QATAR UNIVERSITY

COLLEGE OF ENGINEERING

APPLICATION OF LEAN THINKING IN GOVERNMENTAL SECTOR: CASE OF IT DEPARTMENT IN MINISTRY X IN QATAR

BY

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ABSTRACT

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Title: Application of Lean Thinking in Governmental Sector: Case of IT Department in Ministry X in Qatar.

Supervisor of Project:: Prof.Khalifa N Al-Khalifa.

Lean thinking practices are known to improve manufacturing processes by increasing customer value and minimizing waste. Gradually, the technique has been successfully implemented in many service-based organizations around the world, including organizations in the governmental sector. In the recent years, some applications of lean have been implemented in Qatar, but a minimal amount of studies are found on applying lean thinking in Qatar governmental sector. Therefore, this project contributes to the sector by examining the applicability of lean thinking to improve services provided in Ministry X in Qatar.

First, the project is guided by knowledge and lean applications available in literature. Then, value stream mapping (VSM) lean tool was selected to be applied on service request management which was chosen based on certain criteria using Kepner-Tregoe decision analysis tool. A detailed map of the process was outlined in order to understand the process flow based on which VSM was created. The service VSM current state consists of 14 steps that is processed in 188.5 minutes. After applying lean thinking and eliminating waste identified, 8 steps were removed from the process, service became paperless, and process time was reduced by 72.4%. Validation results showed that the improvements occurred on the service VSM future state are feasible, and lean thinking is applicable to improve services provided in the Ministry.

DEDICATION

I dedicate this work to those who were supportive since day one. I dedicate it to my parents, family, wife and daughter.

ACKNOWLEDGMENTS

First, I thank Allah for all the blessings I received which helped me get this far. Then, I would like to thank my parents, family, and friends who were very considerate and supportive. I would like to thank my supervisor Prof. Khalifa N Al-Khalifa for his guidance, assistance and support until the end of the project.

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CHAPTER 1: INTRODUCTION

1.1 Background

Lean thinking was originally applied in Toyota production system in Japan. Later on, it became a well-recognized continues improvement technique all over the world. Even though it came up from a manufacturing background, the principles and tools of lean have been extensively used in other industries such as services, computing, and education. Lean main objective is to identify value and increase it; and identify waste and reduce it. Lean defines waste into many forms, but in general it can be described as any activities or resources that are not adding value to the finished product.

Lean implementations in service industries have been increasing recently (Gupta, Sharma, Sunder, 2016). Ideally, services exist to satisfy customers' needs, and the more satisfied are the customers, the more they appreciate the service and become loyal to the service provider. In fact, customer satisfaction is an important key of success to service-based organizations; since today's market experiences a huge competition especially in commodity services where cost is almost the same. Therefore, some organizations were able to differentiate their services by applying lean thinking, where they have succeeded in reducing the waste and increase the service quality that increased customer satisfaction. In addition, public sector also need to apply lean thinking not only to satisfy the public, but also because it is an effective method to reduce expenditures. Some of government entities around the world have adopted lean and their experience was successful. However, in Qatar not many applications were performed.

Ministry X is one of the largest government entities in Qatar that provides several internal and external services. Recently, the Ministry started to show interest in continuous improvement where it initiated a development strategic plan; and started an

internal project to organize and document work under each department to accomplish process standardization. Now it is the opportunity to introduce lean thinking to the Ministry. Additionally, examine the applicability of lean thinking on a service provided by the IT department, which experiences the most workload in the organization.

1.2 Problem statement

Today where businesses run on computer systems, employees' productivity highly depend on the accessibility and availability of Information Technology resources. In this project, we will explore lean thinking and some of its applications to improve services. Then, we will examine the applicability of lean thinking in one of the services offered by the IT department in a local government entity.

1.3 Objectives of the study

The project aims to:

1- Study lean thinking in general, and its applications in service sector in particular.

2- Examine the applicability of one of lean tools to improve a current service provided by the IT department in a local government entity.

3- Identify the results and suggest way forward.

1.4 Scope and limitations

The scope of this project is limited to the process of service request management in the IT department at Mistry X in Qatar. The study is limited to processes involved in the service life cycle starting from the request initiation phase until request fulfillment. The service selected is limited to the process of handling requests from new employees who need access to IT resources and office machines for the first time. Data were observed and collected from people involved in handling service requests. The performance measures considered in the study are process time and material used.

1.5 Report overview

After the introduction, the report is divided into five chapters. Literature review conducted about related topics is in chapter two. Chapter three is about the research methodology. The application of lean in the IT department of Ministry X in Qatar is in chapter four. Chapter five is where results are discussed and analyzed. Conclusion is in chapter six.

CHAPTER 2: LITERATURE REVIEW

2.1 Lean philosophy

Lean, lean manufacturing, or Toyota production system is the philosophy of developing continuous process improvement that focuses on increasing customer value and eliminating waste. The lean was firstly used by Toyota after the company had suffered economically; as Japan economy was not yet over the consequences of the second world war in 1950s. At a later point, the concept of lean has spread all over the world. Furthermore, it has been adopted and applied in not only manufacturing plants, but also in public and service sectors under the term lean thinking, which was coined in early 1990s by Womack et al.

Lean thinking concept is not any different than lean manufacturing, it focusses on finding the value-adding activities among processes and enhance them. Other activities that considered as non-value adding should be eliminated or reduced, even if they are necessary to deliver the product or the service. Value adding activities are those steps in the process which have influence on the final product, or simply defined as what customers are willing to pay for, where non-value adding activities are defined as wastes and divided into seven categories which are:

a) Overproduction
b) Waiting time
c) Transportation/ motion
d) Unnecessary processes
e) Defects
f) Inventories
g) Manpower

In addition, one more type of waste was defined by Womak called skill misuse. The

eighth waste occurs when an employee capacity is not utilized, or when an employee is not involved in the improvement cycle. (Liete and Vieira, 2013)

There are some challenges that are likely to complicate the implementation of lean thinking such as poor management, unstable financial status, and unreliable transportation network. Therefore, in order to effectively implement lean in any organization, top management should consider the following: positive workplace atmosphere, goals and objectives are clear, good communication, appropriate motivation, un-use of skills and potentials, investing in employee development and leadership. (Lawal and Elegunde, 2020)

In fact, leadership is one of the critical success factors in lean management and it is the key initiative of applying lean in organizations according to a systematic literature review conducted by Oon, Aziati, and Abu. The objective of the review was to explore available knowledge and the relationship between business excellence, leadership, and lean. The authors have collected 506 articles that were published between 2009 and 2020 in the best scientific databases, and then used 129 in the review's analysis. The publishers found a strong relationship between leadership and lean, and concluded that leadership styles such as empowering and motivating employees are necessary to accomplish business excellence. Also, through the review they found that continuous improvement is the way for business outstanding and operational success, and it is a result of strategic leadership and lean thinking (Oon, Aziati, Abu, 2021).

(Elkhairi, Fedouki and Alami, 2019) published a study with the aim of identifying the barriers and critical success factors for lean adoption in small to medium enterprises (SMEs) based on available knowledge. The team considered the SMEs because they have a large contribution to countries' economy in terms of employment

and added value to the GDP. The barriers from applying lean concepts can be divided into 3 main categories which are managerial and technical barriers, economic barriers, and social barriers. Table 1 shows the barriers and the corresponding critical success factors as per the study.

Table 1. Barriers and critical success factors for lean adoption in SMEs

Category	Barriers	Critical success factors
Managerial and technical barriers	Lack of expertise	Competence and expertise, education, and training
	Lack of planning	Competence and expertise
	Lack of commitment from top management	Leadership, commitment from top management
	Lack of strategic perspective	Leadership, competence and expertise
	Misunderstanding of the lean management	Education and training
Social barriers	Resistance to change	Cultural change, communication

Another study has investigated the critical success factors for lean application within SMEs. The authors have interviewed 10 local SMEs in the East of England which have implemented lean in their production firms to know what the most important keys of success are in applying lean. The surveys included questions about the volume of production, areas in which lean was applied, resources in terms of finance and labor, return in investment, and difference in lead time after lean practices have been implemented. The results have shown that leadership and management strategic vision are the most critical success factors, which made sense because the change starts from top management. Also, the results showed that finance, organizational culture, skills, and expertise success factors are the supportive elements towards successful lean adoption, which would lead to production improvement and development. (Achanga, Shehab, Roy, Nelder, 2006)

2.2 Lean thinking tools

Lawal and Elegunde (2020) conducted a review of literature on lean management with the objective of investigating the different applications of lean in both manufacturing and service industries to conclude the outcomes of applying lean different tools and methods. The authors have found that the most common lean tools used in organizations are:

a) Just-in-time (JIT): a pull-based technique that do the manufacturing process based on existing request rather than manufacturing based on forecasted demand.
b) Value stream mapping (VSM): a tool that helps in visualizing the current and future flow of process by using the improvement insights appeared after identifying non-value adding activities.
c) Jidoka: a technique that stops the production line after defects are identified by using semi-automated manufacturing design.
d) 5S: sort, set in order, shine, standardize, and sustain.
e) Heijunka: a scheduling technique used in production.
f) Kaizen: a strategy that involve employees to contribute towards the improvement of production.
g) Kanban: product flow controlling method over the supply chain.

Furthermore, to understand the expected outcomes from using lean practices mentioned above, a comparative analysis has been performed to compare the different applications found in the literatures on both the manufacturing industry and service sector. Table 2 shows the results of the analysis.

Table 2. Comparative analysis of lean management tools

Lean tool	Outcome
JIT	Reduces inventory and space, improves cashflow.
VSM	Define waste and helps creating a waste free workflow (as much as possible).
Jidoka	Reduces labor hours/ cost, improves defects detection.
Heijunka	Reduces lead time, inventory, and waste generated by poor process design.
5S	Improves work environment and reduces lead time.
Kaizen	Insures the continuous improvement in the process.
Kanban	Eliminates inventory and overproduction wastes.

