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Lean Service Operations and A Lean Management Application at a Foundation University

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ABSTRACT

Lean service operations and lean management are of vital importance for all service providers as much as manufacturers. Unfortunately, most universities need to be made aware of the concept of lean. However, they can benefit from lean management in all their service areas, such as admissions, administration of research funds, hiring, and nearly any functional area where multi-step processes can be simplified and focused on the needs of the users served by the organization. Lean methodologies focus on reducing waste (Muda in Japanese), removing overburden (Muri in Japanese), and unnecessary variation (Mura in Japanese). Non-value-added activities are eliminated or dealt with to develop the performance of the process. This study aims to highlight the suitability of lean in a university environment to enhance the efficiency of the operational tasks performed and provide suggestions for better performance. Lean methodologies were applied to the School of Graduate Studies at a Turkish university to study the current state of the process and provide recommendations and alternatives for the current issues faced using Value Stream Mapping (VSM). As a result, Value-Added and Non-Value-Added activities were identified with Indicative Ratios to compare the performance before and after applying lean. In the end, seven questions were answered to develop a proposal for the future state of the process, which was presented to the university management.

Keywords

higher education; lean management; lean service operations; quality; value stream mapping

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INTRODUCTION

Lean service operations and lean management are becoming a necessity for all service providers and tangibles/products providers. As a major group of service providers, most of the universities are not even aware of the concept itself, lean thinking. Universities and colleges can benefit from lean management in all their service areas such as admissions, the administration of research funds, hiring, and nearly any functional area where multi-step processes can be simplified and focused on the needs of the users served by the organization (Langer, 2011; Balzer, 2020; Oktarian & Surjasa, 2021). Lean methodologies focus on the identification and elimination of waste (Muda), overburden (Muri) and variation (Mura). Non-value added activities are eliminated or dealt with in a way that will not affect the quality and time of final service (Francis, 2014). Being more efficient, reducing costs, and providing more standardized service are the main motives that attract service providers to think about lean. Lean operations were first brought up by the Japanese manufacturer Toyota when they decided to have mass production in their plant by studying mass production in depth and coming up with the idea of eliminating Muda or waste.

In the literature, Womack & Jones (1997) mentioned that lean philosophy is based on five principles to be studied: (1) specify customer value by understanding their requirements and expectations from the organization; (2) for each product or service, identify the value stream for all the processes included; (3) ensure service or process flow; (4) assure a pull system is being applied to the organization; (5) always aim for perfection in terms of quality and delivery time. These principles are primarily used in manufacturing sectors, and later we started to see lean applications in service sectors, such as healthcare (Anderson et al., 2019) or hospitals (Mazur et al., 2019; Sunder M et al., 2020), banks (Sunder M., 2016), call centers (Agnetis et al., 2019), and firefighting stations. However, only a few applications are being undertaken at a university or in higher education, and most of these papers are looking from the educational aspect.

In this study, lean thinking with its concepts and the philosophy will be applied in a Turkish foundation university environment. The university subject to this study is a foundation university that gets most of its funds from external sources and provides scholarships for its students, which makes the idea of reducing costs more reasonable in order to accept more students so that the university provides more scholarships with the money saved. The work of this study will not examine the educational section of the university or look over the curriculums taught or how a professor is supposed to teach in his class. The main goal of this study is to focus more on the practi-

cal section of the university by studying the most important department a graduate student usually interacts with, with one of the services provided by the department, and how we can apply lean to improve this service. The primary purpose of this study is to look at the department and observe the service they provide to inside or outside customers, then have a look in more details at the service process and implement lean principles.

Within the scope of the study, we conduct extensive interviews with the head of the department, the School of Graduate Studies (SGS) department. First, the interviews are mainly used to draw the flowchart of the top process performed at the university, the Application Process. Later on, the interviews help to confirm the drawing with the process stakeholder to ensure the chart represents the real-life process. Secondly, value-adding and non-value-adding activities are specified by looking at the process in more detail and observing each sub-activity as to whether it adds value to the final customer or not, and lean methodologies will be applied to reduce time and serve the service in the most optimal way we can. Furthermore, this work aims to investigate specific problems in the department, analyze the current situations, draw the flowchart, identify wasteful and non-value-added activities and eliminate them, analyze root causes of the problem, and propose a solution to the management of the university.

LITERATURE REVIEW

Lean in Higher Education Institutions

The effective applications of lean principles and practices as mentioned in lean applications articles across different cultures, industries, and departments lead us to conclude that lean was influential in various service sectors. Thus, we expect that this will apply to Higher Education Institutions (HEIs). Lean Higher Education (LHE) expands the applications of the lean philosophy for manufacturing, service, and professional organizations to HEIs. LHE is a holistic approach to systematic change, which helps colleges and universities to reconsider their responses to the expectations and needs of those benefiting from their services. LHE principles and practices should become the institution's culture, engaging faculty and staff in the improvement of the underlying processes of higher education to make them more efficient and effective.

Lean implementation in HEIs is still at the initial stage, and there is a huge space for improvement; all the applications are good examples to follow, but there is no one best way for implementation. The principles of lean have been applied in Higher Education Institutions, but the tools and techniques differ from one study to another.

Emiliani (2004) demonstrated the applicability of using lean principles and practices to design and deliver a graduate business school course. The research objectives were to improve consistency, eliminate waste, improve the quality and relevance of course materials, and deliver greater value as perceived by students. The objectives were reached by applying key Lean processes and tools such as Five 5S, Just-In-Time, Kaizen, Lean behaviors, Heijunka, and VSMs. The results show a higher level of student satisfaction through more obvious expectations, less ambiguity regarding assignments through the standardized format of assignments, level balancing of individual and team assignments over the course, and better time-management of students inside and outside class. Emiliani (2005) continued applications of LHE using Kaizen to improve graduate business school degree programs, including ten courses. Based on students' feedback from formal and informal surveys, the improvement opportunities were identified into four categories that were the main focus of the Kaizens to address them and make improvements in these opportunities.

An assessment of the use of lean sustainability concepts was developed by Comm & Mathaisel (2005). The questionnaire was applied at five public universities and 12 private universities in the United States. The result of the study suggests that lean sustainability practices can be applied to the operational or administrative side of higher education enterprise more often than to the teaching or research side. Hines & Lethbridge (2008) visualized the lean process as an iceberg. Technology, tools, and techniques affecting the process deceive those planning to implement lean in their universities. At the same time, the majority of the iceberg is beneath the surface and consists of enabling elements. To have a successful, sustainable transformation of lean, the bottom of the iceberg should be addressed by forming a lean implementation team

Various lean tools were used by Alagaraja (2010) to improve the development of teaching materials and to examine the applicability of lean thinking in higher education. El-Sayed et al. (2011) utilized the very well-known lean principles to help develop an educational program and course assessment process. The authors established performance criteria and targets for assessment with some illustrative examples. Doman (2011) significantly improved a university administrative process by his new paradigm of teaching undergraduate students the lean principles, practices, and techniques and allowing them to reinforce what they have learned on the grade change process. Although the study shows that a small group of students can work with the lean team and suggest solutions if they were taught well, these solutions are already from the beneficiaries' perspective.

