I found that 5 from 8 samples never use the system due to a misunderstanding that the system belongs to the counting-house officer. This can be explained by the theories of “Schema”, which is explained that human will connect their sense to their experience (Bartlett, 1932). The target of this system is the university staff, who are working in the bureaucratic context with the position of the “Counting House Officer”. So, when the system has the term “Counting House” in its name. The university staff will automatically connect it with the position of the counting-house officer.
For another 3 samples, they said that they avoid using the system due to the increase in tasks after using the system. But after the comparison of tasks before and after using the system I’ve found that the true reason is the system has been designed with less understanding of its user behavior. That is why the system is user-hostile and causes a burden on its user.
But the existence of the system is still an advantage for the process and the ICT center is still able to edit the system. So, the process prototype of this research will be based on the use of the existing system with its user’s feedback combined with my ECRS^{+IT} solution, and the suggestion of using extreme programming in its continuous improvement to evolve the system from the electronic counting house system to be the virtual working place of the university.

Process Prototype & Information Technology Suggestions

This is the prototype that is the combination of the ECRS^{+IT} solution with the use of the “Automated Document Storing” of the existing electronic counting house system and is adjusted to suit the working behavior of the staff. (Figure 6)

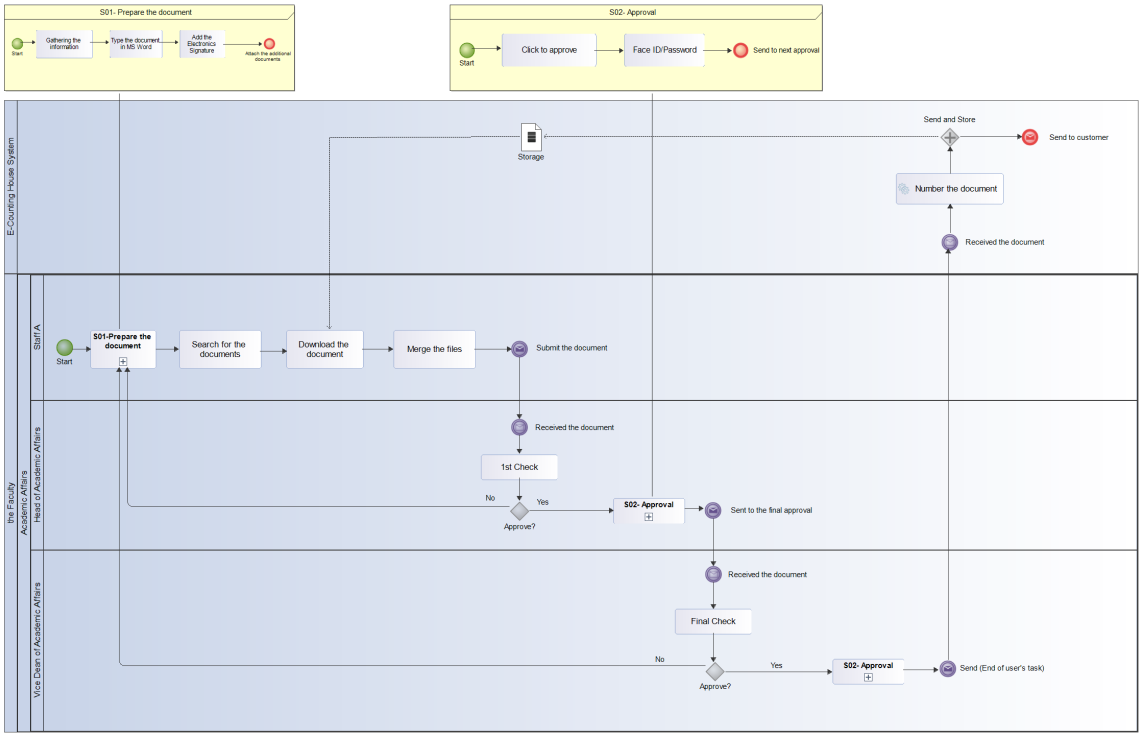


Figure 6 BPMN Diagram of the Process Prototype

In this Prototype, I choose to keep the sub-process S01 in its way of working. But suggested using MS Office 365, which is already existed at N University, and all of the staff have an account to use it. The reason is that the work of academic affairs is mostly routine, and which has not much variety of documents. Nowadays, the solution for some faculty is to build the template in MS Word and shared it in academic affairs. But it still has the pain point that when it runs on a different version of the software, it will cause an impact on the format of the document. So, I suggested a solution to use the template that is built and run online to avoid problems with the document format. So, the use of the electronic counting house system will start when the document is ready for the attachment.

