Learning by doing: an undergraduate lean A3 project in a Kuwaiti bank

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Abstract

Purpose – This case study shows how methods of lean philosophy can be successfully taught to undergraduate students and applied to improving a real-world loan process. Students were instructed to use newly acquired classroom skills to analyse and improve a bank loan process in Kuwait.

Design/methodology/approach – This study involved an initial gemba walk through the bank. A case study format with direct observation and semi-structured interviews was adopted by 27 undergraduate students to identify waste, analyse the loan process and develop an efficiency plan.

Findings – The results revealed that undergraduate students could quickly learn basic lean principles and techniques and utilize them in a real-world situation to significantly improve a bank loan process. Areas of waste included over-production, over-processing, defects in procedure, under-utilized skills, wasted motions and poor time management. Suggested corrective measures were expected to reduce loan processing time by 30%.

Practical implications – Increasing costs and competition in the business environment make efficiency improvements imperative, and it was shown that students can play a major role in applying lean principles to a bank loan process while gaining knowledge and skills highly valued in industry. Universities have the opportunity to create a valuable learning experience for undergraduate students in applying classroom skills to solving a real-life problem.

Originality/value – This is the first study of a novel classroom technique for teaching undergraduate students to apply lean techniques in a Kuwaiti bank.

Keywords Industry–university collaboration, Higher education, Teaching, Lean banking, A3, Kuwait, Process improvement

Paper type Case study

Introduction

In the current markets, companies in different sectors are striving for improvement to stay competitive and widen their market share. The concept of lean methods was first developed and named by Womack *et al.* (1990) and tested in the manufacturing sector (Vlachos, 2015). The lean philosophy is widely utilized by managers in such diverse sectors as healthcare (Mazzocato *et al.*, 2010; Alnajem *et al.*, 2019), banking (Gong and Janssen, 2015; dos Santos and Cabrita, 2016), manufacturing (Alnajem *et al.*, 2013; Belekoukias *et al.*, 2014) and higher education (Emiliani, 2004; Balzer, 2010 and Suárez-Barraza and Rodríguez-González, 2015), public sector Radnor Johnston (2013). Lean methods have been proven to improve efficiency in many different businesses and processes (Suárez-Barraza and Rodríguez-González, 2015; dos Santos and Cabrita, 2016). The main targets of lean efficiency management are over-

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production, over-processing, defects, unused skills, wasted motions, transportation delays, poor inventory planning and waiting (Ohno, 1988; Womack *et al.*, 1990; Neha *et al.*, 2013).

Gulf University for Science and Technology (GUST) is an AACSB-accredited university, and part of this accreditation involves learning projects at companies where students are given a real-life business problem to solve by using their classroom skills (Carraher, 2009). This project was created to enrich the students' learning experience. This study focussed on an industry–university collaboration in the fall of 2019 between GUST and one of the most popular banks in Kuwait, known for their focus on youth. The name of the bank must be kept anonymous for confidentiality reasons, and thus the bank will be labelled (L-Bank). The L-Bank aims to have a positive impact on Kuwaiti society by providing educational opportunities for Kuwaiti students. Every year they invite undergraduate students from GUST to gain first-hand experience in the basics of lean philosophy by supporting them to apply classroom learning in real-life situations. The project was initiated in the fall 2019, and students were instructed to utilize the principles of lean efficiency management to improve a bank loan process. With full support from the bank, the undergraduates analysed the problems with the loan procedure according to lean guidelines and came up with workable solutions for speeding up the process while enhancing their learning experience and career prospects (Doman, 2011; Martínez León, 2019).

Making loans is one of the main sources of profit in any bank. Currently the loan process at L-Bank for one customer takes 31 min, which is substantially longer than other banks where the procedure can be completed in 15 min or less. Therefore, the goal was to shorten the processing time so that the bank could shorten the clients' waiting time, serve more customers and increase its market share and profits.

The main objective of this project was to give undergraduate student a hands-on experience in a Kuwaiti bank analysing a loan process and applying the principles of lean management to shorten the time a client spent applying for a loan. To achieve the research objectives of this study, the following questions were formulated:

(1) How can lean principles best be taught to undergraduate students?

(2) How can students apply the knowledge acquired during the course to solve a real-world business problem?

To answer these questions and prepare students for analysing the problem and coming up with workable procedures for improving the case bank loan process, the students were taught lean business principles and trained during the four month course in the key aspects of lean system such as kaizen methodology, PDCA (plan, do, check, act) approach, A3 and so on.

Literature review

According to Mathews and Muguntharajan (2012), the loan process in many banks is slow and prone to errors that cause customer dissatisfaction. Banks could benefit by applying the cost-saving measures posited in lean philosophy (dos Santos and Cabrita, 2016) to eliminate wasteful procedures, reduce processing time and provide a cheaper, more flexible service (Arfmann and Topolansky, 2014). Despite the obvious benefits of reducing inefficiency by implementing lean procedures, many banks find it hard to adjust to these principles (Leyer and Moormann, 2014), and changes have to be clearly based on needs and goals (Ohon, 1988). According to dos Santos and Cabrita, 2016, bank managers were motivated to seriously consider deploying lean methods because of the 2008 recession and the need to develop a global presence to remain competitive. The banking sector has been prone to excess waste or "muda" as Toyota called it, because of a lack of standardization, unnecessary approval requirements, delays in obtaining required information and system downtime. The application of lean philosophy provides many tools for eliminating inefficiency in the banking sector such as 5S standardization, value stream mapping (VSM), just in time (JIT), heijunka, visual management

and poka yoke, andon, jidoka and kaizen (Bicheno, 2008; Leite and Viera, 2015). Bicheno (2008) has explained the lean tools as follows: VSM is the visualization of a process to identify wasteful activities and determine how to eliminate them. Heijunka is a Japanese term meaning levelling production by dividing the workload, reducing variation and promoting stability (Bicheno , 2008). JIT is an approach to eliminate over-production and inventory imbalances by adjusting production to actual demand (Bicheno, 2008). 5S standardization and visual management are ways to organize the workplace and eliminate wasted motions by making everything easily accessible (Bicheno, 2008). Andon is the Japanese term for a signal used to alert managers to a problem in a process. Other Japanese concepts include poka yoke which is a set of techniques for reducing process errors, jidoka which refers to stopping the process if there is a problem and kaizen meaning the incremental pursuit of change for the better (Bicheno , 2008). According to Gupta *et al.* (2016), many Toyota sensei have contributed to the development of the lean system: Taiichi Ohno worked on the development of Toyota's production system, JIT, Kanban, Seven wastes; Shigeo Shingo made refinements to JIT, single minute exchange of dies (SMED), zero quality control; Kenichi Sekine assisted in the development of the continuous flow system; and Hiroyuki Hirano contributed to the development of the 5s system. Gupta *et al.* (2016) cited many researchers who identified lean tools and practices that are applicable in the service industry to speed up service, improve quality, reduce operations and labour costs and provide better flexibility in responding to customers' demands (see Table 1).

Several banks around the globe such as BNP Paribas and Bank of America have successfully implemented the lean philosophy (dos Santos and Cabrita, 2016) to reduce lead time, improve service, increase customer satisfaction, lower costs and enhance competitiveness (Vaduva, 2011).