A systematic literature review conducted by Gupta, Sharma, and Sunder to explore the importance of lean in service industries from 1990s to 2016. The papers used in the review were collected from publications from 24 countries, where most of them were from the United States and United Kingdom. Among the review, the authors performed a quantitative analysis to observe the industries in which lean thinking was applied. The 32 lean applications were mostly in health care, IT, financial services, education, and public sector. The team have also analyzed the tools used, and they found that value stream mapping (VSM) was the most used lean tool with 15 applications out of 32. VSM helped in removing waste in all implementations, simplified processes, and engaged front-line staff. (Gupta, Sharma, Sunder, 2016)

2.3 Lean thinking applications in services

(Farissi, Oumami, Beidouri, 2020) published a study to assess lean adoption in food companies in Morocco. The team have structured questionnaires and interviewed the quality managers, operation managers, and chief executives in nine different sized food businesses. The authors methodology was to investigate current best practices of lean in food industry, and then check whether it has been applied in local food companies. After the team have listed the common lean practices applied in food industry, they developed a list of survey questions that are related to customer

engagement, physical flow of materials (row material and finished goods), employee involvement, and production systems. The findings proved that the Moroccan companies are not very far from completely adopting lean, since all nine companies have applied lean to some extent. However, 80% of the barriers were due to lack of management commitment, and 73% due to lack of training and knowledge. Based on the results, the authors conclude that the Moroccan food industry can improve and advance by applying lean thinking tools if strategical and managerial barriers have been resolved.

Qatar university student Ihssan Bader conducted study on the applicability of lean thinking principles in Toyota main service center in Qatar. The author methodology was to study the main services provided, observe, and analyze the current situation, apply lean thinking principles to the service and examine the potential improvements afterwards in terms of delivery time. By observing the different services, Bader found that 60% of customer orders are under the periodic maintenance; and considered visualizing the process using value stream mapping tool to understand the flow of work which can give insights on where improvements could occur. The process analysis shown that the actual process time (value adding activities) is about 2.75 hours; where the non-value adding activities time is about 3.4 hours, which meant that 65% of the service time is a waste. After obtaining the statistics and knowledge about the current state, a root and cause analysis was performed using the 5-whys methods on waste forms found in moving the vehicle, workshop, quality control, and car wash activities. The author then proposed an appointment system to control the load of periodic maintenance orders, and multiple tracking solutions to easily track the car inside the service center and during the driving test performed by the quality control team. The results of the proposed solutions would have a positive impact on different

operational aspects, especially on lead time which would be decreased by 29.1%. (Bader, 2018)

(Viviana and Juan Luis Fernando, 2021) published a paper on how lean service methodologies can reduce service times and improve processes in electrical service providers in Peru. The production of electrical energy in Peru have increased up to 2.4% in recent years, and the problem motivated the study is the noticeable delay in providing the electrical service due to poor logistics management and manual request processes as per the authors which made both internal and external clients unsatisfied. The objective of the study was to assess the current situation by analyzing the process procedures, and then apply lean thinking to enhance the quality of services and reduce lead time which in return would improve customer satisfaction. As to improve the process, the team conducted bottleneck analysis to understand and identify the waste in terms of waiting time and reduce it. Then, an ERP system has been proposed to digitalize the process. Finally, VSM lean tool has been used to have an idea of the expected improvement and the effectiveness of the proposed solution. The new designed process would benefit in reducing the lead time from 13 days to 7 days, standardize the process, and increase customer satisfaction.

Maimonah Alsaadi (2018) studied the applicability of lean thinking in the Student Affairs section in Qatar University. The study considered implementing lean on scholarship exemption request process and external transfer process to examine the potential of improvement in terms of process and lead times. The author reviewed the documents and observed the processing activities to gather data and information about both processes. Then, she visualized the process flow, information flow, and timeline for both processes separately to identify value-adding activities, necessary waste, and waste using VSM and Kaizen burst tools. The forms of waste found in the first process

were related to extensive waiting time, over-processing, and transportation. The future state of the first process would reduce processing time by 77%, reduce lead time by 91%, and eliminate material use in the process (paperless). The form of wastes found in the second process were defects, work-in-progress, waiting time, and transportation. However, the author was not able to provide the future state of the second process due to time limitations. (Alsaadi, 2018)

(Bakar, Mat, Fahmi, Urus, 2017) studied the effectiveness of implementing lean practices in the local government in Malaysia. The team have developed a 30 questions survey to collect data from city council's employees located in nine different Malaysian cities to know what lean practices are being used and how it improved the council productivity. The input from 198 participants showed that the most common lean tools used are 5S, VSM, and Kaizen. Lean implementation improved the performance of the local government by minimizing wase and error, employee involvement in terms of production, increasing customer satisfaction, and reducing waiting time in terms of service delivery. The team have also developed two hypotheses to test the effectiveness of lean adoption to support the survey results, and it showed that lean management practices have a significant positive effect on the local government productivity and service delivery.

A case study in lean public management has been used to prove the effectiveness of involving the public (customers) in the improvement cycle. The study took place in Jiangmen city in China, where a hotline service was created by the local government to get public suggestions, proposals, and demands. The input is taken seriously and processed based on the nature of required actions such as coordination between local departments, investigation, examination etc. The city was using e-government based information and communication technology, which eased the hotline

system integration between various government departments. To ensure consistency and availability, the hotline service can be reached using different communication channels which are phone calls, text messages, online chatting, and email. An example was provided to show the success of involving the public lean strategy when a report was received regarding a dirty open sewer in one of the city streets that have not been disposed for 6 years. A meeting was held afterwards to investigate the issue, and the authorities decided to fix the issue by replacing the open sewer with an underground network, and the project was completed in one month. Therefore, adopting Lean in public management, through the case study, can enhance access to information and improve customer satisfaction, which in returned would increase the value and quality of services provided and production rate. (Tang, Miao, Xi, 2010)

2.4 Lean thinking applications in IT services

Goutam Kundu and B. Murali Manohar (2012) proposed a group of critical success factors for applying lean in IT services. The team found that not all success factors identified in lean manufacturing and lean services are applicable to IT services. The critical success factors they proposed for adopting lean in IT services are: management leadership, management support, top management commitment, organizational culture, communication, training and skill building, and financial capabilities. (Kundu, Manohar, 2012)

In 2018, a study was published on implementing lean methods in managing PT Kalbe Farma's IT infrastructure monitoring system, which is a service used by the IT department to track infrastructure components status. The paper objective was to improve the monitoring system by eliminating unnecessary alarm notifications that would negatively impact the traceability of incidents and accuracy of information. After they have interviewed the IT infrastructure team to understand the system features and

concerns, the team performed both field and document observations, and then used VSM lean tool to visualize the system features. The authors and infrastructure team found the following waste forms after applying VSM: a) Inventory waste: the system was monitoring IT resources that are not being used, enabled features on some network appliances that are not utilized, and disabled resources b) Over-processing waste: 20 non-value adding alarm configurations were enabled in the notification feature c) Defects: alarms are not presented based on criticality; no severity level d) Overproduction: All alarm logs are saved in the system, false alarms. The team then used the 5S tool to eliminate identified wase and improve the poorly organized system. The improvements implemented increased the number of monitored network components by 39%, minimized alerts by 77% and events by 49%. (Pratama, Aji, Yazid, 2018)

Another study conducted in one of the companies in Finland published by Hannamaria Vayrynen (2019) showed an example of how lean can improve IT services. The author objective was to propose enhancements on the field service management process that new employees in the company must go through to access the system. To understand the challenges in the current state of the process, data and information were collected through interviews with process handling team, process documents, internal customers feedback, best practices from experts, literature, and benchmarking. The analysis showed some weak points in the current state which are: unnecessary process steps, process include many manual activities, long waiting times through the process, and logs are saved in multiple systems. To find improvement initiatives, the author used benchmarking to compare the process with other organizations to have a baseline to start with, and value stream mapping to plan the improvement. The lean process proposed by the author removed waste by eliminating over-processing steps,

automating the service end-to-end by using an identity access management system and a web-based portal to handle service requests. (Vayrynen, 2019)

CHAPTER 3: RESEARCH METHODOLOGY

The main methods used to conduct the project are qualitative research method, value stream mapping tool, process mapping, Kepner-Tregoe decision analysis tool, and validation of results.

3.1 Qualitative research method

As illustrated in the literature review chapter, qualitative research has been performed with the aim of understanding lean philosophy and its tools. Also, examples of lean thinking applications in service industries were explored to give tangible facts and evidence on how lean thinking can improve services in both service-based organizations and public sector. The information gathered and knowledge extracted proved, that lean thinking can improve services and will be the guide to apply lean thinking in this project.

3.2 Value stream mapping tool

Among the seven lean tools identified in the previous chapter, value stream mapping (VSM) lean tool was shown to be used in the majority of lean thinking applications (Gupta, Sharma, Sunder, 2016). Moreover, VSM was proven to be a powerful tool that can improve services by visualizing process flow, identifying waste in the current state of the process, giving improvement insights that can reduce waste identified, and giving an idea of how the improvement can impact the process in the future state. Thus, VSM has been selected to be used in the project's case study. VSM is built using a common set of icons shown in figure 1 (Bonaccorsi, Carmignani, and Zammori, 2011).