Dragomir & Surugiu (2012) have implemented lean in three higher education organizations by initially drawing a VSM for their current situation. After identifying the current VSM, opportunities for improvement were analyzed and measured to draw the future VSM. The final analysis of the three case studies came up with some 'particularities' to implement lean in an educational environment: Lean should not be triggered only when there is a crisis; it should be executed by higher-level managers in the university beforehand. Furthermore, the initiatives of lean and the commitment is a lifelong commitment, and the outcomes take time to be visible; as a result, an office of process improvement must be created with the help of a lean facilitator.

Sustainability and lean practices have been a major interest for authors and readers in manufacturing settings, yet, few studies have been applied to analyze the causal relationship between both the triple bottom line of sustainability and the lean practices in HEI. Klein et al. (2021) discovered a positive relationship between lean practices in HEI and environmental, economic, and social practices in HEIs. HEIs do not contain only a few processes and procedures but a wide range of systems and processes. A university would not perform its duties without the comprehensive work of its departments and offices, for instance, International Relationship Office, Financial Affairs, Graduate and Undergraduate School, IT, and so on. Each department has its own processes for identified activities to reach specific outcomes, these processes should add value from the customer's perspective if the process is performed correctly from the first time, and the customer perceives the value (Douglas et al., 2015; Antony, 2017; Kazancoglu & Ozkan-Ozen, 2019; Hartanti et al., 2022).

Customers in HEIs

It is easy to identify customers for a process in a production setting. Usually, they initiate the order in the system, pay for it and use the product/service (Emiliani, 2004). Yet, it is quite complicated in the public sector in general and in HEIs in particular. In healthcare, for instance, an operation cannot be performed, and it would not have existed in the first place without a patient that the surgery is to be performed on. So, patients are considered the main customer in healthcare, along with patients' relatives, society, and government supporting the patient financially (Douglas et al., 2015; Klein et al., 2022). Applying the same logic at a university environment, courses would not exist nor be taught without the students' attendance and appearance in the classes. So, students may be seen as the main customers of universities, even if they are offered a scholarship and are not paying for their education. The funder is also considered as the sub-customer too.

Furthermore, the concept of seeing customers as 'outsiders' is false. The literature has identified an organization's customers as internal and external customers. Not all processes' outputs are provided to external customers. Some of the processes are performed upon the request of another department, and the result or the final stage of the process is to move the service/product to a different department within the same organization. This customer-driven approach states that "the customer or the beneficiary defines the value, the university's object should be to deliver that value rather defining it in all things academic" (Balzer, 2020).

Waste

Waste is defined as any human activity that absorbs resources but creates no value (Womack & Jones, 1997). In order to remove wastes in a service industry and streamline the process, firstly, wastes must be recognized and highlighted from the whole process line; second, the causes for these wastes must be understood and addressed, remove the causes from the entire system if possible (Douglas et al., 2015).

The Transformation of Manufacturing Wastes into HEI Wastes

Douglas has studied how the development of the idea of waste has changed from a generic concept of waste in a manufacturing environment into specific waste for each sector. The father of lean, Taiichi Ohno identified seven categories of wastes that originated from his successful work at Toyota Production System in 1988, while Womack & Jones (1997) found the eighth one. These wastes are: Transportation, Inventory, Motion, Waiting, Over-Processing, Over-Production, Defects, and People. Since these eight wastes were developed for production systems, a minor modification was to be done to make them suitable for service environments. Taj & Berro (2006) represented these eight wastes in service organizations based on the generic waste definitions by Ohno (McBride, 2003; TechTarget Contributor, 2009; Neyer, 2019).

Bonaccorsi et al. (2011) have appended two different categories, making them ten categories in total: Delay/Waiting, Duplication, Unnecessary Movement. Unclear Communication, Incorrect Inventory, Errors/Defects, Lack of customer focus, Overproduction, Underutilized People, Variation. Douglas et al. (2015) have translated the eight generic categories of wastes into wastes for HEIs. Later on, Kazancoglu & Ozkan-Ozen (2019) provided a model that categorizes waste in HEIs into waste and sub-waste items. The article also suggests a roadmap to be followed when implementing lean in HEIs. Table 1 illustrates all eight types of wastes that might be found in HE with an example of each waste and a detailed explanation is provided.

Table 1

Waste examples for HEIs

Waste in HEIs	Sub-waste (examples from HEIs)	explanation
Transportation	Moving/transferring administrative documents for approvals	Moving or transferring administrative documents for approvals between different administrative units is inefficient, such as sending course descriptions and contents to heads of departments
	Lack of technology usage in terms of course materials (hard-copying of materials, books, etc.) - carrying them between classes	Course materials must be created in hard copy and carried between classes, rather than using IT like USBs, e-books, etc.
Inventory	Lack of sources (academic journals, research materials, equipment, database, software, etc.)	There are insufficient resources for academic work, including academic journals, research materials, equipment, databases, and software
	Excessive use of paper copies	Excessive amounts of paper are used instead of electronic copies for academic and administrative work that may be unnecessary
	Unbalanced course-classroom pairs (idle or over-capacity, inappropriate)	Classroom specifications (technological equipment, special software, etc.) do not match the course requirements, or the capacity of classrooms is underused
Motion	Inefficient scheduling of classrooms and instructors (long walking distances)	Lecturers are inefficiently assigned to classrooms, which may force instructors to walk excessively long distances
	Redundant movements required between office machines and facilities	Office machines (printers, faxes, photocopiers, etc.) and facilities related to daily work are located far from offices, creating long walking distances
Waiting	Inefficient scheduling practice in terms of timing	The poorly prepared teaching schedule does not allow time to be used effectively, such as having long gaps between classes
	Non-standardization of workdays (unbalanced workloads across days)	The workload is not standardized across weekdays, such as having some over intense or busy days that decrease efficiency
Over-processing	Unnecessary repetition of tasks	Academic and administrative tasks are unnecessarily repeated daily or monthly, such as keeping track of weekly student attendance
	Excessive variability of courses	Academic staff have to teach a wide variety of courses that may not be mandatory for the curriculum of that program
	Ineffective control of course contents	The contents of some courses are not coordinated carefully. For example, some subjects overlap in different courses
Over-production	Producing extra, unnecessary information	The complexity of the system creates excessive amounts of information in academic and administrative work, which is used ineffectively or not at

Waste in HEIs	Sub-waste (examples from HEIs)	explanation
		all
	Excessive number of academic units	The university has too many academic units, which may cause excessive use of human, finance and time resources
	Excessive number of administrative units	There are too many administrative units with similar purposes, which may increase bureaucratic work for academic staff
	Excessive number of students to graduate	Due to the excessive number of students, the student/academic staff ratio is too high, so student-academic staff interaction is inadequate
Defects	Missing information (administrative or academic)	Communication deficiencies result in missing information in daily tasks, such as misunderstandings of regulations and bylaws
	Repeated work at the end of the semester (preparing reset exams, remarking exams, etc.)	Work has to be repeated at the end of the semester (e.g., preparing reset exams, remarking exams)
	Errors owing to misunderstanding/communication problems	Errors occur owing to misunderstandings, communication problems, or disinformation
Unutilized staff's talents	Unnecessary bureaucracy	Unnecessary bureaucracy in academic or administrative work wastes time and decreases academic staff motivation
	Talent underuse	There is perceived underuse of staff talents, background, expertise. Subordinates could easily do some tasks
	Skill mismatches	Specializations and assigned responsibilities (e.g., courses taught) do not match

Value Stream Mapping

After an in-depth analysis of the previously made applications in HE, process mapping, process flow, and VSM can be seen repeatedly in most of the literature. It is worth mentioning that VSM and process mapping are similar and have been used to visualize the process to improve it. Yet, VSM looks at the process from a broader view and with more details. It is one of the reasons why it will be used in this paper instead of process mapping.