Sunder (2016) demonstrated how the lean system could help the retail banking sector reduce the rejection rate, reduce processing time and enhance employee mindset. Several benefits in banking procedures were discussed by Gong and Janssen (2015). Their study showed how lean techniques enabled banks to be more innovative and make their processes more efficient. dos Santos and Cabrita, 2016 (2016) declared that if implemented correctly, the lean system could help the banking sector maximize profits by optimizing their processes. Muturi *et al.* (2015) showed that the lean system had a significant impact on the banking sector. Their studies revealed that the case bank managed to lower costs by reducing process cycle times, turnaround times and error rates. Putri *et al.* (2017) showed that the successful implementation of lean principles resulted in less waste, greater flexibility, improved employee knowledge and empowerment, lower operating costs and more satisfied customers.

The importance of industry–university collaborations

According to Wood (2003), problem-based learning is an excellent way to enhance knowledge and understanding of course content by tackling real-world problems. Many researchers have emphasized the importance of business collaboration in university projects (Burns and Chopra, 2017; Martínez León, 2019). Such collaborations give students the chance to apply what they have learned to analyse and solve actual business problems. Doman (2011) seconded this view that students can learn by analysing managerial deficiencies and coming up with potential solutions. According to Burns and Chopra (2017), industry–university collaboration provides students with life-changing experiences that boost their networking connections with professionals who may be their future employers, give them practical experience in applying what they have learned to real-world scenarios, enhance communication skills and advance them along their career path. Savery (2006) pointed out that problem-based learning can stimulate students' analytical abilities, foster work ethics and improve communication. Similarly, Hasan and Hossain (2018) and Bradley and Willett (2004) have demonstrated that this kind of collaboration can benefit both the students and the business owner. Industry–university collaborations are a great opportunity for the students

Authors	Sector	Lean practices and tools	Benefits achieved
Swank (2003)	Financial services	Standardization, takt time, VSM, heijunka, visual management	(1) Faster results from reduction in time to completion of a job (2) Cheaper results from reduction in labour cost (3) Better quality results from reduction of errors
Apte and Goh (2004)	Financial services	Value creation, waste elimination, information flow, supplier relations, kaizen, JIT	(1) Better quality from reduction in loss pay-out (2) Faster, larger volumes, reduction in cycle times and more flexible service on customers' claims (3) Faster availability of high-quality information
Emiliani (2004)	Higher education	5s, standardized work, JIT, visual control	(1) Better quality of course materials and delivery of higher value
Sunyog (2004)	Healthcare (laboratories)	Process mapping, inventory management, waste elimination, single-piece flow	(1) Cheaper results from reduction in cost
Kim *et al.* (2006)	Healthcare	Standardizing and poka yoke, the process of ordering, delivering and administering medications	(1) Better because of improved patient access (2) Faster results from reduction in waiting time for tests and turnaround time for test reports (3) Better quality from reduced incidence of ventilator-associated pneumonia
De Koning *et al.* (2008)	Financial services	5S, visual management, SMED, one-piece flow, pull, line balancing, standardized work, cellular production, communication, quality control system, employee engagement	(1) Faster because of reduction in waiting time (2) Better quality from reduction in errors (3) Cheaper because of reduction in operating costs
Barraza *et al.* (2009)	Public sector	5S, gemba, kaizen workshops and process mapping	(1) Better because of improved processes and services (2) Cheaper from saving space and resources (3) Faster and more flexible because of reduction in response time
Chiarini (2013)	Healthcare	Spaghetti chart, VSM and activity worksheet	(1) Cheaper because of reduction in cost (2) Faster and more flexible because of reduction in lead time

Table 1.
Lean practices and tools used in service industries and benefits achieved (adapted form Gupta *et al.*, 2016)

to have a learn-by-doing experience that enhances the traditional way of teaching (Hasan and Hossain, 2018). Suárez-Barraza and Rodríguez-González (2015) strongly supported a hands-on approach that helps students apply the knowledge gained in class room and in tackling an actual business problem.

Methodology

L-bank was chosen as the case bank because it is the only bank in Kuwait with an established lean system department started in 2016, and which was willing to share their experience and

give our students the chance to have a real-life experience. The L-Bank is adopting A3 methods as the main problem-solving tool and for evaluating new solutions for any process or service. Their lean team was established in 2016 to spread the lean mindset to their employees and the society and made university–bank collaboration a building block to success in this endeavour. This section describes the methodology employed to help answer the research question and achieve the objectives of this study. In doing so, we reviewed the literatures and adopted qualitative methods such as case studies, semi-structured interviews and direct observations (Yin, 2009).

Before starting the project, a team from L-Bank visited the GUST and presented the problem with their loan procedure to be improved by using lean analyses and tools, the L-Bank has assigned a mentor to guide students throughout the process. The team from the bank included managers involved in process change and improvement, and the class consisted of 27 undergraduate business students who were taking a lean philosophy course in fall 2019–2020. The students were divided into six groups and each was asked by the L-Bank team to solve the same problem – to reduce the loan processing time. The student teams then visited nine L-Bank branches in different locations using a gemba walk approach to observe the current loan process, check the timing and collect data for analysis and ask staff about the process. The gemba walk technique was developed by Toyota to identify waste in their manufacturing processes and to come up with workable changes to make the system more efficient. As a powerful improvement tool, the gemba walk involves "going where the action is" to understand the problem at the source and to interact with the people directly in charge of the process (Bicheno, 2008; Bremer, 2015). The gemba walk combined with lean analysis is an excellent hands-on teaching exercise. Gemba means the real place where the value is created (Imai, 1996). Several authors have stressed the importance of the method such as (Imai, 1996; Liker, 2004; Liker and Meier, 2006; Bicheno, 2008; Suárez-Barraza and Ramis-Pujol, 2010). According to Suárez-Barraza and Ramis-Pujol (2010), the gemba walk is a method that helps problem-solvers to watch the process and flow in real time to detect potential waste. This technique allows the problem-solvers to observe the problem points as they occur and to discuss them with the people who oversee the process. According to Imai (1996), the gemba method begins with going to the place where the value-adding activities and the potential waste occur. The observers can then take temporary countermeasures on the spot, find the root cause of the problem and modify the procedure to prevent recurrence.

Nine bank officers were interviewed to gather information about the current loan process and possible reasons for service delays. PDCA was the main technique used to analyse and create the A3 report describing potential areas for reducing waste (Sobek and Smalley, 2008).