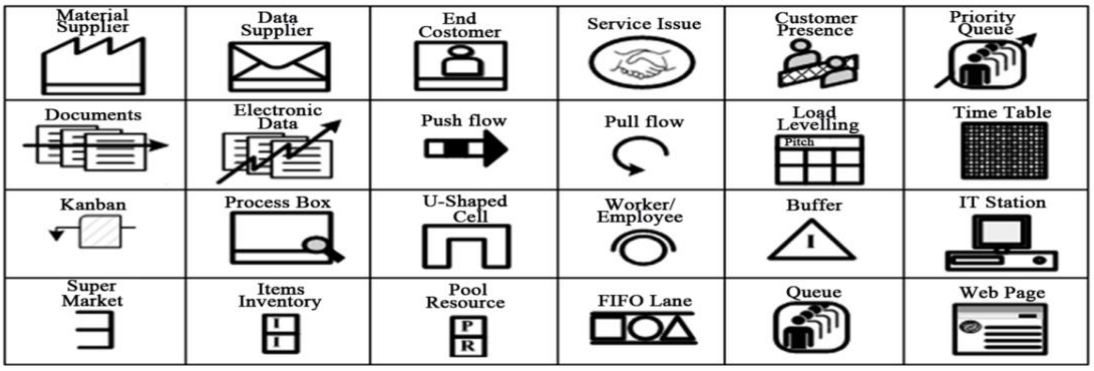

Figure 1. Bonaccorsi, A. Carmignani, G. & Zammori, F. (2011). SVSM Icons

The map would consist of three important parts shown in figure 2 which are workflow, information flow, and timeline (Karen, 2013). The figure also shows the direction of flow from start to finish, as well as the performance measures which in this case lead time and actual process time. By finding the ratio of each stage, it is possible to understand what stage delays the process and accordingly plan for improvement.

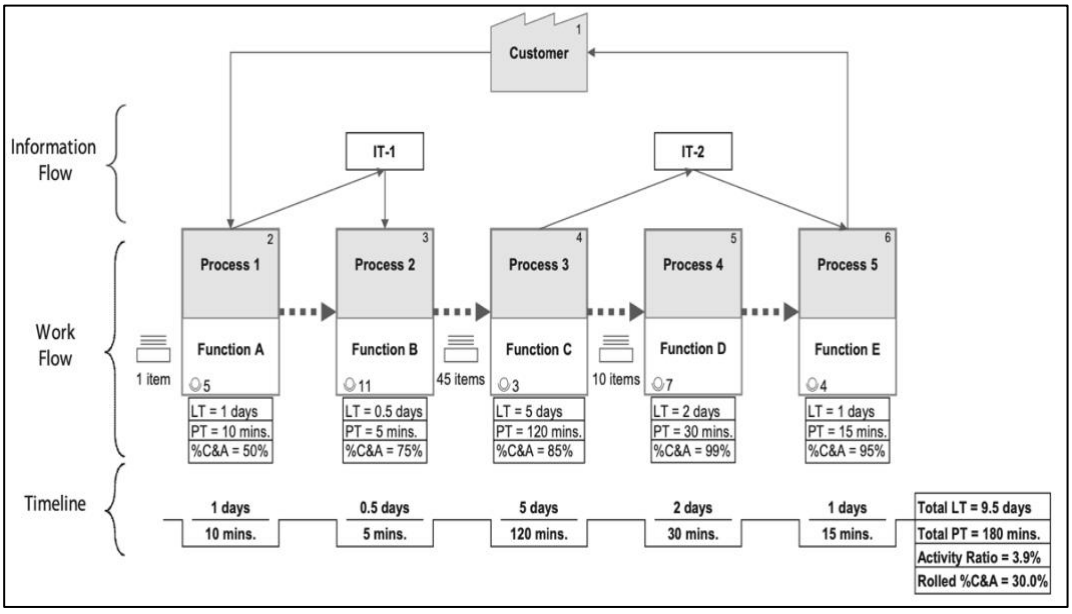

Figure 2. Martin, K. & Osterling M. (2014). Value Stream Mapping

3.3 Service selection using Kepner-Tregoe decision analysis tool

IT department in the Ministry provides a set of services to employees and public, and the services provided internally are the ones considered for improvement using lean thinking in this project. The potential services that could be selected and used in the project are:

1- Data back-up

2- Incident management

3- Maintenance and repair

4- Service request management

5- Training

The function of each service is listed in figure 3 below.

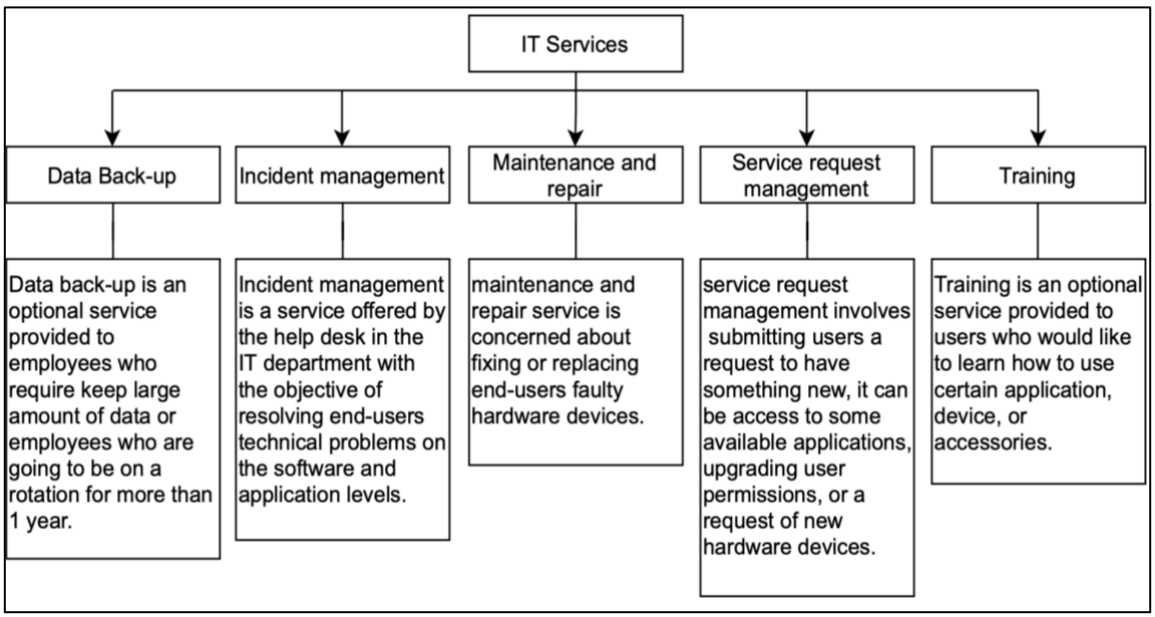

Figure 3. Services provided by the IT department

After potential services have been identified, the selection was based on the results of Kepner-Tregoe decision analysis tool, where the following criteria was developed:

a) the criticality of the service to users.

b) how many people are involved in the service delivery.

c) In a month, how often the service is requested.

Each criterion was given a maximum score of 10 to normalize and simplify the comparison analysis. Table 3 shows the average scores obtained from employees responsible for delivering the five services accordingly.

Table 3. Service selection

Criteria	Data Back-up	Incident Management	Maintenance and repair	Service Request Management	Training
a	6	10	10	9	8
b	3	5	3	10	2
c	2	7	6	6	4
Total	11	22	19	25	14

Based on the results, the service request management has been selected. The service inputs and outputs vary depending on the nature of the request, which can have negative impact on the end results of this study. That being said, the type of service request that was considered in the project was the request for access and office machines coming from new hired employees.

Understanding the process and collecting data was very straightforward by observing the time it takes to finish each step. Employees involved in providing the service are: IT department director, head of networks section, active directory administrator, application team, technical support supervisor, technicians, IP telephony team, and the department assigned driver in case of stock unavailability in local store.

The performance measures considered in the observation were process time and papers used in each stage. Moreover, random employees were interviewed to understand the request initiation phase, their answers were various in terms of process time so, the average time is assumed in the study, which is 10 minuets, but they all agree on the way of submitting the request and material used (1 paper).

3.4 Process mapping and value stream mapping of the service request management

Process mapping is essential to further implement value stream mapping. Therefore, a process flow of the service request management was outlined. Then, value stream mapping current state was mapped using the flow of information and

performance measures discussed in the service selection step. Waste identified in the VSM current state and improvement initiatives are used to improve the service and shape VSM future state.

3.5 Validation of results

Validation of research findings is known to be one of the important methods that can assess the effectiveness of a project's findings. Also, it gives some indications on how relevant study results are and to what extent they can be applied. Therefore, a list of five questions has been developed to be used at the end of the project to validate the results and determine whether the study objectives have been successfully met. The employees considered to participate in the questionnaire are:

- Head of networks and telecommunications section
- Head of information security section
- Head of systems development section
- Head of technical support section

The list of questions is:

1- Do you know the concept of lean thinking?

2- What do you think of the current state and the future state of the service request management service, did the process improve significantly?

3- Do you think that the proposed action plans are feasible and can be adopted?

4- Do you think lean thinking can be effectively applied on other services in the Ministry?

5- Do you think that top management can adopt and support lean implementation in the Ministry?

The reason behind the first question is to test the participants' knowledge about lean thinking and its tools. The second, third, and fourth questions are to determine whether

the addressed problem statement have been answered. The fifth question is to understand the level of commitment top management can provide towards adopting lean thinking in the Ministry.

CHAPTER 4: APPLICATION OF LEAN THINKING IN THE IT DEPARTMENT OF MINISTRY X IN QATAR

4.1 IT department

The IT department in Ministry X in Qatar provides many essential services on organization level, employee level, and public level. The department serves the organization by maintaining a strong and secured infrastructure network, the employees by providing services contribute to internal applications accessibility and business continuity, and the public by offering e-services through the website and mobile application. The services provided to employees and public proved that the department is on a high level of reliability, when 80% of employees worked from home and public were asked to use e-services during the peak of both Covid-19 waves in Qatar. Thus, ensuring quality and service reliability are important not only to reduce invested resources, but also to satisfy internal and external customers.