VSM is one of the most used lean techniques in the lean literature. The objective of VSM is to visualize processes and to comprehend how the value is being created and where wastes occur. The visualization of the process helps the stakeholders understand how the value is being created and sets the standardization of the process as a reference. It also helps in improving the process by emphasizing the sources of waste to eliminate them (NHS England & NHS Improvement, 2021). Khurum et al. (2014) mentioned the process of VSM, with details for each process and its outputs. These steps

may be seen in Figure 1. More details about them can be explained in the following passages.

Step 1. Initiation: To start the journey of VSM, some preparations and planning must be considered for a compelling journey, the following activities should be done first:

- Identifying the stakeholders of the process.
- Defining the purpose of VSM.
- Defining the team to who is going to follow with the rest of the steps.
- Training the team on lean concept and VSM.
- Scoping the current problems, which the process is facing, and the reason for VSM to be implemented.
- Identifying the value and value creation relevant for the goal to be achieved.

Step 2. Current Process Map: The current state map is drawn in the second step of VSM. The map helps understand the whole process, how it occurs, and identifying wastes in the process that must be addressed later on. Steps to be followed to draw the most representable current state map are:

- Drawing the first draft of the process.
- Identifying tasks and the flow of the process.
- Collecting actual data through observations and interviews.
- Evaluating the value from the customer's perspective.
- Understanding how the process is repeating.

Step 3. Waste Identification: After the first draft of the map is drawn, waste may be identified easily in accordance with value-adding tasks.

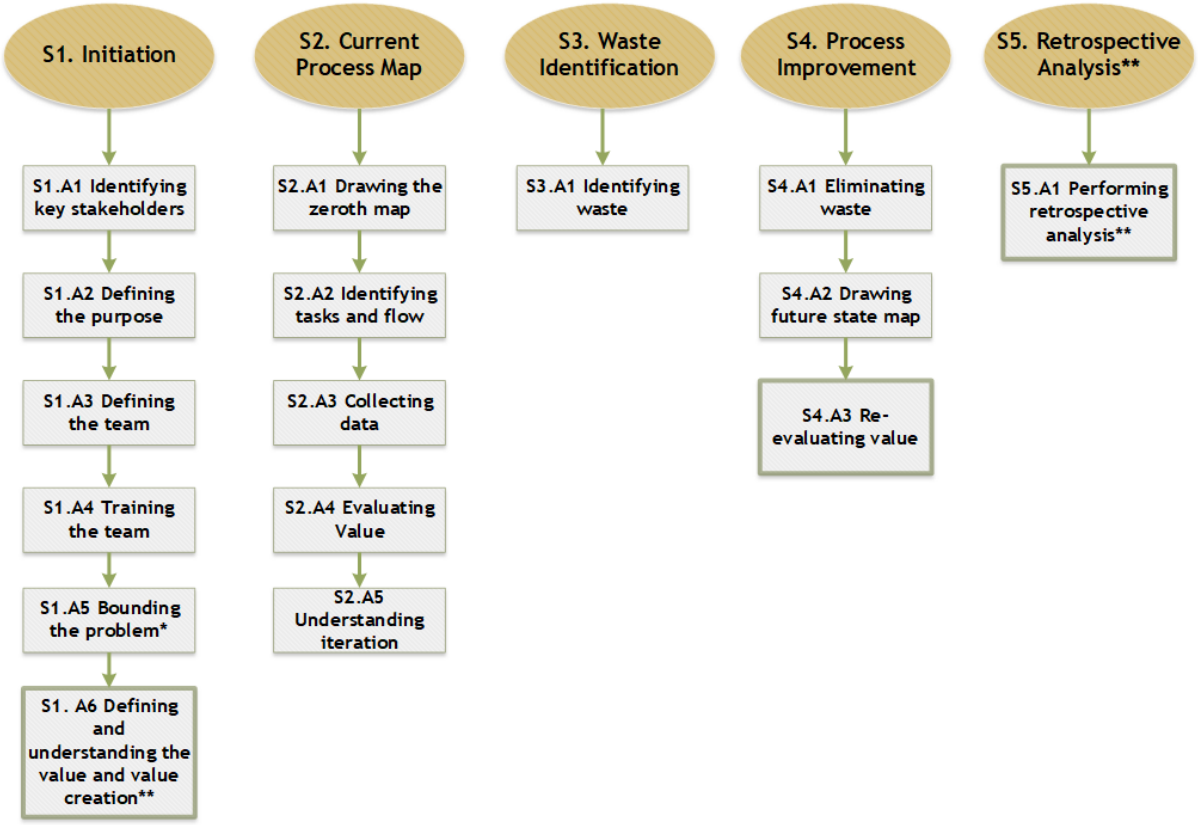
Step 4. Process Improvement: When wastes are clear and highlighted, improvement alternatives are suggested by following these tasks:

- Eliminating the significant wastes.
- Drawing future state map.
- Re-evaluating value for the whole process.

Step 5. Striving for Perfection: This last step suggests that after providing the alternative improvements, continuous observation and checking must be on the go to make sure that no misunderstanding has happened, and make sure that the suggestions are performed as planned.

Figure 1

Value Stream Mapping Process (adopted from Khurum et al. (2014))



METHOD

Research Design and Methodology

This work looks at the literature to find the suitable lean tools and techniques to apply at a university and then applies them to prove that lean is an effective approach. This makes the paper a deductive paper. Furthermore, the study follows a mixed approach in collecting data, interviews and focus groups are examples of qualitative, and measuring the performance indicators by surveys and direct observations are examples of quantitative methods. Accordingly, this research is composed of three phases as described below and in the Figure 2:

Phase 1: Diving into the literature to find real applications of lean in HEIs and coming up with the best and most used LHE tools and techniques to apply them at the university under study.

Phase2: Observations of the Departments and Data collection to draw the current state of the process with its current performance indicators.

Phase3: Measurements and Performance Indicators analysis to draw the future state and provide suggestions.

While applying the lean management principles at the university, we will follow the steps below which are based on the five principles suggested by Womack & Jones (1997):

1. Defining the value and expectations of the process from the perspective of the person who receives the process or benefits from it and what they expect to receive.
2. Drawing the process flow and determining whether each step and activity contributes value to the end service is provided or if it is a waste.
3. Eliminate wastes after identifying waste and propose solutions to improve the efficiency of the process from the receiver's perspective.
4. Designing each process that the customer pulls rather than pushing the service to them.
5. Seek perfection in the process through continuous improvement, simultaneously observing beneficiaries' satisfaction, and making rapid changes.