This report was based on a case study conducted in the L-Bank in Kuwait where the objective was to analyse a loan process and use the principles of lean processing to shorten the time a client spent applying for a loan. This study was descriptive and exploratory, and the methodology developed should help bank managers reduce client dissatisfaction with the loan process (Yin, 2009). The case study approach is very useful when researchers want to answer the questions of "how" and "why" (Yin, 2009). This method is also suitable for operations management studies (Voss *et al.*, 2002). According to Hammond (2002), the case study is one of the most widely used pedagogical techniques in business education. In order to ensure consistency in the analysis, the students used the direct observation and semi-structured interview approaches (Yin, 2009) to analyse the L-Bank's loan process. After reviewing the relevant literatures and learning the principles of lean management, the research began with a gemba walk-through to directly observe the current loan qualification procedure, and this was followed by semi-structured interviews (Saunders *et al.*, 2009). The techniques of lean efficiency analysis were used during the gemba walk to discover areas of time and resource wastage that could be targeted for streamlining the process. For the direct observation, students went to different L-Bank branches around Kuwait to see the process in

action and record important data such as the cycle time for each step, how the process was conducted, how many questions customers were asked, the length of time that a customer had to wait, how many times an employee had to move from one place to another to search for information, get supervisor approval or signatures and so on. The observation lasted from 3 to 4 h. During this time, students interviewed the key personnel involved in the loan process. While asking questions, the students used a checklist to determine whether a particular step in the process did or did not add value. Students then documented every step in the process as well as the answers from the bank representatives to help them analyse and come up with later recommendations. The rationale for these two methods was so that students could identify deficiencies in the procedure that resulted in waste. To ensure consistency, reliability and validity of the gathered data, students collected information from several different branches and interviewed a number of different personnel as well as their mentor (Yin, 2009).

Teaching methodology: preparing students for the lean A3 project

A3 is a powerful set of tools that can help many businesses improve their operations (Sobek and Smalley, 2008). It can be applied in the classroom where students can use the techniques to enhance their critical thinking as well as their ability to solve problems (Bradley and Willett, 2004; Allen *et al.*, 2009; Anderson *et al.*, 2011; Suárez-Barraza and Rodríguez-González, 2015; Hasan and Hossain, 2018).

According to Suárez-Barraza and Rodríguez-González (2015), the kaizen methods can be easily applied in graduate courses. Their study showed that kaizen enabled them to better design and teach an operations management course. The main objective of lean management is to create value for customers (Womack *et al.*, 1990). In this case, students act as the customers. Suárez-Barraza and Rodríguez-González (2015) showed that implementation of kaizen helped them to better serve students, improve satisfaction and enhance performance. With kaizen, the students were more focussed on learning than grades, which allowed them to gain greater experience and knowledge as they employed their new skills in an actual work environment (Suárez-Barraza and Rodríguez-González, 2015). Bradley and Willett (2004) gave their students the chance to have a hands-on experience by using a lean kaizen approach to help the Lord Corporation improve production. Their results showed that the students succeeded in helping the company get better results after analysing their processes and highlighting some issues within the organization. This university–industry collaboration paved the way for exploiting students' fresh perspectives to help firms utilize practical techniques for successfully managing a kaizen project (Bradley and Willett, 2004).

Hasan and Hossain (2018) used kaizen and PDCA to help their engineering students apply lean methods to solve real problems. Their study suggested that the students became more skilled in developing the most efficient and effective processes and were well on their way to being experts in their own field of specialization. According to Hasan and Hossain (2018), this way of learning by doing gave far better results than traditional lectures, as it equipped the students with the right skills for their future careers and created a practical mindset.

Allen *et al.* (2009) applied lean principle in the classroom by having undergraduate business students become involved in an actual problem-solving situation. The results were overwhelmingly positive. The students applied kaizen principles to tackle the problems and their ideas helped to reduce the operations cost by $500,000. Similarly, Anderson *et al.* (2011) adopted the A3 lean tools in an MBA class with outstanding results. The students felt that mastering Toyota's problem-solving toolkit would give them a decided advantage in securing a job and in advancing their careers. The students who enrolled in the course on principles and practice of lean philosophy had minimal knowledge of the subject but had already completed the prerequisite course on operations management. The instructor started with very basic concepts and spent six weeks teaching them the fundamentals of lean

management. The five principles of lean production as introduced by Womack *et al.* (1990) including value, value stream, flow, pull and perfection were covered, together with the differences among value-added, non-value-added and essential non-value-added activities. The commonest sources of waste were transportation, inventory, motion, waiting, over-processing, over-production, defects and skills (using the mnemonic, TIMWOODS). These topics were presented with real-life examples, case studies, videos and games (Bicheno, 1995; Bicheno, 2008; Nicholas, 2018). After introducing the basics, the instructor discussed lean improvement techniques such as 5s standardization (sort, set in order, shine, standardize, sustain) (Ohno, 1988; Bicheno, 2008), visual management, poka yoke, andon, jidoka, kanban, JIT, SMED and kaizen (Bicheno, 2008). This was followed by the seven basic methods to help students analyse problems: tally sheets, histograms, fishbones, Pareto analysis, control charts, scatter plots and process flow charts (Dias and Saraiva, 2004). In addition to these tools, the instructor explained the five whys, spaghetti analysis, VSM, A3, PDCA and the gemba walk (Bicheno, 2008; Sobek and Smalley, 2008; Nicholas, 2018). As the course progressed, the students overcame their initial confusion and started thinking according to lean principles. The games and case studies helped them grasp how lean system concepts could be applied to speed up a process (Badurdeen *et al.*, 2010; Bicheno, 2008).

The A3 project

The project was designed to follow the A3 report format. The A3 system is part of a lean tool box of powerful kaizen methods for analysing and solving problems (Bicheno, 2008; Sobek and Smalley, 2008). A3, which evolved around the kaizen methodology and PDCA cycle (Liker and Meier, 2006; Bicheno, 2008), has been emphasized by Toyota as the premier method for maintaining optimal production (Sobek and Smalley, 2008). Toyota has used the A3 reporting format for working on problems, highlighting project status and making proposals (Sobek and Smalley, 2008). The A3 report is a standard format used by Toyota kaizen teams along with the gemba walk to analyse problems and decide on appropriate solutions (Sobek and Smalley, 2008; Doman, 2011). The A3 format used by the student groups had seven general headings following the PDCA cycle (see Appendix). After introducing the basic lean concepts and tools that students needed to tackle the problem presented by the bank team, the instructor explained how the A3 report could be used to define and analyse the problem. Students were instructed to tackle the problem using the lean tools and following the kaizen approach which emphasizes incremental change (Ohno, 1988). Sobek and Smalley (2008) explained how the PDCA cycle could be divided into left- and right-hand sides to create A3 reports. The left-hand side is the planning phase where students explore the background, describe the current process, find the root cause of the problem and set measurable targets to reduce waste. On the right-hand side are the other three components of the cycle – doing, checking and acting. In the doing phase, students need to choose methods to tackle the root cause of the problem. In the checking phase, the students need to determine whether the proposed countermeasures were effective in resolving the problem; and finally, in the acting phase, if the solution works, the loan officers at the bank need to make it a sustainable part of the standard procedure and teach employees to use it properly.

Figure 1 shows the template and guidelines followed by the students in analysing and solving the L-Bank's loan processing problem. To arrive at a workable plan, however, the students stopped at each stage to analyse and evaluate their progress.