The IT department in the Ministry consist of a director, assistant director, and four heads of sections who are managing the four main divisions of the department. The four divisions are networks and telecommunications, systems development, information security, and technical support. In addition, one driver is assigned to the department in case there is a need to bring devices or accessories from the warehouse located in Al Wukair, which is about 25 km far.

4.2 Service request management

Service request management in the department is simply the process in which employees' requests go through to be satisfied. Normally, employees' requests are related to access requests to new or existing applications, upgrading user privileges to the next level, or asking for an additional device such as laptops or tablets.

4.3 Value stream mapping of service request management process

Value stream mapping (VSM) is a unified language that can be understood by

people with different backgrounds and work experience. Applying VSM would give insights for improvements, and with the appropriate planning and change it can improve services and accomplish the purpose of lean thinking. A good VSM application requires four general steps according to Locher, they are:

1- Preparation
2- Current state
3- Future state
4- Planning

Preparation step is related to understanding the targeted process, mapping the flow of information and work, and collecting necessary data. Current state step is where the process flow is mapped again but following VSM method discussed in the previous chapter. Moreover, in this step the stages of the process are defined as value adding and non-value adding with highlighting the data needed to be measured like process time, lead time, transportation, etc. Future state step is basically the flow of the process after waste has been identified and removed or reduced, in other words it should reflect the process flow after improvements are made. Planning is the step where changes and action plans are proposed to achieve the future state (Locher, 2016).

Step 1: preparation

Now to prepare correctly, data and information were collected and observed from employees handling the process. Various types of requests are processed in service request management, so to gain maximum benefit from applying VSM, requests submitted by new employees asking for access and office machines are the only requests considered in the study, since they have impact on new employees' perception of IT services.

The process starts with the new employee filling access to IT resources request

form manually, submit it to the supervisor who approves it and send it through the correspondences system to the IT department. New mail in the system is received by the IT director, so when the request is received to the department the director forwards it to the networks head of section. The head of section forwards the request to the active directory manager (ADM) to create a user account including username, password, email account, and place the user in a predefined group for the system access level depending on the employee title and department. After the account has been made, the ADM sends the request to the technical support supervisor (TSS) to provide the user office machines which are desktop computer, IP phone, and accessories (wireless keyboard, mouse, flash drive ...). The TSS forwards the request to an available technician. The technician checks for stock in order to get the needed devices configured for the user. Now, if the stock is not available at site the driver goes to the warehouse to refill the stock. When stock is available, the assigned technician sets up the computer, and send the IP phone to the IP telephony support team to get it configured with an available extension number from the range reserved for the department the request came from. After the phone is configured it is sent back to the technician. The technician groups the devices, accessories, and necessary cables and goes to the employee office for installation. Upon delivery, the technician would hand over a delivery form the user has to sign to confirm receiving the office machines and service fulfillment. The user then would scan the form and send it to the IT department to be referenced in the system.

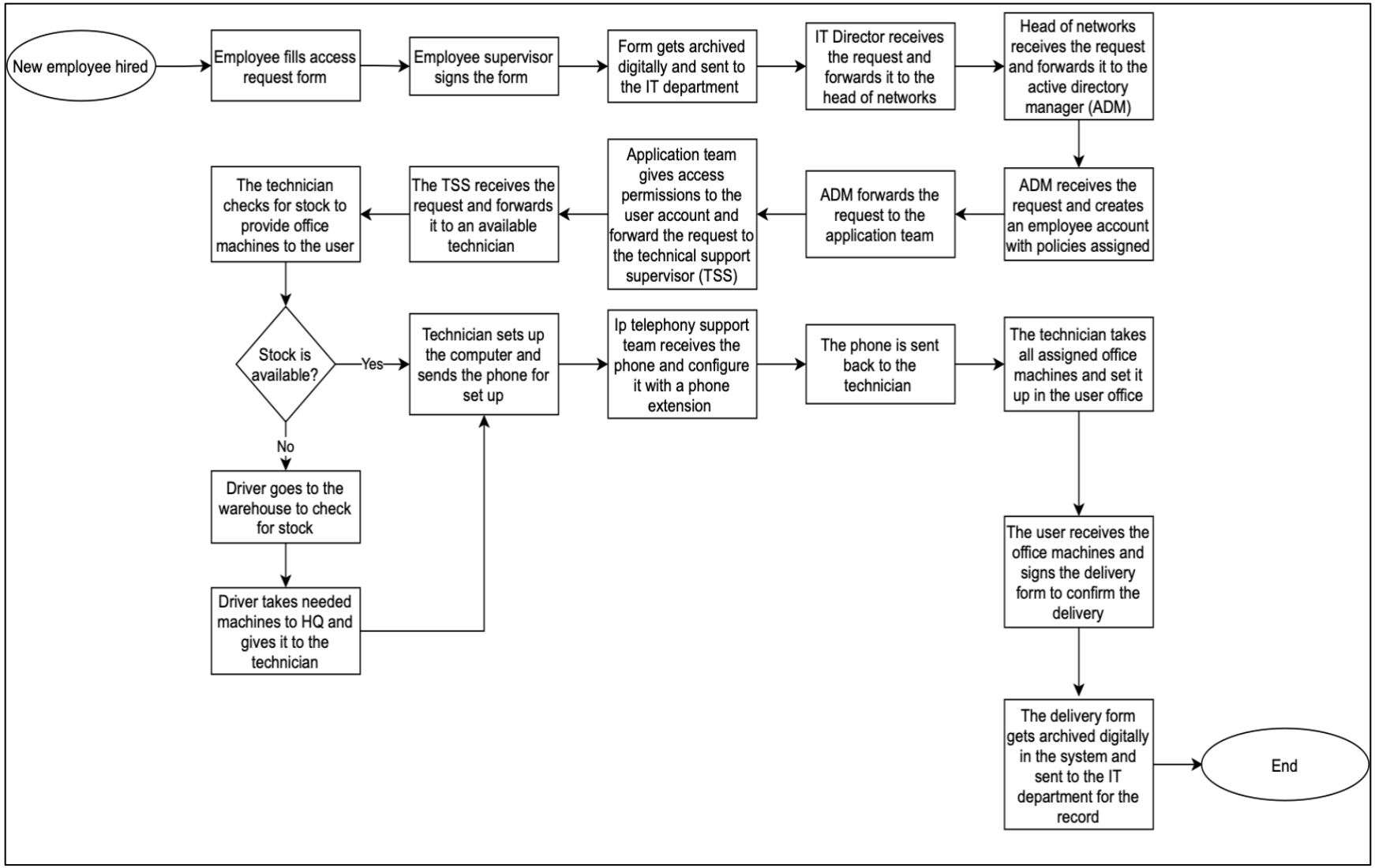

Figure 4. flow chart of the service management request process for new employees

Step 2: Current state VSM

The current state of value stream mapping involves all process stages discussed in the preparation step. The difference between the flowchart and VSM is that the stream map would include data observed in each stage in terms of processing time and material used. Both performance measures are named as PT and MU in the value stream map accordingly.

- PT is the time that the request is being processed.
- MU refers to the number of papers used in the stage.

Symbols:

The symbols used to draw the VSM charts are shown in figure 5 below. All symbols are used in drawing the process VSM current state and future state.

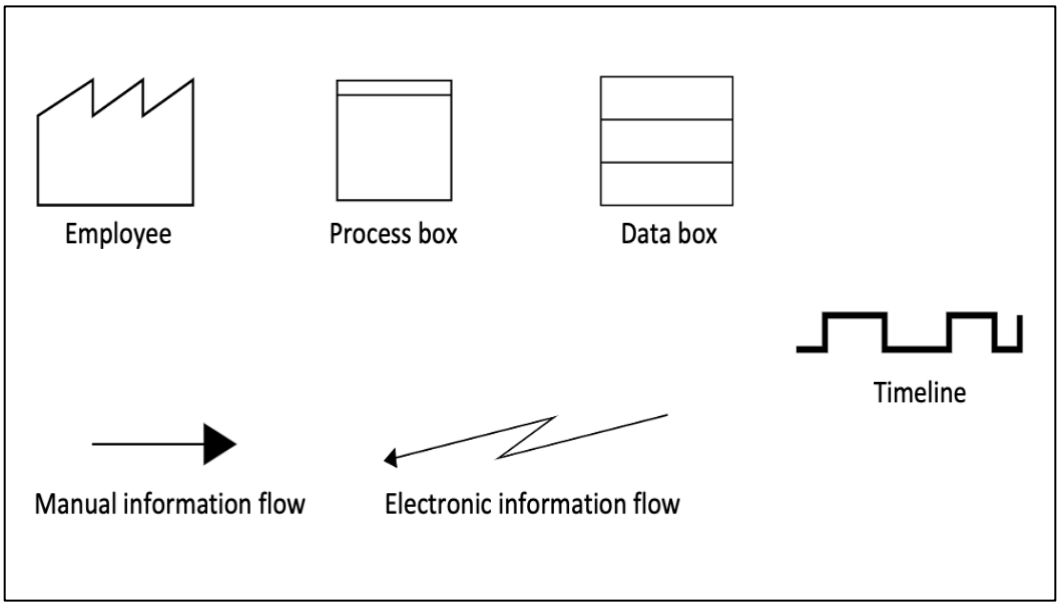

Figure 5. symbols of VSM used in current and future state

Assumption:

- The process assumes the longest path where the driver brings stock from the warehouse.
- The process assumes a new employee with no access or office machines.

- Technician is available.
- Driver is available.

Current state:

The current state of service request management request process is shown in figure 6. The process consists of 14 steps which explained below:

1- Request: employee initiates the request by filling out a standard paper form used for access and office machines request. The step is performed out of the IT department, so the process time assumed is the average obtained from asking different employees which was 10 minutes, and material used is 1 paper.

2- Approval: employee supervisor approves the request and send it to IT department. Again, the case occurs so process time assumed is 10 minutes.