To attach the related document, now Staff A will just use the system to search and download the document to attach. When the document is already attached, staff A will have to upload it to the system and submit it for approval. When the document is submitted the system will notify the approver that the document has arrived and the sub-process S01 will start. In the sub-process S02, the approver will just click on the “Approve” or “Disapprove” button. The “Disapprove” will send the document back to Staff A for editing, but if “Approve” the approver will have to confirm either by typing the password or FACE ID and the approved document will be automatically sent to the next level of approval. When all of the approval is done, the approved document will be automatically numbered and stored by the “Automated Document Storing”. And to send the document out, Staff A can either download the document and send it via email as before or just set the destination in the system so it will be automatically sent if the destination is the other subunit in the university.

To evolve the system, this process prototype has to be paired with extreme programming, by assigning a development team that is included 3 pairs of programmers for each sub-process (S01, S02, and S03). Each team will have different assignments as below:

1) The S01 is assigned to find a way to connect the system to MS Office 365, or may just develop the easiest way to upload the document.

2) The S02 is assigned to redesign the UX (User Experience) and UI (User Interface) to be more user-friendly by referring to a mobile banking and PDF editor application. And has to

develop a document tracking function that can use its data to address the place of delay in the process, and the data can also use as the key performance indicator (KPI).
3) The S03 is assigned to categorize the stored document and users by cooperating with both human resources and counting house officers collecting all of the user's data and transactions of downloaded documents.
All of these teams must have a channel for users to submit feedback, and use the feedback to develop the system with one leader to monitor the overall compatibility of all 3 teams.
This bundle of process prototype and extreme programming suggestions are already validated by a focus group of system users that the bundle is suited to their working behaviors and is secure enough to use in the bureaucratic organization.

DISCUSSION & CONCLUSION

This research is beginning with the aim to prepare the formal education unit to be ready for the digital world. After 2 years of observation at N University, I found that digital transformation is a bit far from the present checked point than I thought. Especially in the back office like academic affairs, where most of the staff are required to work at their full load of capacity but lack the proper technologies to maintain efficiency. Proofing that business process management is the most urgent and is also on the path to digital transformation. As the research is taking place in a bureaucratic university, there are a lot of challenges in doing this research. Among those challenges, I would like to mention these 3 major challenges for the benefit of any further research. The first challenge of this research is the bureaucracy of the organization that must include the counting house process in all of its services. When it cannot be eliminated so I choose to redesign it as a prototype. The second is the structure of the organization that cannot be changed and I have to keep the current number of approval levels as before. The solution to this issue is the use of information technology to solve the problem of accessing the device caused by the working behavior that always has to work outside the office so when the staff is able to work from anywhere the process can be easier to continue regardless to the number of approval levels. The third is a rare number of related contemporary research, only 2 useful related research have been found during this research the first is the *"Lean university: applying the ECRS method to improve an administrative process."* by Bârsan & Codrea in 2019 which help me confirming that my choice of using ECRS^{+IT} to solve the bottleneck will be worked, and the *"A Divergent View of the Impact of Digital Transformation on Academic Organizational and Spending Efficiency: A Review and Analytical Study on a University E-Service."* by Brdesee in 2021 which I got a concern in developing of an E-Service system that some service can cause an impact to university's income if the process is too easy. So, it is good that my research has to keep the number of approval levels due to its structure. But when it came to the research in Thailand, it is unfortunate that what I have found is only a large number of quantitative researches regarding the satisfaction of the electronic counting house system with the use of 4Ps and 7Ps models and just concludes that the users are satisfied with the system. None of these researches have mentioned the true problem with the process or even the problem with the system. It shows that the problem with the efficiency of the backhouse office in Thailand's bureaucratic organization is never been mentioned while the people who are the customer can generally be impacted by the delay of its operation every day. I'm glad that the result of my research is the bundle of process prototype and extreme programming suggestions for the counting-house process which is the core process of any bureaucratic organization so it will be able to apply not only to the university but to any bureaucratic organization that has the problem with the delay of operation, the problem with the existing electronic counting house system or may just want to transform itself to be digital.

Notes for Using the Bundle

1) This bundle of process prototype and extreme programming suggestions can be applied to any kind of bureaucratic organization with the counting house process. But extreme programming suggestions will be worked only if the system is created by the organization itself so the codes are able to be edited. But if the system is created by outsourcing and has the problem of its user-hostile like in this research, then I suggest stopping using the current system and hiring another outsourcing to create an application by using the bundle as a guideline.

2) The process prototype can be used as a reference in creating the standard operating procedure for the counting-house process which can be used in the staff training of the system.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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