After six weeks, the instructor felt that the students had mastered the lean methods and were ready to take on the loan process problem. The instructor acted like a team coach or sensei (Womack and Jones, 1996; Doman, 2011). He tried not to influence the students' analyses, as the main objective of this real-life challenge was to allow them to apply the lean techniques they learned in the classroom to identify and eliminate waste in the loan

Plan

In the Planning Stage, students should address the following:

1. **Background of the problem:** Students need to define the symptoms and the impact. It might have to do with a company's market-share target, how to improve service, reduce cost, or increase productivity. The problem must be stated in one or two sentences, including what was affected and the severity.
2. **Current conditions:** Students need to explain the problem and its consequences: What type of waste is in the process and how is it affecting the bank's productivity? What are the value-added activities, the non-value-added activities and the essential non-value-added activities? Which activity needs be changed to solve this problem? Students should present these elements visually using spaghetti diagrams, histograms, Pareto charts, process flow charts, tally sheets, or value stream maps.
3. **Goals/targets:** What goals do you propose to resolve the problem and what outcomes are expected? Students should set measurable targets and explain what constitutes their successful attainment. The goals and targets need to be 'SMART'--specific, measurable, attainable, realistic, and timely.
4. **Root cause analysis:** What are the main causes of this problem? Students need to consider all factors to identify the root causes of the problem.

Do

In the Doing Stage, students should suggest countermeasures to remove waste.

5. **Countermeasures:** To resolve the problem, students need to identify the corrective measures that address the root causes.

Check

In the Checking Stage, students should describe the expected outcomes.

6. **Effect confirmation: implementation plan:** Students should describe the desired future state of the process and how implementation of the proposed countermeasures will produce this outcome.

Act

In the Acting Stage, students should develop a follow-up plan for sustaining the improvement.

7. **Follow-up:** Students should propose follow-up steps to ensure that the proposed solution is fully implemented and sustained.

Figure 1.
Students' guidelines to analyse and solve the problem

procedure. The students observed the current process and interviewed selected employees to better understand the problem and identify the sources of wastes in the process. They also tried to come up with small incremental changes that together could make a large difference in the loan process. Their plan centred on the idea that employees needed to work smarter not harder to reduce a client's waiting time. After completing the A3 project, the students presented their work to the L-Bank team.

Analysis and discussion

This study presents empirical evidence about the outcome from successful application of A3 and PDCA strategies by undergraduate students after taking a course in lean management practices at a business school. There were six groups who analysed the L-Bank's loan procedure and applied lean principles to reduce the processing time. Each group's work was marked individually and the instructor summarized the findings of the top two groups. The following section provides the A3 analysis of the bank's loan procedure as conducted by the students. The A3 has been divided into seven main tasks following the PDCA cycle:

(1) Task 1: Background of the problem (*plan*)

(2) Task 2: Current condition of the problem (*plan*)

(3) Task 3: Goals (*plan*)

(4) Task 4: Root cause determination (*plan*)

(5) Task 5: Countermeasures (*do*)

(6) Task 6: Effect confirmation (expected outcomes) (*check*)

(7) Task 7: Follow-up plan (*act*)

Task 1. background (plan phase)

The process improvement manager (PIM) for L-Bank met with the student teams for 1 h on each of three days and explained how the process worked and the severity of the problem. The students stated the problem as follows: the loan application takes an excessive amount of time to complete which results in customer dissatisfaction. This inefficient process could be speeded up by eliminating time-wasting procedures. L-Bank is one of the most popular in Kuwait, and it derives substantial profits from loans. Currently a loan for one client takes 31 min to process and this time can increase 25% or more because of mistakes, which means the bank can only do about 14 applications per day. In other banks, a loan can be processed in half the time. This was the problem facing the students.

Task 2. current conditions (plan phase)

To understand the current state of the process, the students conducted gemba walks at several L-Bank branches to observe the procedures and followed up with semi-structured interviews. Branch managers explained the loan process while the students recorded and timed each step needed to complete the loan deal and to identify value-added, non-value-added and essential non-value-added activities. Students calculated the cycle team for each step, monitored the movement of the employees, identified the root causes of the problem and devised countermeasures to improve the process. During the gemba walk, the students questioned the employees about every step in the process, particularly what would be the result of removing a step or merging steps together. They asked whether the employees thought the current procedure was efficient or should be improved, and if so, how. They also

asked why approval was needed for certain steps. Based on the branch managers' inputs and students' observations, clients must perform the following steps in the current loan application process:

Request a loan. Relationship manager (front office):

1. Request required documents.
2. Check documents and sign forms (2 min)
   2.1 Check salary certificate and civil ID
   2.2 Sign CI-Net consent form and save on *PC*
3. Update CIF from system: IMAL CSM (4 min)
   3.1 Update client's information in system (IMAL CSM)
4. Print account statement from system: IMAL CSM (2 min)
   4.1 Obtain three-month account statement (25 pages)
5. Create deal from system: PEGA (6 min)
   5.1 Enter client information: CIF number, financial details, Ci-Net details, Ci-Net summary, bank account, guarantors, vendor details
6. CI-NET upload from system: CI-NET – (5 min)
   6.1 Upload CI-Net consent form (CI-NET) to view client's liabilities.
7. Print deal documents from system: IMAL Islamic Deal – (5 min)
   7.1 Enter client's details: CIF #
   7.2 Print deal documents
8. Obtain client's signature (2 min)
   8.1 Obtain client's signature on every page of deal package (16 signatures)
9. Upload to system: PEGA for credit approval – (5 min)

Based on study findings, any correction or missed information will add 25% to the time. The following flow chart shows the steps for completing the loan process as depicted by students (see Figure 2).

Waste identified in the loan process. The process starts by the customer entering or calling the bank and requesting a loan. The bank then gives them three standard documents and a consent form to sign to enable the bank to check their financial status on the credit information network (CI-NET). The relationship manager (RM) must print out the form, have

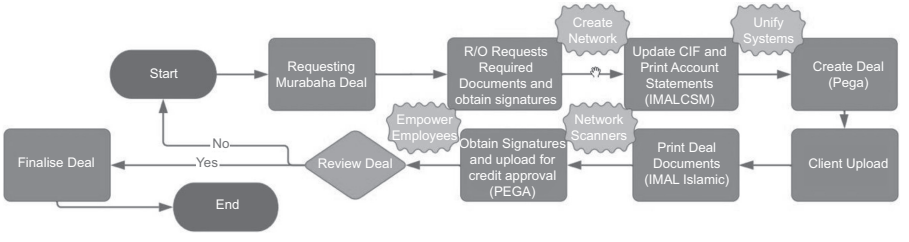

Figure 2.
Flow chart for the current state of the loan process

the client sign it and scan it which wastes time. The next step is to talk to the client about their liabilities instead of uploading the scanned consent form into the CIF. This is a major non-value-added step and an under-utilization of employee skills. There is no need for the bank to spend time speaking to the client to get information that might turn out to be untrue. Based only on client-supplied liability information, the RM may calculate the wrong loan amount. This constitutes over-processing waste and should be eliminated.