3- Receive: IT director is the one who receives new mail, so the request is received by him first. Process time observed is 2 minutes.

4- Receive: Head of networks section receives the request and forwards it to the active directory manager who creates user profiles on the system. Process time observed is 3 minutes.

5- Create: active directory manager creates the user profile and place the user information under his/ her department group, then send the request along with user information to the developing team. 13 minutes is the process.

6- Give access: developing team give access to the user based on the access level approved by the employee supervisor. Then, they forward the request the technical support supervisor. Process time is observed to be 7 minutes.

7- Receive: technical support supervisor receives the request and forwards it to an available technician. 2 minutes is the process time.

8- Receive: technician receives the request. Process time observed is 1.5 minutes to open the system and get the requirements list.

9- Check: technician assigned checks the storeroom for devices availability. The process time is 5 minutes.

10- Assign: the driver is informed by the technician with the needed stock to be brought from the warehouse. Driver then drives to the warehouse, finish access procedures, takes the devices to the vehicle. The process time observed is 35 minutes.

11- Bring: drivers drive back and hands the devices to the technician. Process time is 30 minutes.

12- Set up: technician installs necessary operating system and software. Also, he sends the phone to IP telephony team for configuration. The process time is 40 minutes.

13- Configuration: IP telephony team configure the phone with an available extension number from the range assigned for department use. Then, they send the telephone back to the assigned technician. Process time is 10 minutes.

14- Delivery: the assigned technician delivers devices needed to the employee, completes the installation, and get the delivery paper signed to confirm the delivery. The process time is 20 minutes and material used is 1 paper.

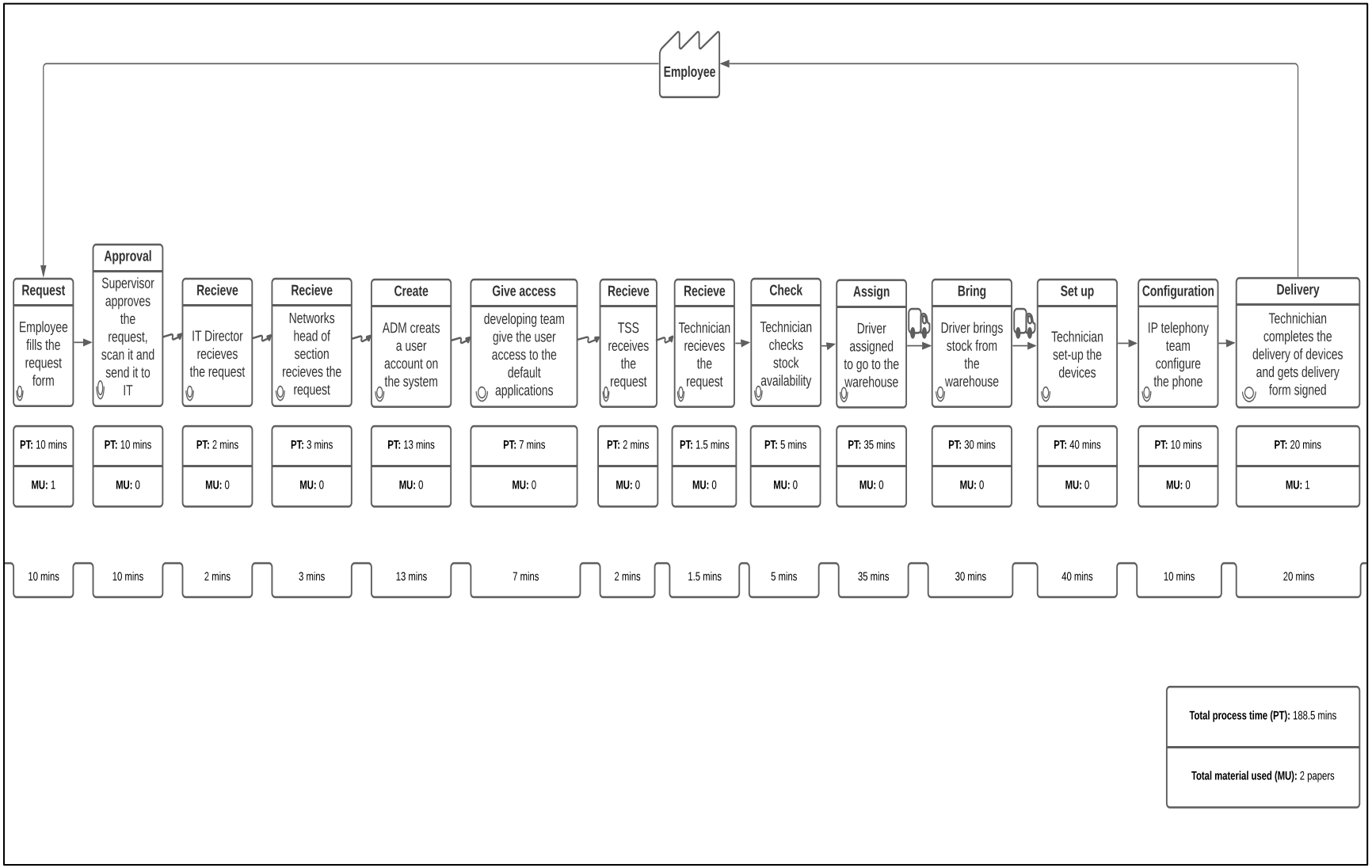

Figure 6. Current state VSM of the service management request process for new employees

Step 3: Future state VSM

To draw the value stream mapping future state, kaizen events can be used to brainstorm possible improvements by highlighting non-value adding steps, and potential improvement among necessary activities. Also, the proposed solutions in the planning phase are the key factors in the future VSM chart shown in Figure 7. The improvements proposed are expected to impact the process steps as follows:

- Step 1: process can be combined with step number 2.
- Step 2: process can substitute the first step, and employee supervisor can initiate the request, assign needed access level, and send it to IT department for approval and further steps.
- Step 3: unnecessary process, the step should be eliminated.
- Step 4: unnecessary process found in receiving the request by networks head of section, the step should be eliminated and goes directly to ADM for approval.
- Step 5: process can be eliminated
- Step 6: giving access to user step can be handled by the employee's department using the identity access management solution; step can be eliminated.
- Step 9: manual check can be eliminated, and stock can be checked using the MS Access inventory monitoring solution on the computer.
- Step 10 and 11: assigning driver to bring devices is considered as a necessary waste when stock is not available in the store, they can be eliminated from the process by using step 9 improvement solution.

- Step 12: set up activity can be eliminated by preparing a group of devices beforehand and keeping them ready.
- Step 14: material used should be eliminated.

Step 4: Planning

In the planning step, an actual action plan was developed to design to the process future state, where steps in the process can be waste-free as possible. The improvement can divide the process into three parts. The first part of the process consists of the process initiation method, account creation, and access granting. The second part of the process is related to the stock availability at site. The last part is related to the set up and delivery steps. The plan of improvement that should impact the first part of the process is:

- Get the IT management support
- Explore available solutions that can improve the first part of the process.
- Develop a request for proposals to obtain proposals from identity access management solution providers.
- Propose one of the solutions to the management for approval
- Once the solution is installed in the environment, ask employees involved in the process to test it and approve it.
- Once the solution is approved, the employees must adopt the new method of handling the process (Culture change).

The plan of action to improve the second part is:

- Develop an inventory monitoring solution using MS Access which is available in the IT resources.
- Adopt fixed-order quantity model in the solution

- Estimate the demand during a period of 2 weeks and based on that, choose a restock point.
- Keep updating the quantity after retrieving from or filling the stock, so inventory can be monitored accurately through the solution.
- Visit the storeroom twice a month to make sure data available is up to date.

The last plan of action is related to devices setup and delivery. the plan as follows:

- Devices in the storeroom should be kept ready and featuring default system and applications.
- Use a tablet to get delivery confirmation signatures electronically.

CHAPTER 5: RESULTS AND DISCUSSION

The service request management service found to contain several waste forms that increase the service delivery time. The action plans, discussed in the previous chapter, were not yet implemented except for the inventory monitoring solution. However, the action pans can be proposed to the management along with the expected results below, to show the feasibility of the improvement. The wastes found in the process are either related to unnecessary processes or necessary waste, however, the improvements can reduce time, process steps, transportation, and material used in the process.

5.1 Results of the first action plan

Identity access management (IAM) solutions are one of the essential systems used in today's main businesses. By using IAM, all access related steps can be done in two steps, where the solution is expected to be integrated with other applications and necessary servers to grant access level desired to IT resources within few clicks. The impact IAM would have on the process is:

- Substitute the request step and initiate the request directly by the employee's supervisor.
- Combine the first two steps, and combine steps 3,4,5,6.
- 32 minutes process time and 1 paper are the eliminated from the process.

5.2 Results of the second action plan

A free of cost solution can be developed to solve the issues related to stock availability. A mini database can be built using Microsoft Access available in the Ministry's IT systems, where inventory information can be kept updated. More specific, stock type and quantity can be filled in table forms with the status and store location. Then, one query can be developed to show available stock in both local store and the warehouse,

and another query to show inventory items at restock point. If items are available in the warehouse they can be brought, and if warehouse items are at restock point, they can be ordered through the procurement department ahead of time. For instance, if the expected demand for the next two weeks is 10 computer devices, inventory of devices in local store should be 10 + 2 safety stock, and if the inventory level drops down to 3. Also, the same restock point can be used for inventory stored in the warehouse and an economic quantity can be ordered through the procurement department. The key success factors for the solution is the form should be available in the shared folder, updated and refreshed by the technical support supervisor (TSS) after requests are received and devices are retrieved from the store; by doing this, the form will always contain an accurate inventory information. Also, TSS should visit the store twice a month to make sure the information on the form is up to date, and ask the driver to bring out of stock devices from the warehouse when the inventory reaches the restock point. This solution would:

- Eliminate checking the available stock step.
- Eliminate the driver role from the service delivery.
- 70 minutes process time is eliminated from the process.