Phase One: Literature Review

As the concept of lean in HEIs is still at its first glances, and the use of lean principles was very famous in the industry but rarely used in a university's settings, an in-depth review of LHE literature was conducted to understand how the concepts and theories of lean were transformed from the production line to university's offices. Literature played a major role in this study to provide the tools and techniques that had been used with their indicators. The role of literature did not stop at the first phase only, there was always a need for the literature to support or answer some of the obstacles faced during the writing of the paper.

The university's electronic library was of huge help in finding the resources and articles together with Google Scholar. Some of the keywords that were searched for areas such as "Lean in Higher Education, "Lean Implementation" and "University", "Lean Thinking" and "University", "Value Stream Mapping" and "University", and LHE.

Phase Two: Data Collection

After the phase of checking the literature and coming up with the scope of this article, we moved to the second phase of the study, where the following methods were used. The interviews held for this study can be divided into structured and semi-structured interviews. Structured interviews were held with the head of department and staff with ready questions to decide whether the introduction of Lean should be considered or not. These questions were introduced by Brigel & Olsson (2018) and was initially validated by The Association for Manufacturing Excellence (2019), if any of the following

questions is answered by yes, then lean thinking must be the following strategy for the organization:

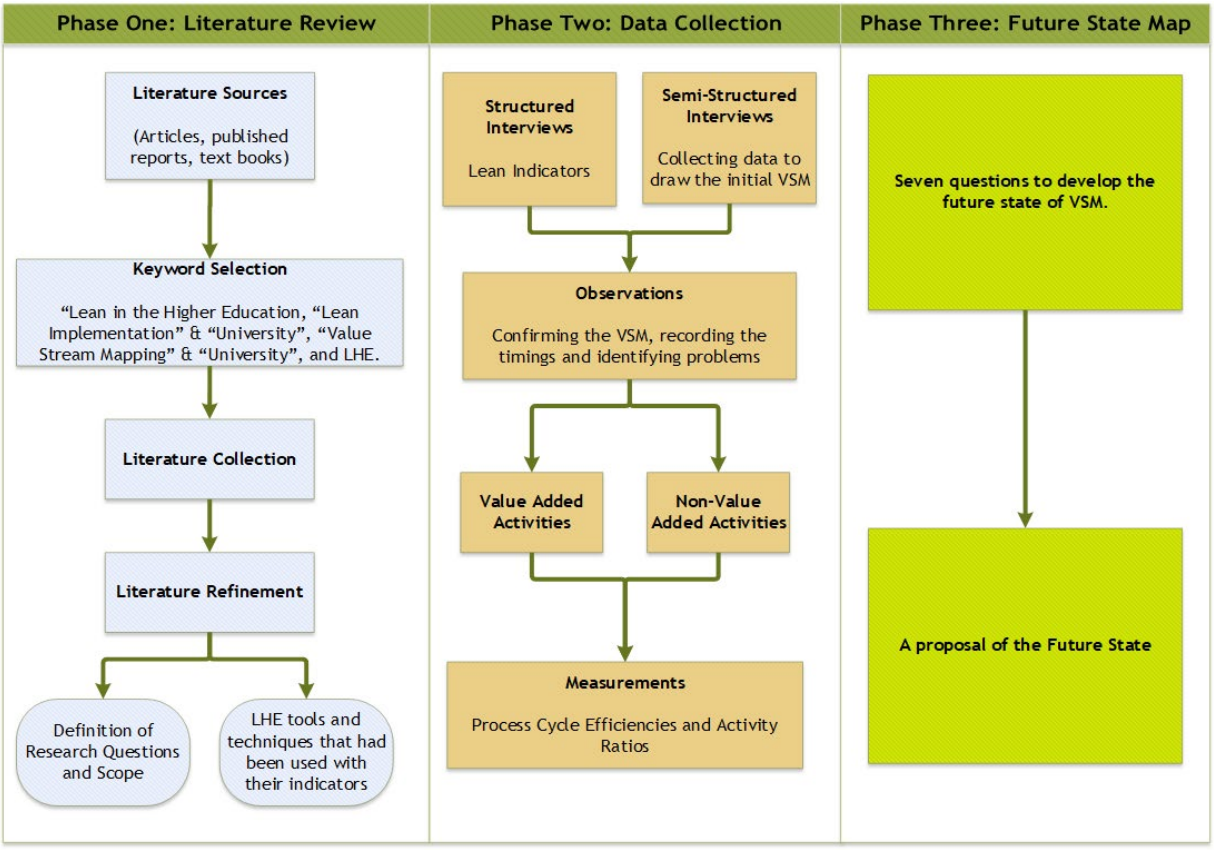
1. Is it normal to spend extra time (overtime) on an activity in the department?
2. Is there frequently a need to rework something after considering it done?
3. Does the staff of the department spend a lot of time on paperwork?
4. Is there more than one way to perform a task?
5. Do employees waste time by looking for the appropriate materials?
6. Were there any changes in the processes when the department grew and moved to the new campus?

For the following questions, if one answer is no, then that should be an indication of the need for a lean solution for the targeted process:

1. Does the department have a standardized procedure?
2. Does the department implement the best/optimum practices?
3. Does every process have a manager or a responsible one?
4. Do employees understand the impact that they make on the process?
5. Do employees in the department communicate the right information to the right person at the right time?

Figure 2

An overview of the three phases of this study



Semi-structured interviews are held after the structured interviews and after discovering lean needs in the university. Semi-structured interviews are a set of specified questions prepared by the interviewer beforehand to guide the conversation according to the objectives, yet, with the possibility of elaboration when something interesting comes up (Bryman & Bell, 2015). Mainly semi-structured interviews were held to specify the steps and procedure in detail from its stakeholders, timings, and performance indicators such as the total length and time required to finish a step, process time, with the time the activity keeps waiting until the next step.

Not every detail is mentioned in the interviews, that is why observations took place to identify and record the behavior of the representatives of each department (Bryman & Bell, 2015). Some details seem too obvious for the workers to mention during the interview because they are not aware of them, but they have a huge impact on the process. The purpose of the observations is not to depend only on what the interviewee has said, but to understand and learn in detail the work they are doing, identify problems directly from the process itself, and ask questions when there is something that is not clear.

For some of the processes, the steps of some of the main activities were already recorded for students or other workers to use or to be as a reference when a worker forgets the procedures. These secondary data were collected from the department's website and asked from the head of the department directly. The literature suggests that the most feasible lean tool used to obtain time and screen the current state of the processes at a university setting is VSM. Below are the steps that were followed to implement VSM at the university and assess the current state:

- Identifying each step/task in the current process,
- drawing the map of the task in order,
- and confirming the map from the process stakeholders.

After drawing the map, Value-added and non-value-added activities are identified from the customer perspective, keeping in mind for most of the processes in a service organization such as what we are working with, there are two types of customers, internal and external. Waiting time, the time when the process is idle, is measured. Additionally, process time, the time required to finish a step without any interruptions, is calculated for value-added and non-value-added activities for each task. Lead time, time to complete an activity from the beginning until the end of the task, lead time includes waiting time with processing time combined. In the last step in assessing the current process, Indicative ratios are calculated for further comparisons.