After checking the client's liabilities, the employee uploads the information into the PEGA system. The PEGA is a workflow system between the bank and an outside vendor, which needs to be updated with the client's information before the forms can be uploaded. There are unnecessary screens in this system where the RM has to search for the required fields that need to be filled resulting in over-processing waste. The information sent to the vendor, including the amount of the loan, is all based on information given verbally by the client, and this increases the risk of errors because the accuracy is not validated. After this step, the RM uploads the signed consent form to the CI-NET system, which allows an employee to check the client's financial status. This should have been done at the beginning rather than after taking verbal information that wastes the client's time. Next, the RM initiates the IMAL-Islamic loan process by logging into the site, where the client's information has to be entered again – another over-processing step. The application is printed and given to the customer for signing, usually 11–16 pages. According to the rules of the Central Bank of Kuwait (CBK), signatures are needed on only six pages. Finally, the RM requests approval of the loan from the PEGA system; but if the client fails to qualify because of inaccuracies in their information, the process cannot be completed and the RM must start over, wasting even more time and effort. The process should have started with a check of the client's liability to avoid wasting time and causing dissatisfaction. Ideally, the process should be completed in 31 min; however, our studies showed that the process often takes longer due to errors, and each problem increases the time by 25%. The student interviews with the L-Bank process improvement team revealed the most prevalent types of error (Table 2).

Table 2 shows that most of the errors resulted from missing details in the applications. The improvement strategy would be to eliminate the process with the most wasteful errors. Pareto analysis was conducted to identify the main problems for investigation and modification (see Figure 3).

The Pareto analysis showed that application errors and CI-NET errors were the most prevalent, so the improvement method was focussed on these two errors to eliminate waste in the process. Student observations, interviews and analyses revealed several steps that a client did not need to complete at the bank. They also found several other inefficiencies responsible for most of the wasted time (Table 3) and three major steps that needed improvement depicted as kaizen bursts on the flow chart (Figure 1). The decision to accept or reject the deal comes at the end of the process, which means that a critical error will negate the deal forcing the RM and client to start over.

Error type	Average number of errors per quarter
Missing application or errors in details	649
CI-NET errors	276
CBK policy	265
Missing or incomplete account statement	113
Missing or invalid salary certificate	65
Missing or invalid civic ID	49
Quotation error	5

Table 2.
Types of errors in the loan process

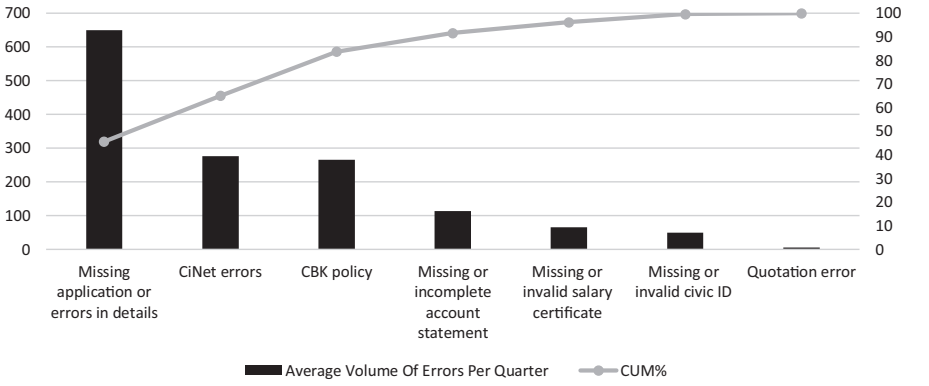

Figure 3.
Pareto chart for comparing error types in the loan process

Waste	Description
Motion	(1) Looking for information and files
	(2) Walking to another room for scanning
	(3) Going to the back office for a signature
	(4) Seeking information by phone, email or in person
	(5) Fetching the CI-NET form. After the CI-NET form is signed, it is scanned and uploaded to the server. These movements are unnecessary because this step can be carried out in a more efficient way
Over-processing	(1) Multiple signatures
	(2) Printing the CI-NET form is unnecessary because after the RM obtains the client's signature on the document, it is uploaded to the server again
	(3) Printing the three-month account statement from the IMAL CSM system is unnecessary because the RM only needs to check if the client's salary is correct as stated
	(4) Multiple passwords needed to log in to different systems
	(5) Multiple systems and repeated input of information
Waiting	(1) Clients have to wait while the employee prints and scans documents
	(2) Clients wait while the employee looks up vendor codes
	(3) When clients are unaware of the required papers they need to bring, they will need to get them and return
	(4) Many steps within the process can be carried out without the client's presence because all they need to do is read and sign the application. This should take substantially less than the average 31-min processing time
Defects	(1) Manual input of information causes errors
	(2) Lack of standardization leads to defects and wasted time
	(3) Having to work on multiple systems places unnecessary burden on employees and leads to mistakes
	(4) Any mistakes like filling in the wrong information necessitate repeating the whole process
Skills	(1) Employee productivity and efficiency varies
	(2) Parts of the RM's job could easily be automated to save time

Table 3.
Waste identified in the loan process

Task 3. goals (plan phase)

The students were instructed to establish their targets using the SMART system: specific, measurable, achievable, realistic and timely. The SMART system criteria help to focus improvement efforts and increase the chances of achieving the goal of reducing time waste.

The target was to reduce the loan processing time from 31 to 15.5 min. Students conducting a benchmark analysis of an online application process with local Kuwait banks found that it only took 17 min to complete the process. The *takt* time was used to set the SMART target. From interviews with RMs, the students learned that employees worked an 8 h a day with a 1-h break (420 min), which meant that with an average time of 31 min for each loan application, they could process a maximum of 14 loans per day. Reducing the processing time to 15.5 min allowed RMs to process 27 loans per day (420 min/15.5 min = 27). Takt Time = 420 min/27 deals = 15.5 min/deal

Task 4. root cause determination (plan phase)

A priority of the teams was to determine the root causes of the delays in the loan process. The students visited different branches where they engaged in gemba walks to observe the loan process and interviewed key personnel such as the RM, branch manager and process improvement manager who were directly involved in creating the loan application procedure. Fishbone analysis was used to uncover the root causes of the problem: manpower, machines and methods. The students described these as follows:

(1) Manpower:

- There was a lack of employee empowerment and process ownership, which led to variation and lack of standardization in the work done by employees in different branches.
- Employees were not trained well enough.

(2) Machines:

- Only one scanner was available for multiple employees to use to complete the process.
- The card reader was not used or working properly.
- There was no biometric/facial reader for logins (six logins have to be memorized by each employee).

(3) Methods:

- Lack of standardization leads to mistakes.
- Asking for extra signatures.
- Unnecessary pages printed.
- CBK policies limit improvement and efficiency.
- Multiple systems, passwords and signatures are used.
- Employees are not allowed visual aids to help with the process.
- File management is inefficient leading to motion waste and mistakes.
- The process is not standardized across the branches.
- Too much of the process is manual.

There was a lot of time wasted through over-processing in creating a loan deal. The same information had to be input several times on several different systems and employees were required to sign into the system each time for security reasons. This step could be eliminated if employees had a more efficient way of signing in such as face recognition. The repeated

entering of information causes delays and increases the chances of mistakes. Also, the online document does not have a Save button on each page, so an error will not be caught until the last page. Mistakes because of over-processing are a common problem, occurring in about 45% of loan applications. On average, customers are expected to sign up to 16 pages, even though only six of them are a CBK requirement. This is a major time waster. The teams found the lean tools such as 5S, visual management, andon and poka yoke exceptionally helpful for organizing the process better and reducing waste. Standardization minimized variation and encouraged employees to take responsibility for the process.