The proposed solution has been developed and can be found in appendix A.

5.3 Results of the third action plan

The third plan of action is related to the set up and delivery of devices to the end-user and the plan is more of a behavioral solution. Setup time and installing necessary operating system and applications such as antivirus and Microsoft Office, is time consuming and comes as default settings to all employees. Therefore, available devices in the storeroom can be preconfigured and kept ready for delivery. Also, delivery conformation can be obtained using a tablet to make the process of getting delivery

confirmation faster and paper-less, since e-forms can be uploaded in the asset management solution in one step rather than scanning. The proposed solution would:

- Eliminate set up process from the service flow of work.
- Eliminate 40 minutes process time.
- Eliminate paper usage upon delivery.

After implementing the three action plans mentioned above, the new value stream map of the process would be similar to the one shown in figure 7 below.

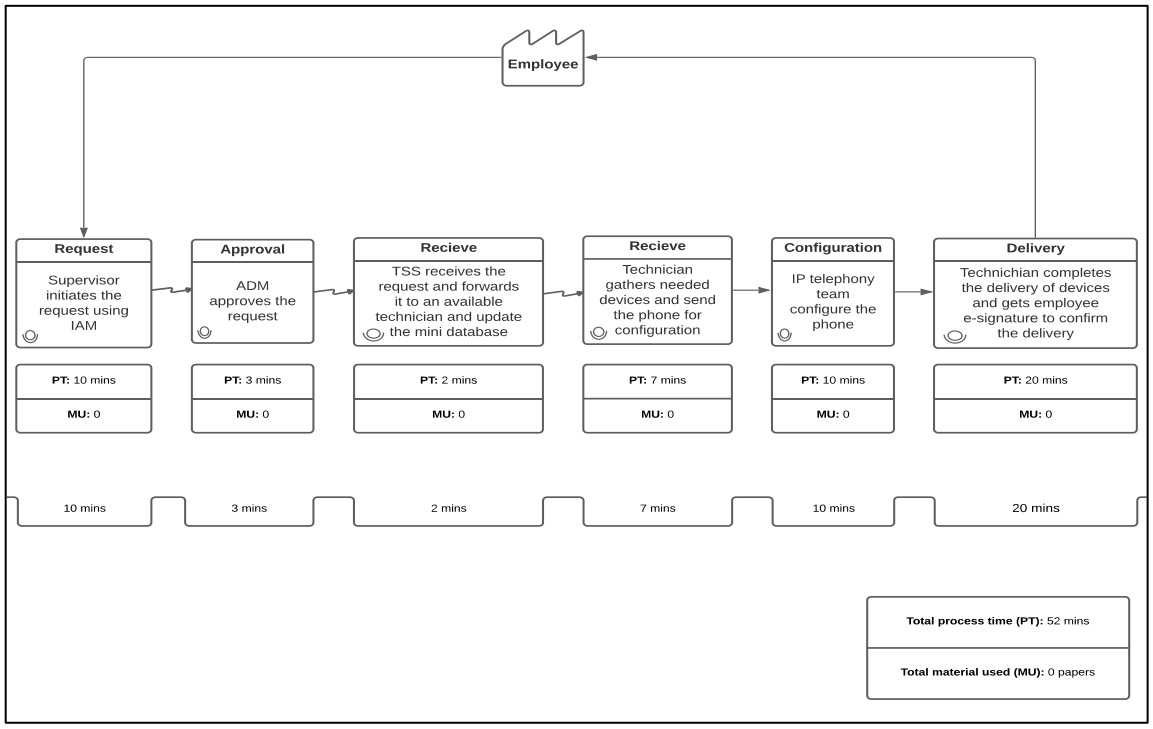

Figure 7. Future state VSM of the service management request process for new employee

Table 4 shows comparative analysis between the current state and future state value stream maps.

Table 4. Comparative analysis between current and future states

Performance measure	Current state	Future state	Improvement
Process time (minutes)	188.5	52	72.4%
Material used (Papers)	2	0	100%

As per the analysis, the new proposed value stream map would reduce processing time by 2.2 hours and eliminate material used by 100%. That means under the perfect circumstances where no or minimal delays added to the actual process time; the service would be delivered in less than an hour (instead of 3 hours) with an improvement of 72.4%, which can be obtained using the following equation:

$$\frac{current\ state\ -\ future\ state}{current\ state} * 100$$

However, to implement changes and achieve the future state improvements, a couple of critical success factors from what have been discussed in the literature review chapter are essential, which are:

- Commitment from top management

  The identity access management (IAM) solution will help in managing access certifications and the level of access of each employee within few clicks, since it will be integrated with other components on the network such as ERP, Active directory, Email server, and OTP server. The only information IAM needs is the user information (such as name, phone number, assigned department), and the level of access needed. IAM will also help protecting the information and will make it easy to disable user privileges or change permissions assigned. However, IAM solutions in the market start from 1.5 million QAR and renewal license and support is about QAR 250,000 annually, that's one of the reasons top management support and commitment is a must.

- Cultural change

  The improvement would change the traditional way employees used to follow. For example, technical support supervisor would monitor the inventory

regularly and update the Access form after each request. Also, technicians would prepare the devices that are expected to be requested soon make it ready before receiving any requests. Therefore, it is very important that employees adapt the new process framework, especially in the technical support division in this service, who have a huge influence on the service delivery time.

5.4 Validation of results

Validation of results method has been used to check the feasibility of applying lean thinking in the Ministry, and the effectiveness of results. The four heads of sections (HoS) have been interviewed with a set of questions, to gain their feedback on the project problem and findings. Table 5 below shows the survey questions and answers which can validate the project's outcomes.

Table 5. Validation of findings questionnaire and results

Question (on a scale from 1 to 5)	HoS 1	HoS 2	HoS 3	HoS 4	Average
1. Do you know the concepts of lean thinking?	3	1	4	3	2.75
2. What do you think of the current state and the future state of the service request management service, did the process improve significantly?	5	5	5	5	5
3. Do you think that the proposed action plans are feasible and can be adopted?	5	4	4	5	4.5
4. Do you think lean thinking can be effectively applied on other services in the Ministry?	5	5	5	5	5
5. Do you think top management can adopt and support lean implementation in the Ministry?	5	5	4	5	4.75

The average of the first question is 3, and it is understandable because most participants are not aware of lean thinking and lean tools. However, most of them are knowledgeable about continuous improvement practices, and can relate to some extent to

lean concepts explained to them while conducting the survey. Overall, three of the four heads of sections had a good knowledge about process improvement practices, even if the term lean was not relevant to them. In addition, the lean thinking concepts have been introduced to participants during the interview to elaborate on questions four and five of the survey.

All four participants strongly agree on the improvement occurred on the service after lean thinking, and value stream mapping tool was applied, and think that the proposed action plans are feasible. The inventory monitoring solution and the tablet for delivery confirmation are applicable, and reasonable as per them and can be implemented immediately after getting the director approval. However, the identity access management solution requires approvals from top management, and it would require the department to prepare a cost-benefit analysis and present it to them.

The four heads of sections totally agree on the applicability of lean thinking on other services in the Ministry. In addition, they believe that the department should take the initiative and start applying lean on other services; especially those which affect the productivity of employees such as technical support related services. furthermore, the participants think that top management would support implementing lean in the Ministry; since they developed an internal strategic plan recently and they are interested in improving efficiency and optimizing cost.

CHAPTER 6: CONCLUSION

When applied right, lean thinking principles have the capability to improve services and optimize resources. The quantity of methods and tools used in lean thinking is large, but in terms of where it can be applied it does not differ, for it can be applied in too many contexts and industries as it can be concluded from the literature review. Additionally, lean tools provide tangible results and can improve services significantly through enhancing quality and optimizing cost and resources. In addition, a great advantage of using lean thinking principles that it can be applied on any process scale and, understood by individuals with different knowledge backgrounds.

In this project, lean thinking, lean tools, and lean applications in service industries have been studied to have a solid knowledge about the philosophy, critical success factors, and applications in services. Then, after literature proven that lean thinking can improve the services, value stream mapping tool was selected to examine the results of applying lean thinking in one of the services provided by the IT department of a local entity. The results show great improvement on the service delivery time and papers used in the process. Also, the validation of results showed that, the improvement on the service request management process after lean has been applied is feasible, and that lean can be applied to other services in the Ministry.

It is recommended that the Ministry considers adopting lean thinking and prioritize the areas that need extra work and effort. It is also recommended that the IT department extend the lean thinking application to other services, such as incident management, which was the second highest service in the phase of service selection. The project can be used to introduce lean thinking to the top management as a forward step towards continuous

improvement and becoming a lean government entity, to match Qatar National Vision 2030.

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APPENDIXES

Appendix (A): Solution developed to monitor the inventory level.