Phase Three: Future State Map

Keyte & Locher (2017) suggested the following questions to implement and draw the future state:

1. What does the customer really need?
2. Which steps create value, and which generate waste?
3. How can workflow with fewer interruptions?
4. How will interruptions in the flow be controlled?
5. How will the workload and/or activities be leveled?
6. How will we manage the new process?
7. What process improvements will be necessary to achieve the future state?

The same approach was followed, and the answers to these questions were found by the authors before drawing the future VSM.

Measurements

In order to compare the current state of the process to other processes and to observe the impact of the future state, the following measurements are applied to the studied process as suggested by Krdžalić et al. (2020). PCE is an important metric in lean, it directly measures the efficiency the whole project is performing, and it gives a percentage on the time which is adding value to the total time.

$$\text{Process Cycle Efficiency} = \frac{Value\text{–}added\ time}{Lead\ time}$$

AR measures the portion of time spent on both value added and non-value-added activities compared to the total lead time.

$$\text{Activity Ratio} = \frac{Total\ process\ time}{Lead\ time}$$

PCE and AR for the process must be measured while drawing the current state of the process and while observing the tasks performed and measuring the times each task takes.

RESULTS

Current State

Context and Objectives of the Studied Process and Related Departments

In this study, a process under the SGS department that has a major impact and represents the majority of the services provided by the university was studied and analyzed to set the baseline for lean implementation at the university. This process starts

where the first interaction between the student and the university occurs in general, the Application Process. All Master's and Ph.D. students must go through this process in order to apply to the university.

The process mentioned above is under the direction of SGS department. Below is a brief description of the department.

School of Graduate Studies (SGS)

SGS is established to contribute to the university's mission, and they offer multilingual degree programs and courses of study that comply with international curricular standards. The SGS consists of distinguished faculty members who work in the research areas of Political Science, International Relations, Management, Economics, Philosophy, History, Sociology, Psychology, Law, Education, and Religious Studies. At SGS, students, faculty, and staff work together on projects that have an impact on society in a supportive academic environment. This support is strengthened with the help of the university's international education network ties— presenting students and faculty diverse research opportunities both in and out of Turkey— in addition to its collaborations in the public and private sectors.

An interview was held with the Secretary of SGS to talk more about the department's performance in general and highlight the issues that the department is facing with the current process. In addition, indicators of lean implementation were asked to him as suggested by Brigel & Olsson (2018), to see whether lean is a feasible tool to be implemented at the department.

After the first meeting with the SGS's secretary, his response indicated that lean must be applied at the department, and the application process with the thesis submission process are the two major works that the department is contributing to the university. Below is the current situation of the department as he perceives it.

For the SGS, it is normal for staff to spend overtime working on a task. Reworking on the same task is not general, though, paperwork wastes most personnel's time in the department. In addition, there is only one way to perform a task when it comes to performing tasks, and the steps are agreed on within the department. As a result, an employee wastes time looking for the appropriate material, and the procedures and steps are not updated often; they were only looked at during the pandemic.

The department wrote all the procedures and tasks for the processes they are performing and even published them on their website for the students to follow. However, the department does not implement the best practice, yet; they constantly seek the best solution for their issues. Each task in the department has a task owner identified and assigned, and the employees understand the impacts they make in the pro-

cess. The employees always communicate the right information, to the right person, at the right time.

Current State Map and Description of the Application Process

The process studied is the application process. This process makes the first impression of the university in the student's mind, since it is the first interaction between the student and the university. The application process is a must-go process for any student who is planning to apply for a university, and it must make a good impression on them. It is worth mentioning that all students must apply online for the university, and no applications are accepted by hand anymore.

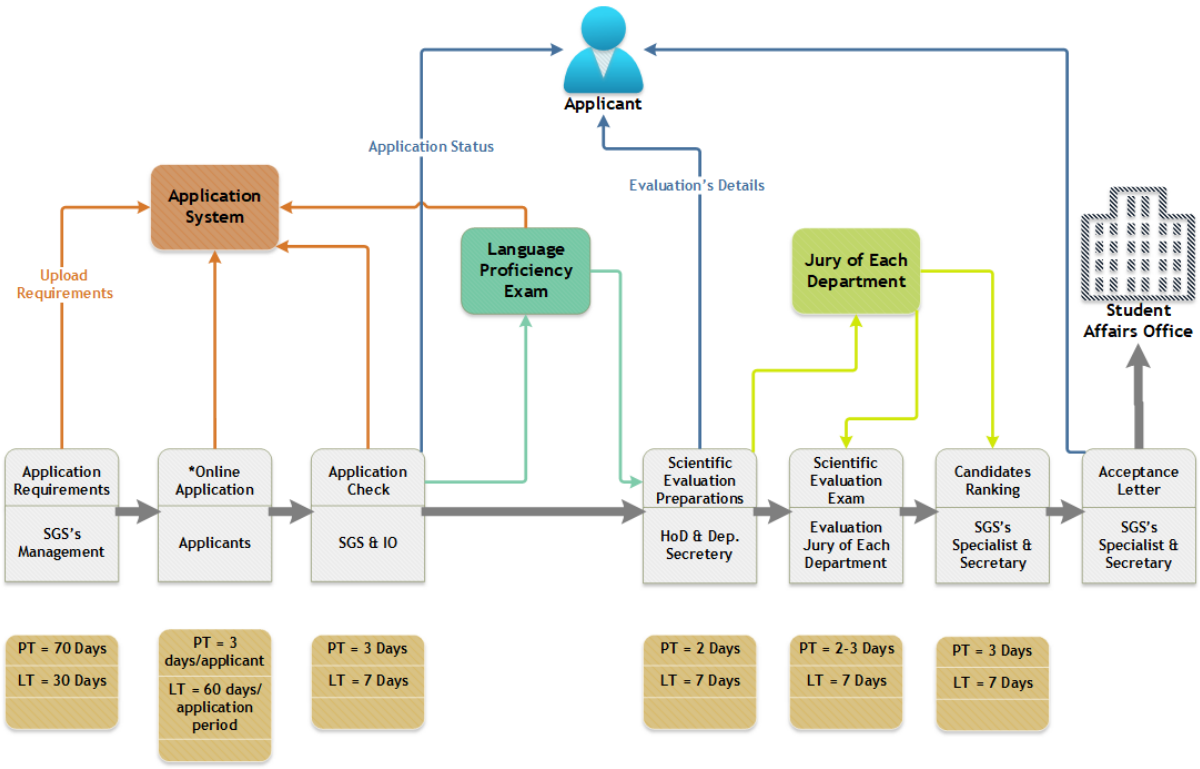
The application does not start from the task of the student going online and applying for the university as it seems from the student's perspective. It starts a few tasks before the Online Application task, where preparation of the application requirements and dates for the events occur. After holding interviews with the responsible staff for the application process, the first draft of the application was drawn and confirmed in response to the order of the tasks. After the first draft is confirmed, walkthroughs and staff's opinions were considered to fill the timing of each task to be as accurate as possible. The current state map of the application process is shown in Figure 3.