Task 5. countermeasures (do phase)

After completing the root cause analysis, the students came up with different countermeasures to speed up the process and prevent errors. The countermeasures were divided into two categories: (1) incremental countermeasures to stabilize the process and reduce the takt time, and (2) radical countermeasures that require completely changing the system, but which will reduce the takt time, increase the number of loans processed per day and decrease errors. Both types of countermeasure were discussed with L-Bank to ensure applicability and ease of implementation. Only the approved countermeasures are shown as follows. The student teams made the following recommendations to successfully create and implement the new lean loan process.

Incremental countermeasures should reduce the loan process to 9 min. When a client first enters the bank, there should be a display at the entrance indicating the documents needed for the loan application. This information is provided for clients who may not know what is required to reduce waiting time. With this form of visual management, the client will immediately know by reading the board if they have brought the necessary documents before they meet with the RM. Visual management is a lean tool in which signs are placed around the bank in plain sight so that clients can easily and quickly understand the process.

A second countermeasure is for the RM to use facial recognition to log into accounts rather than having to repeatedly sign in. This strategy will not only eliminate waiting time but will also reduce motion waste. The lean tool used here is 5S ("sort, set, shine, standardize, sustain"), which is a set of methods for creating and sustaining a clean, organized, safe workplace to promote efficiency and sustainability by reducing waste. Another useful measure is for the client's liabilities to be checked for errors at the beginning of the process to avoid losing time at the end of the application if defects are found. If there is an error, the client will be made aware of it at the beginning and can correct the information without having to restart the whole process. This can be accomplished with the use of 5S by sorting through the process to create a convenient, logical system. The process also has to be standardized and sustained for there to be a long-term benefit in time reduction. Also, most of the printed pages are not required by the bank or CBK policy and this unnecessary printing caused over-production, time and motion waste by the RM. When filling out the loan forms electronically, there should be a visual signal to alert the client that there is missing or incorrect information in the form. This error signalling is one of the lean tools known as andon and eliminates the need for the RM to check every page for errors or missing information, which is a waste of his time and skill. Every page of a form will also have a Save button to reduce mistakes in the process – another lean mechanism known as poka yoke. Following the 5S principle, all information such as name, occupation, salary and so on should be on a single page of the PEGA form rather than on separate pages. This reduces over-processing and waiting time because the client does not need to go through multiple pages to make changes. Unnecessary signatures should also be eliminated as only six documents, the purchase contract, finance request, medical, liability awareness, vendor quotation and account statement, need to be signed. This eliminates motion and over-processing waste and improves the flow by

standardizing the process. Another way to enhance continuous flow is for the RM to upload the files on the system for the back office to see rather than physically delivering them. The final countermeasure for improving the loan creation process is to use a coded system to calculate the loans rather than calculating them manually. With the use of poka yoke, the possibility of mistakes will approach zero and over-processing will be reduced as the chance of human error will be virtually eliminated. To validate their countermeasures, the students conducted discussions with focus groups of L-Bank customers and asked them about their experiences in applying for a loan. The two separate focus groups contained five adults each between the ages of 30 and 55, and the results supported the conclusion that implementing their methods for reducing time and motion waste in the online application would be successful (see Table 4).

Radical countermeasures should reduce the loan process to 5 min. After implementing incremental countermeasure to create stability, the bank can utilize the following to further improve the system.

Task 1 – Create a company network.

Immediately uploading information onto the server allows employees to work on tasks as soon as they become available.

Task 2 – Unifying systems.

Reduce the need for multiple logins so employees can easily work on different systems.

Task 3 – Training employees.

Employees should be trained in loan processing using the new system.

Task 4 – Multi-page network scanners.

Scanners should be installed in every employee's office and connected to the network.

Task 5 – Implementing hardware.

Biometric facial recognition systems and card readers should be deployed to reduce login time and standardize naming.

Task 6 – Standardized work.

Networking will allow employees to work simultaneously on the cloud server and it will force employees to adopt a standardized naming system.

Task 7 – Ensure continuous improvement (kaizen).

Monitor the process and observe employees to measure the increase in efficiency and reduction in waste (see Table 5).

Task 6. effect confirmation (check phase)

Students cannot be sure of the success of their ideas, so in this step they try to show the expected outcomes of their proposals. Based on communications with the change management manager in L-Bank, the proposed incremental and radical countermeasures will be implemented immediately, so the effects of the changes will become quickly apparent. With regard to the time-saving incremental countermeasures based on takt time calculations, the goal was to have a takt time equal to 15.5 min, but students managed to reduce it to 9 min. Without the incremental countermeasures, the bank could only serve 14 clients, but with the improvements, the process can handle up to 46 clients in a day. This will attract more customers and could increase the L-Bank's market share. This idea is easy to implement and will need only a little work from the IT department with no cost to the bank. All employees will be informed of the new system and supervisors in each branch will ensure that it is implemented correctly and employees fully understand it.

If the radical countermeasures were implemented, the loan process could be reduced from 31 min to around 5 min per deal which means that the number of loan applications processed per day could be increased from 14 to as many as 84 per day (see Figure 4).

After implementing lean procedures, the new process had fewer steps which should significantly reduce the number of defects. In addition, the decision to begin the application

Table 4.
Countermeasures for incremental change

Incremental countermeasure	Lean tools/ techniques	Type of waste eliminated	Description
A direction board displaying the necessary steps and documents to apply for a loan	Visual management	Waiting time	When the customers are not aware of the required papers they need to bring, they will need to revisit the RM. With visual management, they will immediately know which documents they need
Face recognition to log in	Automation	Waiting and motion	Rather than having to repeatedly sign in when switching between the systems, face recognition software will immediately log the RM into the system
Checking liability at the beginning of the loan process rather than the end	Andon and poka yoke	Waiting and defects	Checking the liability at the beginning of the process saves time in case of errors in the liability information
Eliminating unnecessary printing	5S	Motion, transportation and over-production	No waiting for pages to be printed or for the RM to take them to the office
Giving employees and customers a signal when there is missing data (which is linked to CIF)	Andon	Defects	Visual alerts will save time by flagging missing or incorrect data on each page of the forms
Cancelling unnecessary steps such as taking verbal information from the customer when it can be done online	Poka yoke	Waiting time	Since approval is unnecessary, the client's waiting time is reduced
Placing a save button on every page of the forms	Poka yoke	Skills	Instead of scrolling down to the final page, the client can save each page separately
Placing name, occupation, salary and related information on a single page of the PEGA form	5S	Over-processing	All required information is placed on a single page and unrequired fields are removed
Employees upload documents and forms instead of delivering them to the back office	Automation and one-piece flow	Motion	Uploading the files on the system for the back office saves time and effort
A coded system is used to calculate loans	Poka yoke	Waiting and skills	With the use of poka yoke, mistakes will approach zero as human error and over-processing are reduced
Reduce the number of papers needing to be signed at the end of the process to the essential six	5S	Over-processing	By standardizing the application in all branches, clients only sign necessary forms