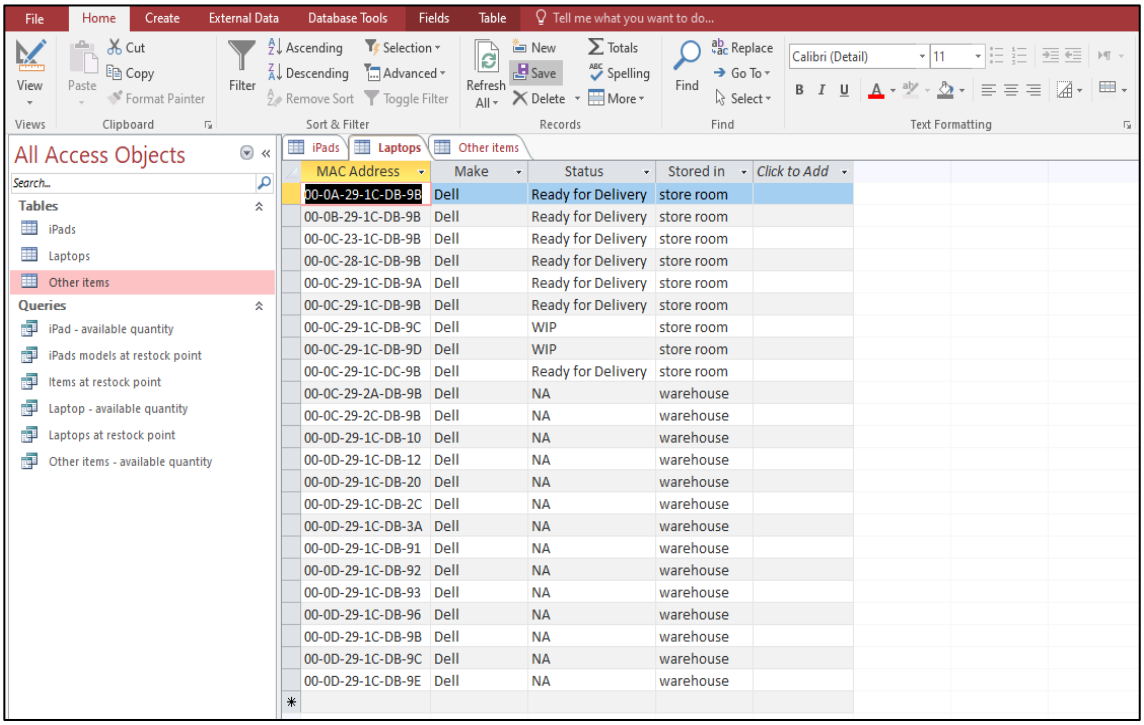

Figure 8. A table contains laptops information, status, and store location

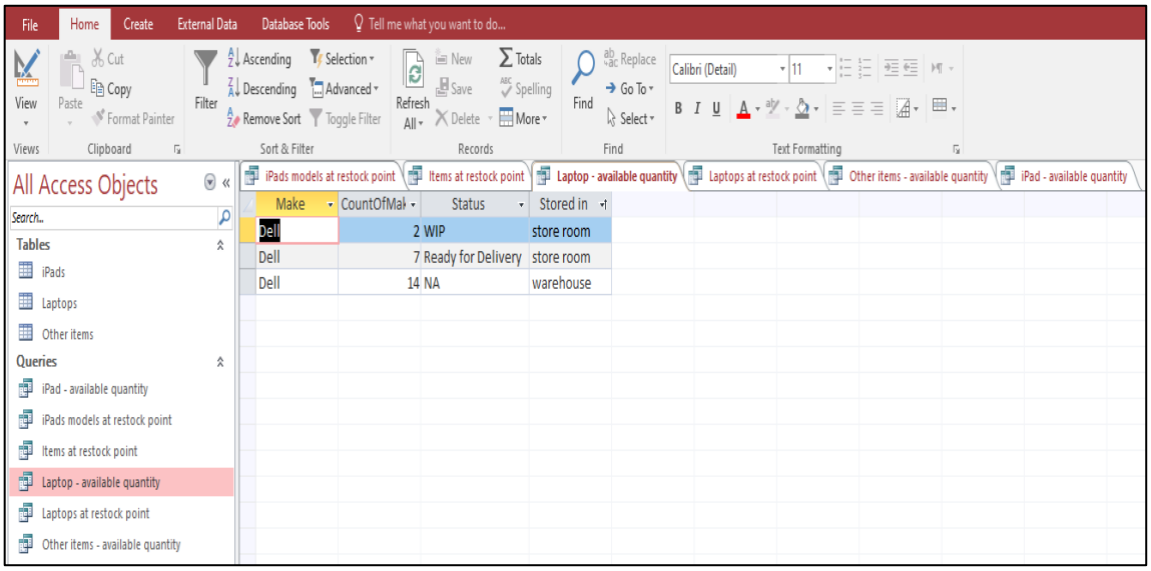

Figure 9. A query summarizes the laptop table

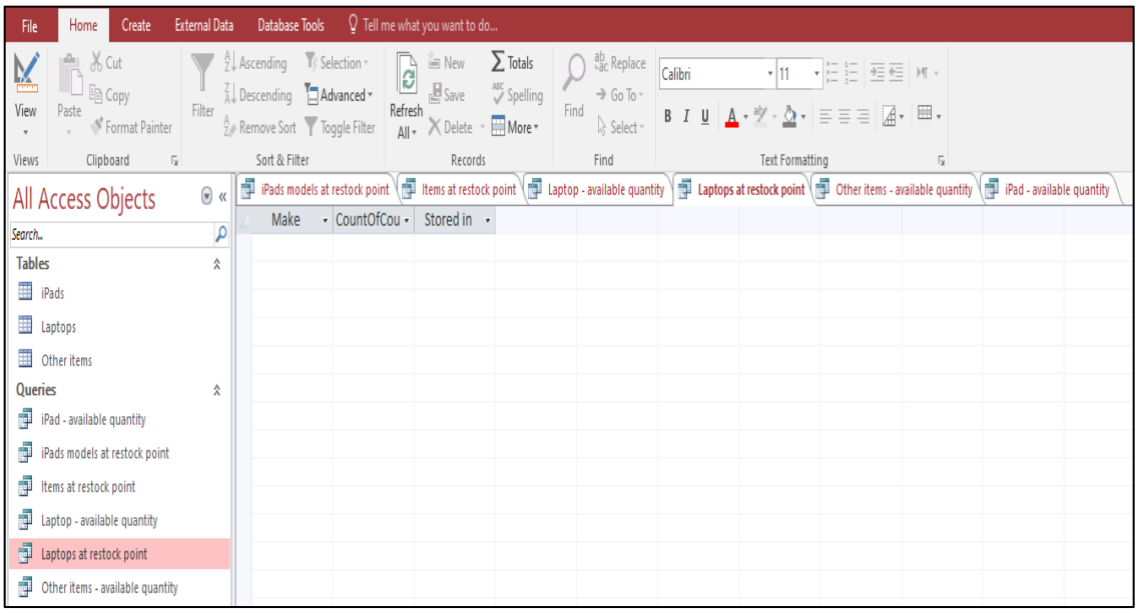

Figure 10. A query for laptops at restock point

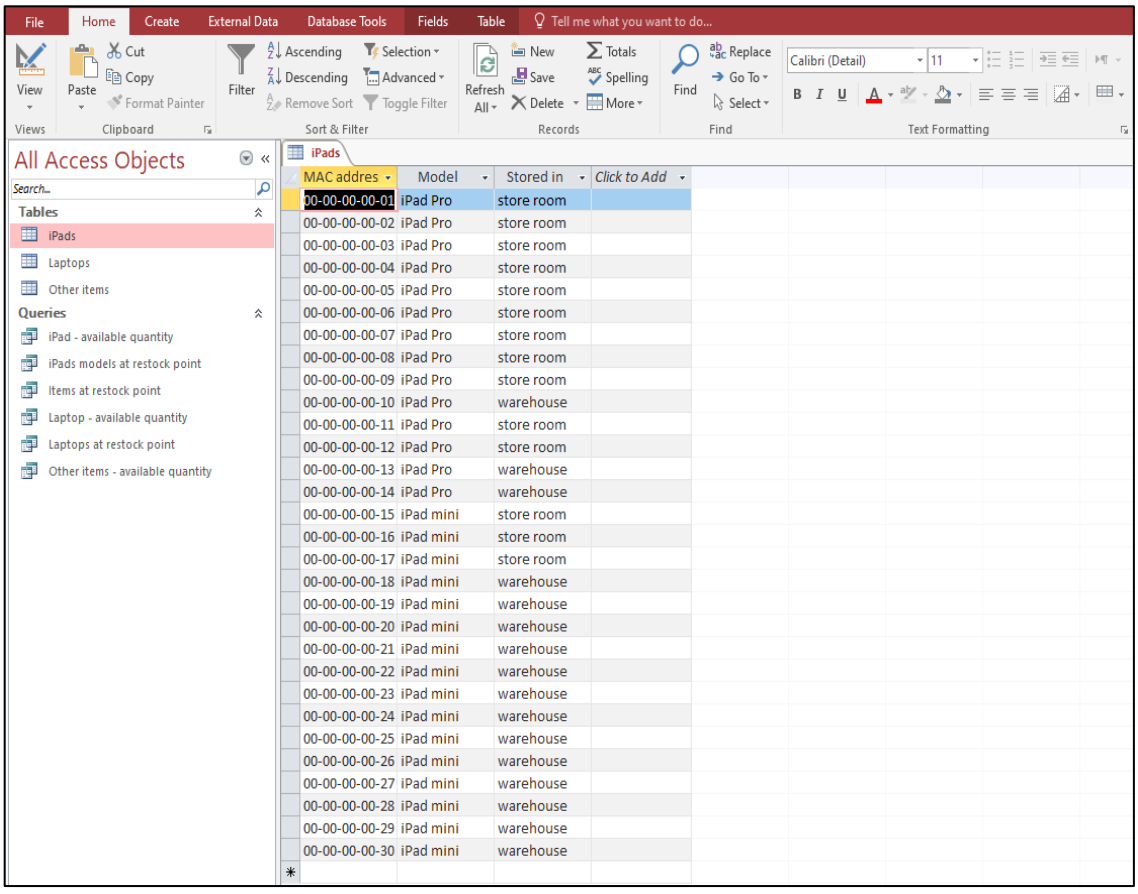

Figure 11. A table contains iPads information, and store location

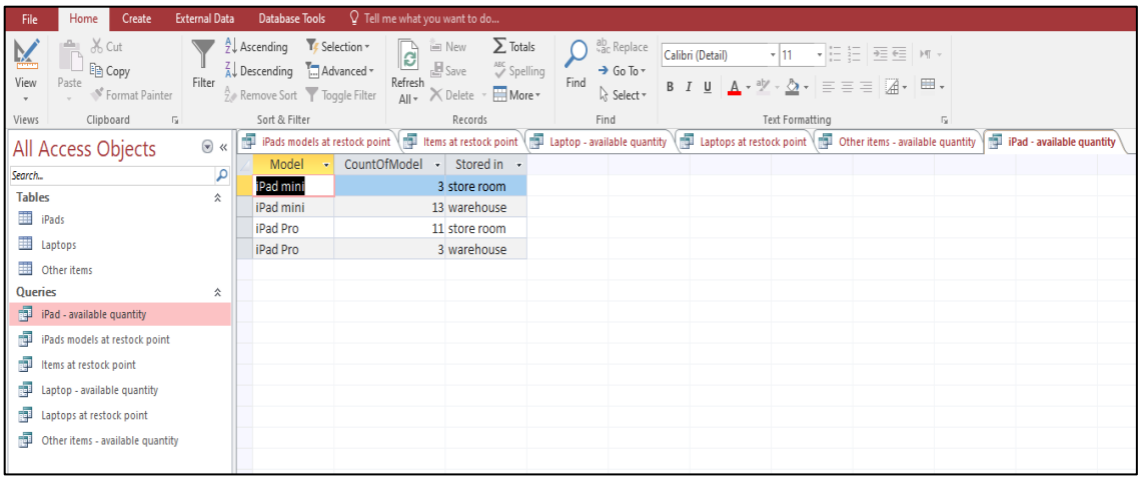