Value-Added and Non-Value-Added activities for the Application Process

After screening the current situation of the process with VSM, Value-Added and Non-Value-Added activities are differentiated with the timing for each task. Non-Value-Added activities are also considered necessary or non-necessary, which must be excluded from the whole process. Students are considered the main customer of this process, since the whole aim of the process is to simplify the student's work and make the period of the Application as short as possible. It starts from the online application, until they receive the acceptance letter. The internal customers of the process are also considered, and they are kept in mind when working on it.

Figure 3

The Current State Map of the Application Process



Performance Indicators for Application Process

Based on the timings observed from the previous section, indicative ratios are calculated for each major task in the process separately, this is because in some tasks, the processing is done for all the applications at once, and in other parts, each application goes through the process individually and must wait for the whole sub-process to finish in order to move to the next one. An example of this is the Online Application and Application check, where each student must apply online on the website, yet wait until the application period is over to go to the Application Check task. Indicative Ratios, PCE and AR, are measured to set the baseline for the process performance before applying lean and comparing it to other processes studied (see Table 2). Krdžalić et al. (2020) claim that process cycle efficiency is around 5%-10% before applying lean tools and techniques.

Table 2

Indicative Ratio for the Application Process

Process Step	Value Added Time (days)	Non-Value-Added Time (days)	Process Time (days)	Lead Time (days)	Wait Time (days)	Volume	Position	Process Cycle Efficiency (VA/LT)	Process Activity Ratio (PT/LT)
Application Requirements	2	5	7	30	23	Once a year	SGS's management	6.67 %	23.33 %

Process Step	Value Added Time (days)	Non-Value-Added Time (days)	Process Time (days)	Lead Time (days)	Wait Time (days)	Volume	Position	Process Cycle Efficiency (VA/LT)	Process Activity Ratio (PT/LT)
Online Application (Per applicant)	1	2	3	60	57	1216 International App. 563 Local App.	Applicants	1.67 %	5 %
Application Check	1	2	3	7	4	End of each call	SGS and IO	14.28 %	42.85 %
Scientific Evaluation Preparations	0.5	1.5	2	7	5	Once a year	Head of Department and Departmental Secretary	7.14 %	28.57 %
Scientific Evaluation Exam (Per department)	2	1	3 days for each department	7	4	Once a year	Evaluation Jury	0 %	42.85 %
Candidates Ranking	2	1	3	7	4	Once a year	SGS's Specialist and Secretary	28.57 %	42.85 %
Total	6.5 days	14.5 days	21 days	118 days	97 days			5.5 %	17.79 %

Issues Found While Studying the Application Process and Some Suggestions to Solve Them

The main aim of drawing the VSM overview is to show how the whole process currently functions and highlight the issues unrecognized by the staff. Some of the problems became very clear while drawing the map.

Too many confirmations: Under the first step of the process, Application Requirements Identification, there is a noticeable amount of waits in the task, two confirmations, and decisions that create extra wait. The decision is taken during the next board meeting, which usually occurs once every week. These board meetings lead the Process Efficiency Cycle to be very low. The processing time for the meetings is one day at max; yet the waiting for the next board meeting plays a significant effect in the Lead Time of the process. These board meetings may be held online or combined into one decision instead of two as a solution for this.

Hold until the call period is over: Another issue that came up when drawing the map of the second task, Online Application, each student is applying online individually and uploading all the necessary documents for the application. Yet, sadly, they must be on hold until the application period is over, and a list of all the applied applicants is created. The applicant's documents are not checked unless the call is over, and then all applicants are moved forward to the next task, Application Check. This is

what makes the PCE ratio very low for this specific task. A suggestion here is to automate the checking process. For example, the SGS may use software that checks the documents of each applicant at the moment of their submission and sends an email to notify them if there is a missing file without waiting for the period to be over or any interference from the staff.

Checking the documents by hand: For the third task, each applicant's documents are checked manually by SGS to avoid invalid certificates. Again, the same suggestion of the previous issue would make the Lead Time of this process shorter and, as a result, more efficient.

No standardized way of holding the Scientific Evaluation Exam: Each department holds the Scientific Evaluation Exam according to what the professors of that department agree on; there is no standardized Exam for each department. Each department arranges a distinctive evaluation according to the department's requirements. Some departments arrange a written exam and an interview afterward, and others stick to interviews only. This is what leads the lead time to be high for this task. A standardized exam type and questions for each department performed the same way each year for all the departments must be considered for this case in order to make the process more efficient.

Development of a Proposed Future State

After drawing the current state map of the process, the seven questions proposed by Keyte & Locher (2017) are answered by the authors to develop a proposal for the future state of the process with some suggestions to improve the performance of the current process.

1. What does the customer really need?
2. Which steps create value, and which generate waste?
3. How can the work flow with fewer interruptions?
4. How will interruptions in the flow be controlled?
5. How will the workload and/or activities be leveled?
6. How will we manage the new process?
7. What process improvements will be necessary to achieve the future state?

Addressing these questions is very essential to future state map as they represent the key concepts of lean: value, waste, flow, pull, leveling, and managing continuity. While working on developing the future state of the processes, the university's mission and vision must be mentioned here to develop the suggestions concerning the university's vision. The university's mission is to be an international social science research university open to all sources of knowledge, prioritizing contribution to society. Furthermore, the university's vision is to be an international authority and pioneer in

the field of social sciences through the production of authentic knowledge and perspectives (Ibn Haldun University, 2020).

Application Process: A Proposal of the Future State of the Application Process

Concerning the provided suggestions from answering Keyte & Locher's (2017) questions, the future state map is drawn as shown in Figure 4. It is worth mentioning that the future state map is only shown to represent the best alternatives according to what the author sees, there is no single correct future state map, the team must always keep trying these alternatives until they reach their best performance possible.

DISCUSSION

This paper went through three different phases, Phase 1 was to dive into the literature to find the best tools to be used in the case of applying lean in the university, where the VSM technique was found to be the most common in a university setting, in addition to Lean Indicator questions and Keyte & Locher's (2017) seven questions to draw the proposed future map.

The second phase helped to collect data to draw the current state map and measure its performance indicators. PCE for the application process was around 5.5% on average, ranging between 0% - 28.57% for each process step. While AR for the application process was 17.79%, ranging between 42.85% - 5% in each process. Krdžalić et al. (2020) claim that process cycle efficiency is around 5%-10% before applying lean tools and techniques, yet, since the application process had some lean techniques being applied to the department without the management knowing that these techniques are helpful in the performance of the department, as such, having one way to perform a task and the steps are agreed upon the department, etc.