Radical countermeasures	Lean tools/ techniques	Type of waste eliminated	Description
Create a cloud server for the bank	One-piece flow and 5s	Over-processing, motion and waiting	A cloud server will benefit the company by providing employees with real-time access to information to reduce motion waste and waiting time
Unify systems, implement facial recognition and biometric software	Poka yoke and 5s	Over-processing, motion and waiting	Employees will be able to work on a single efficient system instead of four systems which all require separate logins
Install networked scanners in each employee's office	Standardization and 5s	Skills, motion and waiting	Reduce wasted employee time and motion by enabling them to scan and send signed documents to the back office (internal to external process)
Spread work evenly across multiple employees in different branches, convert multiple internal processes to external and reduce defects by focussing on small tasks	Heijunka	Over-processing and defects	Different bank branches usually have different numbers of clients, so with an accessible network, all employees can share the work load and focus on individual tasks that reduce defects
Use alerts to signal defects instead of manual searching and checking	Jidoka, andon, visual management and 5S	Motion and defects	Employees have to look through account statements to find if there is a change in salary and a website to look for product codes and look for papers through drawers
Empower employees by decentralizing the system so their policies can easily align with higher management and they can finalize signatures on documents	Hoshin kanri and empowerment	Motion and waiting	Employees are required to send documents to the back office and await their signature to complete the process

Table 5.
Countermeasures for radical changes

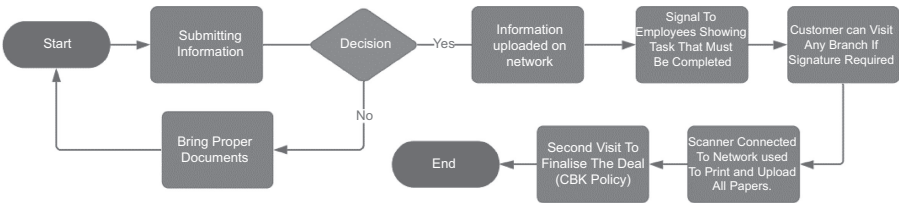

Figure 4.
Flow chart for the process (future state)

was placed at the beginning of the process which eliminates much wasted time in the previous process.

Task 7. follow-up (act phase)

To sustain the improvements, the students devised several actions to help the bank monitor and maintain the new system:

(1) Stop using the old process completely.

(2) Monitor and evaluate the new process to look for further improvement opportunities.

(3) Continuously improve the process to reduce waste.

(4) Ensure that employees are properly trained to perform the tasks and to enhance their abilities.

(5) The employees at the front desk, who give out the numbers, should be familiar with the process so if a customer asks about it, they can provide accurate information to eliminate waiting time.

Conclusions

Part of the university initiative was to have industry–university collaborations where students would have a real-life problem to practice what they had learned in the classroom. This experience shows that lean philosophy can radically change peoples' attitudes towards efficiency and problem-solving. The undergraduates were given the opportunity to analyse a critical process in a bank and come up with a solution that helped the bank to reduce waiting time by removing or modifying activities that detracted from the process. From the perspectives of the L-Bank and the students, the A3 project about the loan process was a huge success. Students, faculty and the L-Bank staff worked together effectively to improve the loan process. Lean principles, tools and techniques were learned in a short period of time and then applied by students to "lean out" the loan process in an innovative and highly engaging learning experience. The outcomes of this project were beyond the L-Bank team's expectations and their feedback was very useful, as was the feedback from the students. Here are some comments from the students after completing the project:

> The course overall was extremely interesting and the project helped immensely with our understanding of lean management. It encouraged us to look for more information regarding lean tools to complete the project which ensured I have a broader understanding in the module.
>
> The project encouraged the group members and me to work consistently and put in our best efforts, which is beneficial to us as people; it ensured that we used our own critical thinking skills to complete the project. This style of teaching should be implemented in other courses as well to improve the level of education.
>
> This project was very detailed and intense as there were many specific parts that needed to be analyzed and worked on. It was interesting to study a real-life bank process and to look for flaws in the system and develop ways to improve it. Overall, I learned a great deal from this project and enjoyed working with my group.
>
> It was a bit challenging and required a lot of work but in the end it was filled with new experience.
>
> This project has been very long and tiring but also very useful and practical. I personally learnt a lot from it on both the academic and personal level.
>
> This was one of the most interactive projects I have ever participated in. I found the project interesting and challenging which was the best part of it. It required precision and had to be very careful with analysing the data which made the project way more fun and challenging. I thank team L-Bank and especially the professor for providing us with such rare experience. I'm so glad I took a part of this project.

The feedback from both L-Bank staff and students showed that this project was a successful learning experience. Students in particular felt very proud of themselves as they managed to come up with a solution in the span of a few weeks that should significantly benefit the bank.

This study shows that lean tools can be applied to improve a specific banking process. More importantly, it shows that students can quickly grasp the methods of lean management and apply them to solve real problems (Doman, 2011; Singh, 2019). The lean system is not just a set of tools but a way of thinking and approaching a problem that anyone can learn to apply once they have mastered the technique. It also demonstrates the great benefits that can be gained by industry–university collaboration. The bank can save money by engaging students to solve real-life problems and the students can gain useful, practical experience by applying classroom learning to reducing waste in a real banking procedure.

This case study has many important implications. It confirmed that students could acquire profitable experience in solving a real-world business problem that brought tangible benefits to the bank, for which they received accolades from L-Bank's managers. The students all agreed that this was a great career-building opportunity and they learned much more through hands-on activity than in classroom lectures. They felt that these projects would make their resumes stand out, improving their chances of employment particularly with a participating industry partner. This project was a true win-win opportunity for the bank, the universities and the students. Other banks should profit from this study in learning how to remove waste from their processes as well as improving their operations by applying lean tools.

We believe that successful application of lean skills requires a special mindset and that the best way to learn lean concepts is by testing one's classroom knowledge in solving a real-life problem. Lean educators can learn from this experience and customize this project based on their students' needs to give them a chance to prove their understanding and unleash their potential. This study may also encourage other Kuwaiti companies to collaborate with universities in developing courses in which students combine classroom study with hands-on work in a corporate environment with the goal of utilizing lean skills to improve business processes and reduce costs. Instead of hiring consultants, students can do this job and come up with practical, innovative solutions, especially in businesses that interest them like those that depend on competitive branding and marketing.

Epilogue

After completing the project, the groups made presentations of their A3 and PDCA analyses of the current conditions and their lean process recommendation to the panel of judges from L-Bank's process improvement team. The panel applauded the students' efforts and assured them that they considered most of the solutions valid and that the bank will be testing them as a way to improve the current loan process. The top two groups have been rewarded and invited to pitch their ideas to the bank CEO and top management in a small event in January 2020. Some students have even been offered a job by L-Bank.