Figure 12. A query summarizes the iPad table

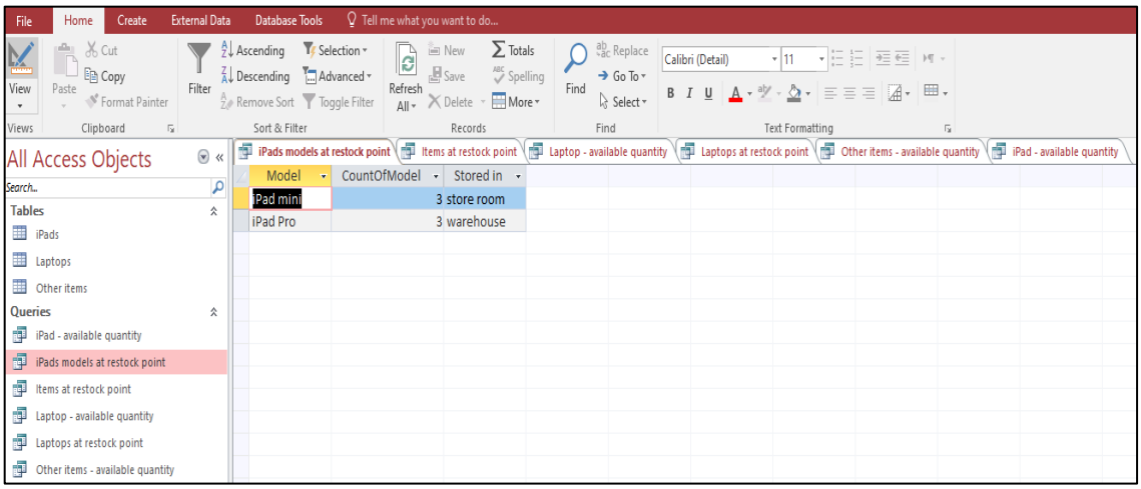

Figure 13 A query for iPads at restock point

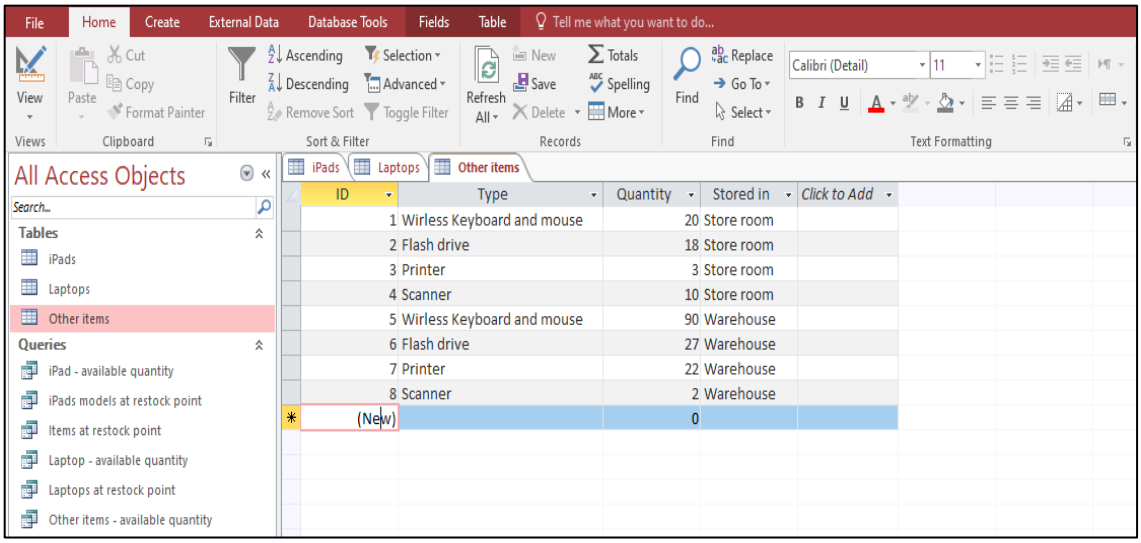

Figure 14. A table contains other items inventory information

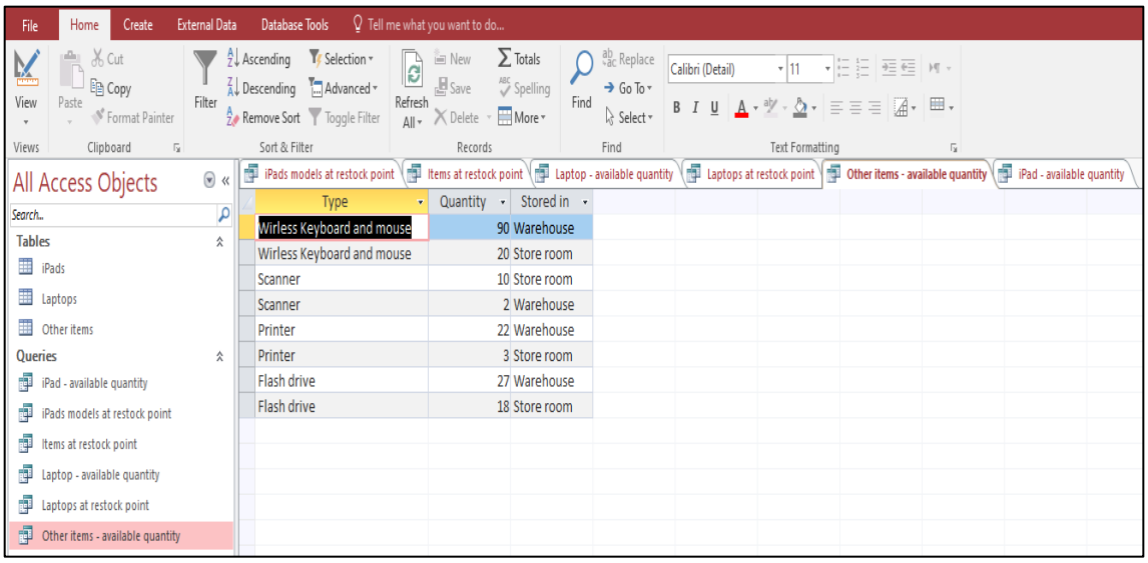

Figure 12. A query summarizes other items table

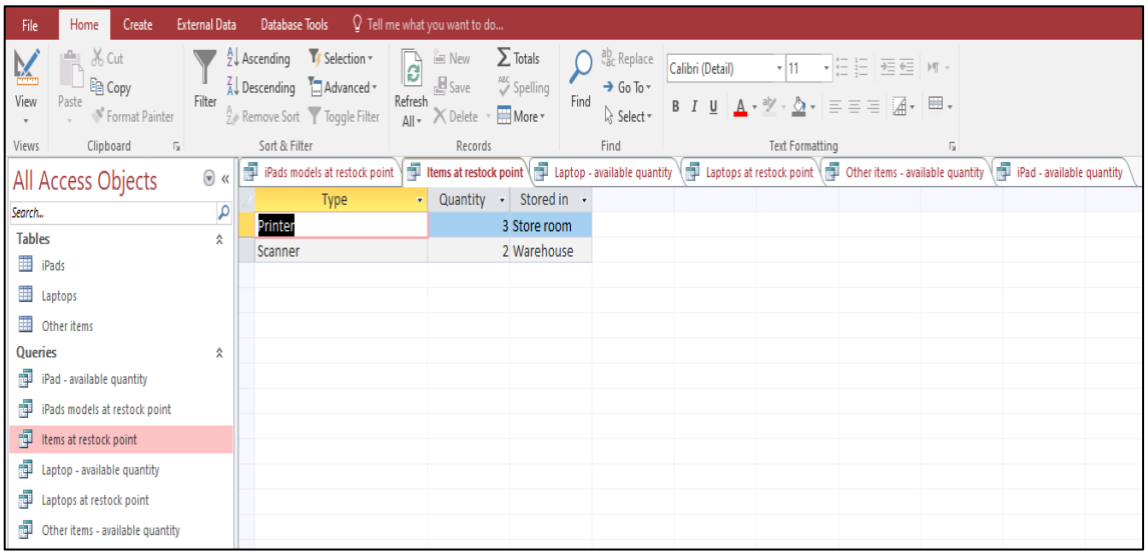

Figure 13. A query for other items at restock point