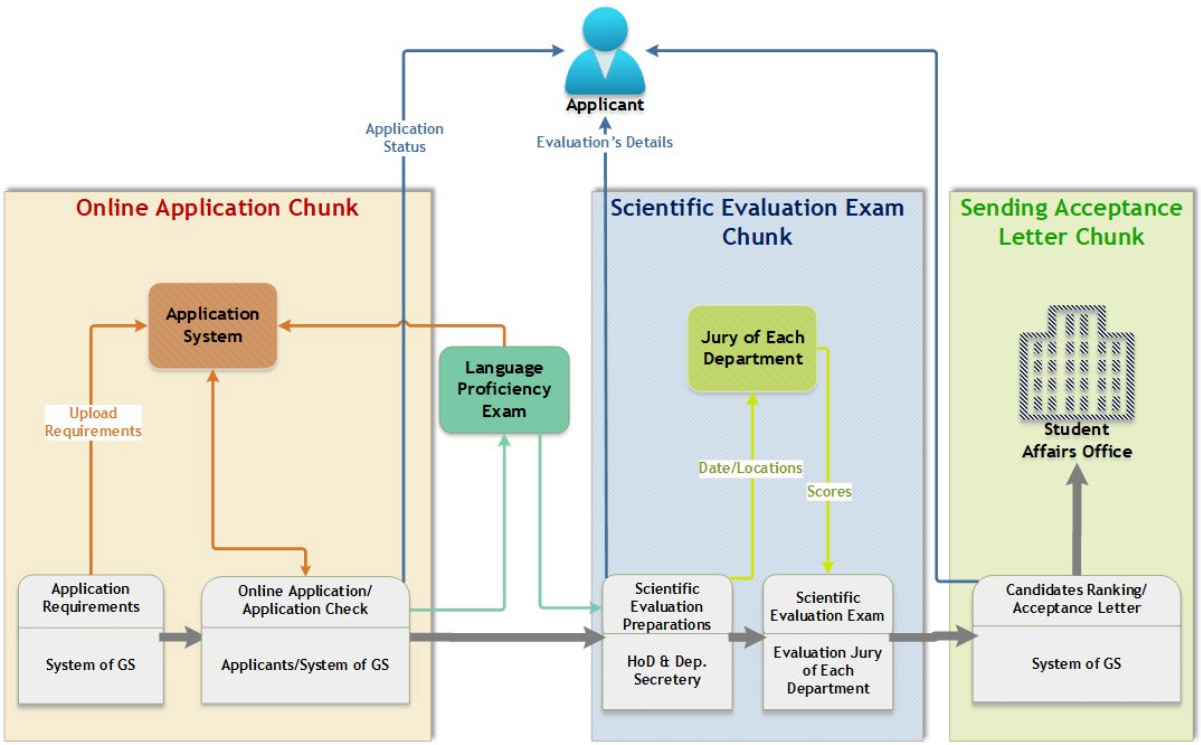
During phase two too, and while the current state map was drawn, some issues were discovered that were not recognized by the staff and the management of the process. The first feasible issue was so much waiting time for two board meetings to occur in order to consider and take decisions regarding the applicants, the suggestion here is that these meetings may be held online or combined into one meeting. The second problem in the AP which led to a very low ratio of PCE and AR is an applicant has to wait until the call period is over, for his/her document to be studied, a solution that might make a huge difference for this case is to automate all the checking processes in the AP. The last feasible issue in the process was not standardizing the Scientific Evaluation Exam, standardizing this step will improve the efficiency of the whole process.

In the third phase of this study, the analyses of the performance indicator for the current state of AP, with answering the question suggested by Keyte & Locher (2017) helped a lot in drawing the future map of the process. The future state of AP recommends combining two steps from the current state into one automated step, which will lead to a huge time for the students being saved for the staff and the applicants too. The last two steps of the process are suggested to be combined two, the Candidates Ranking Step and Acceptance Letter step, using a specialized electric system, to send the acceptance letters to the applications directly. The current state process has seven major steps to go through the whole process, but applying the proposed state map to the process would help in decreasing the number of steps in five steps.

For the SGS department, it is highly recommended to work in chunks as suggested in Figure 4. Online Application chunk, Scientific evaluation exam chunk, and Sending Acceptance letter chunk. These chunks mean that the small tasks are combined into one bigger process, that has a process manager, and moving from one chunk to the next means the previous chunk is over.

Figure 4

The future state of the application process



CONCLUSION

This study aimed to implement the Japanese lean principles at the operational level of a university, which has been used for decades in manufacturing settings to in-

crease the efficiency and performance of an organization. In addition, the paper focused on setting the bases of Lean in a university with some indicators to compare the performance before and after applying Lean. A department, School of Graduate Studies, with its most effective process, Student Application Process was studied to understand and document how the process is performed currently, to identify the issues and problems it is facing, and develop some suggestions and improvements to be implemented for more efficient process in the future.

VSM was used as the main lean practice to draw the current steps of the process, identify the value-added and non-value-added activities, and record the current KPIs for the process. Additionally, the VSM method was used to propose future states of the process, develop some suggestions and improvements for better performance, and provide solutions for the department's issues. Interviews were held to with the related staff to draw the initial state of VSM. Observations and walkthroughs were of great help to identify value-added and non-value-added activities. Indicative ratios were calculated for the process as a reference for the performance of the process and to compare it after applying the suggestions.

For the studied process, the Application Process, which goes under the SGS, has seven tasks, and none of the tasks are automatically done or processed. The suggestions in the future state are to turn the process into three chunks and to combine four tasks into two that are performed at the same time to save the staff's time and effort. Automating the process using software is the most feasible alternative for the current tasks that go under the process. It is worth mentioning that the proposed future state is an initial proposal to improve the performance of the mentioned process. Therefore, the process owners should work on them to realize the continuous improvement principle of lean and compare their performance indicators after applying each of the suggestions with the indicators measured in this study to observe how each suggestion is affecting the process.

For future authors, this article was written during the pandemic time (Covid-19), which closed all the universities and offices and forced everyone to stay home. This led to some limitations in the study such as finding the exact real duration of the activities such as processing time and lead time. Measuring these times should be done by observing the duration of the activity on different occasions and then taking the average of these measurements. Another issue is that the Work in Process (WIP) values were not measured and calculated, the unfinished tasks and services in the studied process must be looked at in order to have a better understanding of the buffers occurring in the process and to give better suggestions for a smoother flow and high-

er performance in the university. Furthermore, a suggestion for future researcher of the Application Process would be to measure the durations of each task and activity by visiting the offices and performing Gemba walks while the staff are performing the task. Plus, buffers occurring between tasks must be considered in the future research with some leveling to them if they are found in the process.

REFERENCES

Agnetis, A., Bianciardi, C., & Iasparra, N. (2019). Integrating lean thinking and mathematical optimization: A case study in appointment scheduling of hematological treatments. *Operations Research Perspectives*, *6*, 100110. https://doi.org/10.1016/j.orp.2019.100110

Alagaraja, M. (2010). Lean Thinking as applied to the adult education environment. *International Journal of Human Resources Development and Management*, *10*(1), 51–62. https://doi.org/10.1504/IJHRDM.2010.029446

Anderson, J. B., Marstiller, H., & Shah, K. (2019). Lean thinking for primary care. *Primary Care: Clinics in Office Practice*, *46*(4), 515–527. https://doi.org/10.1016/j.pop.2019.07.009

Antony, J. (2017). Lean Six Sigma for higher education. *International Journal of Productivity and Performance Management*, *66*(5), 574–576. https://doi.org/10.1108/IJPPM-03-2017-0063

Association for Manufacturing Excellence (Ed.). (2019). *Lean administration: Case studies in leadership and improvement* (eBook 1st Edition). Productivity Press. https://doi.org/10.4324/9781420086874

Balzer, W. K. (2020). *Lean higher education: Increasing the value and performance of university processes* (Second edition). Routledge. https://doi.org/10.4324/9781351216944

Bonaccorsi, A., Carmignani, G., & Zammori, F. (2011). Service Value Stream Management (SVSM): Developing Lean Thinking in the service industry. *Journal of Service Science and Management*, *4*(4), 428–439. https://doi.org/10.4236/jssm.2011.44048

Brigel, V., & Olsson, C. (2018). *Value stream mapping at Sahlgrenska University Hospital: Understanding and improving the coordination process of breast cancer surgeries* [Master Thesis, Chalmers University of Technology]. Chalmers Open Digital Repository. https://odr.chalmers.se/items/75b95e71-7364-4519-9e26-ca1fd4d739f8

Bryman, A., & Bell, E. (2015). *Business research methods* (Fourth edition). Oxford University Press.

Comm, C. L., & Mathaisel, D. F. X. (2005). A case study in applying lean sustainability concepts to universities. *International Journal of Sustainability in Higher Education*, *6*(2), 134–146. https://doi.org/10.1108/14676370510589855

Doman, M. S. (2011). A new lean paradigm in higher education: A case study. *Quality Assurance in Education*, *19*(3), 248–262. https://doi.org/10.1108/09684881111158054

Douglas, J., Antony, J., & Douglas, A. (2015). Waste identification and elimination in HEIs: The role of Lean thinking. *International Journal of Quality & Reliability Management*, *32*(9), 970–981. https://doi.org/10.1108/IJQRM-10-2014-0160

Dragomir, C., & Surugiu, G. (2012). Productivity and durability of quay cranes cables. Nexans case study. *Constanta Maritime University Annals*, *17*, 261–264.

El-Sayed, M., El-Sayed, J., Morgan, J., & Cameron, T. (2011). Lean program and course assessments for quality improvement. *International Journal of Process Education*, *3*(1), 65–72. https://www.ijpe.online/2011/leanh.pdf

Emiliani, M. L. (2004). Improving business school courses by applying lean principles and practices. *Quality Assurance in Education*, *12*(4), 175–187. https://doi.org/10.1108/09684880410561596

Emiliani, M. L. (2005). Using *kaizen* to improve graduate business school degree programs. *Quality Assurance in Education*, *13*(1), 37–52. https://doi.org/10.1108/09684880510578641

Francis, D. E. (2014). Lean and the learning organization in higher education. *Canadian Journal of Educational Administration and Policy*, *157*, 1–23. https://eric.ed.gov/?id=EJ1029215

Hartanti, L. P. S., Gunawan, I., Mulyana, I. J., & Herwinarso. (2022). Identification of Waste Based on Lean Principles as the Way towards Sustainability of a Higher Education Institution: A Case Study from Indonesia. *Sustainability*, *14*(7), Article 7. https://doi.org/10.3390/su14074348

Hines, P., & Lethbridge, S. (2008). New development: Creating a lean university. *Public Money & Management*, *28*(1), 53–56. https://doi.org/10.1111/j.1467-9302.2008.00619.x

Ibn Haldun University. (2020). Mission, vision and values [HTML]. *Ibn Haldun University Official Website*. https://www.ihu.edu.tr/en/mission-vision-and-values/

Kazancoglu, Y., & Ozkan-Ozen, Y. D. (2019). Lean in higher education: A proposed model for lean transformation in a business school with MCDM application. *Quality Assurance in Education*, *27*(1), 82–102. https://doi.org/10.1108/QAE-12-2016-0089

Keyte, B., & Locher, D. A. (2017). *The complete lean enterprise: Value stream mapping for office and services* (Second edition). Productivity Press. https://doi.org/10.1201/b19608

Khurum, M., Petersen, K., & Gorschek, T. (2014). Extending value stream mapping through waste definition beyond customer perspective. *Journal of Software: Evolution and Process*, *26*(12), 1074–1105. https://doi.org/10.1002/smr.1647

Klein, L. L., De Guimarães, J. C. F., Severo, E. A., Dorion, E. C. H., & Schirmer Feltrin, T. (2021). Lean practices toward a balanced sustainability in higher education institutions: A Brazilian experience. *International Journal of Sustainability in Higher Education*. https://doi.org/10.1108/IJSHE-10-2020-0406

Klein, L. L., Vieira, K. M., Marçal, D. R., & Pereira, J. R. L. (2022). Lean management practices perception and their influence on organizational performance in a public Higher Education Institution. *The TQM Journal*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/TQM-11-2021-0311

Krdžalić, A., Brgulja, A., & Duraković, B. (2020). Implementation of Lean Practices in a Higher Education Institution's Student Affairs Office: A Case Study from a Bosnian University. *International Journal on Advanced Science, Engineering and Information Technology*, *10*(2), Article 2. https://doi.org/10.18517/ijaseit.10.2.10822

Langer, T. (2011). *Lean university: The application of Lean Thinking for improving processes in higher education institutions: Evidence from three UK case studies* [MSc Management Thesis, Queen's University Belfast]. https://www.eqaccountants.co.uk/wp/wp-content/uploads/sites/83/2016/10/Tobias-Langer-Dissertation.pdf

Mazur, L., Stokes, S. B., & McCreery, J. (2019). Lean-thinking: Implementation and measurement in healthcare settings. *Engineering Management Journal*, *31*(3), 193–206. https://doi.org/10.1080/10429247.2019.1605957

McBride, D. (2003, August 29). *The 7 Wastes in manufacturing* [HTML]. EMS Consulting Group. https://www.emsstrategies.com/dm090203article2.html

Neyer, A. (2019, January 15). *Taiichi Ohno & 7 Wastes* [HTML]. Internal Resource Library. https://www.internalresourcelibrary.org/articles/lean

NHS England & NHS Improvement. (2021). *Online library of Quality, Service Improvement and Redesign tools: Sustainability Model*. NHS England and NHS Improvement. https://www.england.nhs.uk/wp-content/uploads/2021/03/qsir-sustainability-model.pdf

Oktarian, A., & Surjasa, D. (2021). The effect of lean on improving the quality of higher education in Indonesia. *Business and Entrepreneurial Review*, *21*(2), Article 2. https://doi.org/10.25105/ber.v21i2.8040

Sunder M., V. (2016). Rejects reduction in a retail bank using Lean Six Sigma. *Production Planning & Control*, *27*(14), 1131–1142. https://doi.org/10.1080/09537287.2016.1187312

Sunder M, V., Mahalingam, S., & Krishna M, S. N. (2020). Improving patients' satisfaction in a mobile hospital using Lean Six Sigma – a design-thinking intervention. *Production Planning & Control*, *31*(6), 512–526. https://doi.org/10.1080/09537287.2019.1654628

Taj, S., & Berro, L. (2006). Application of constrained management and lean manufacturing in developing best practices for productivity improvement in an auto-assembly plant. *International Journal of Productivity and Performance Management*, *55*(3/4), 332–345. https://doi.org/10.1108/17410400610653264

TechTarget Contributor. (2009, March). *What is seven wastes?* [HTML]. WhatIs.Com. https://www.techtarget.com/whatis/definition/seven-wastes

Womack, J. P., & Jones, D. T. (1997). Lean thinking—Banish waste and create wealth in your corporation. *Journal of the Operational Research Society*, *48*(11), 1148–1148. https://doi.org/10.1038/sj.jors.2600967