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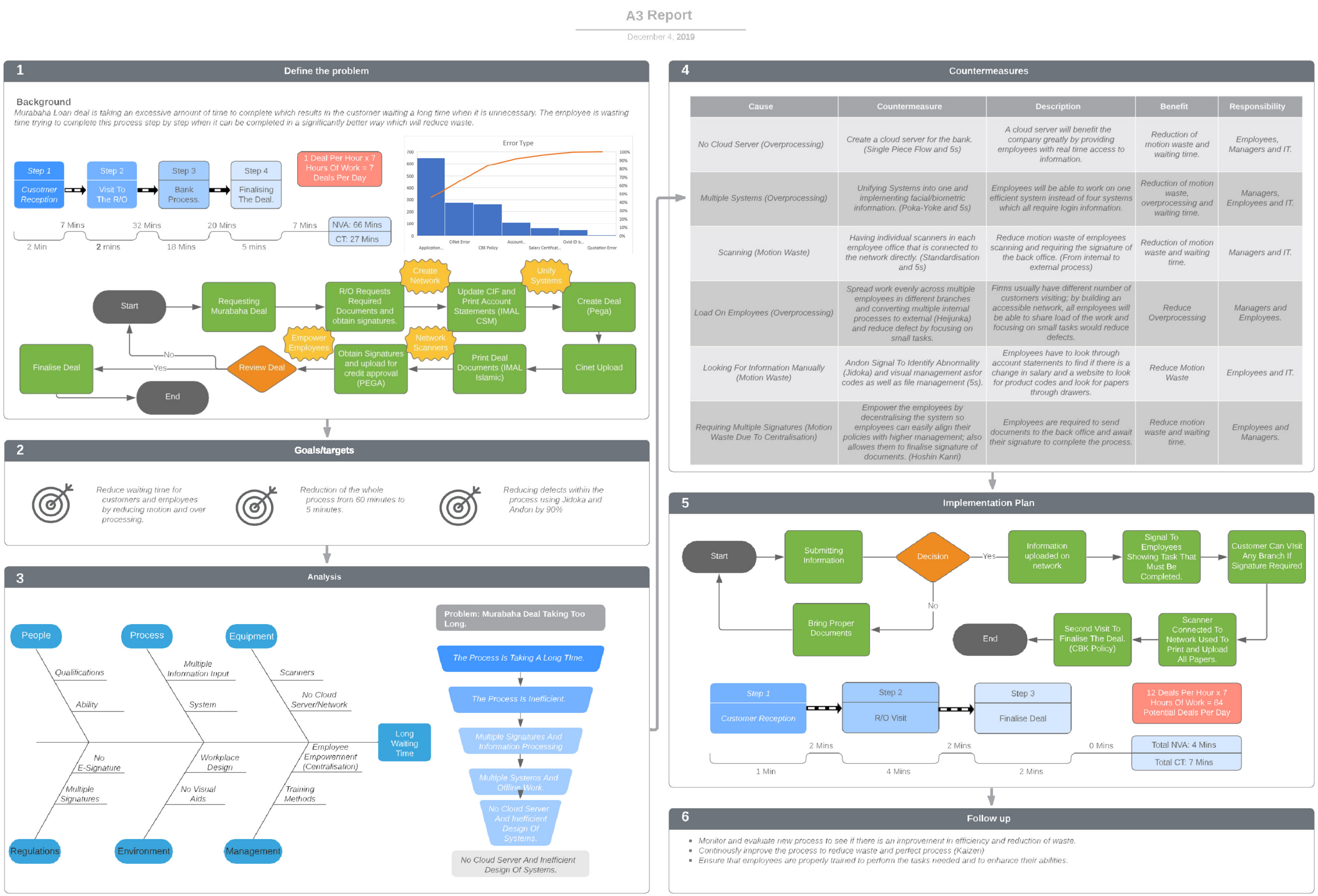
A3 Report
December 4, 2019
1 Define the problem
Background
Murabaha Loan deal is taking an excessive amount of time to complete which results in the customer waiting a long time when it is unnecessary. The employee is wasting time trying to complete this process step by step when it can be completed in a significantly better way which will reduce waste.
Step 1 Cusotmer Reception
Step 2 Visit To The R/O
Step 3 Bank Process.
Step 4 Finalising The Deal.
1 Deal Per Hour x 7 Hours Of Work = 7 Deals Per Day
7 Mins
32 Mins
20 Mins
7 Mins
2 Min
2 mins
18 Mins
5 mins
NVA: 66 Mins
CT: 27 Mins
Error Type
Start
Requesting Murabaha Deal
R/O Requests Required Documents and obtain signatures.
Create Network
Update CIF and Print Account Statements (IMAL CSM)
Unify Systems
Create Deal (Pega)
Empower Employees
Network Scanners
Finalise Deal
No
Yes
Review Deal
Obtain Signatures and upload for credit approval (PEGA)
Print Deal Documents (IMAL Islamic)
Cinet Upload
End
2 Goals/targets
Reduce waiting time for customers and employees by reducing motion and over processing.
Reduction of the whole process from 60 minutes to 5 minutes.
Reducing defects within the process using Jidoka and Andon by 90%
3 Analysis
People
Process
Equipment
Qualifications
Ability
Multiple Information Input
System
Scanners
No Cloud Server/Network
No E-Signature
Multiple Signatures
Workplace Design
No Visual Aids
Employee Empowerment (Centralisation)
Training Methods
Long Waiting Time
Regulations
Environment
Management
Problem: Murabaha Deal Taking Too Long.
The Process Is Taking A Long Time.
The Process Is Inefficient.
Multiple Signatures And Information Processing
Multiple Systems And Offline Work
No Cloud Server And Inefficient Design Of Systems.
No Cloud Server And Inefficient Design Of Systems.
4 Countermeasures
5 Implementation Plan
Start
Submitting Information
Decision
Yes
No
Information uploaded on network
Signal To Employees Showing Task That Must Be Completed.
Customer Can Visit Any Branch If Signature Required
Bring Proper Documents
End
Second Visit To Finalise The Deal. (CBK Policy)
Scanner Connected To Network Used To Print and Upload All Papers.
Step 1 Customer Reception
Step 2 R/O Visit
Step 3 Finalise Deal
12 Deals Per Hour x 7 Hours Of Work = 84 Potential Deals Per Day
2 Mins
2 Mins
0 Mins
1 Min
4 Mins
2 Mins
Total NVA: 4 Mins
Total CT: 7 Mins
6 Follow up
Monitor and evaluate new process to see if there is an improvement in efficiency and reduction of waste.
Continously improve the process to reduce waste and perfect process (Kaizen)
Ensure that employees are properly trained to perform the tasks needed and to enhance their abilities.

Cause	Countermeasure	Description	Benefit	Responsibility
No Cloud Server (Overprocessing)	Create a cloud server for the bank. (Single Piece Flow and 5s)	A cloud server will benefit the company greatly by providing employees with real time access to information.	Reduction of motion waste and waiting time.	Employees, Managers and IT.
Multiple Systems (Overprocessing)	Unifying Systems into one and implementing facial/biometric information. (Poka-Yoke and 5s)	Employees will be able to work on one efficient system instead of four systems which all require login information.	Reduction of motion waste, overprocessing and waiting time.	Managers, Employees and IT.
Scanning (Motion Waste)	Having individual scanners in each employee office that is connected to the network directly. (Standardisation and 5s)	Reduce motion waste of employees scanning and requiring the signature of the back office. (From internal to external process)	Reduction of motion waste and waiting time.	Managers and IT.
Load On Employees (Overprocessing)	Spread work evenly across multiple employees in different branches and converting multiple internal processes to external (Heijunka) and reduce defect by focusing on small tasks.	Firms usually have different number of customers visiting; by building an accessible network, all employees will be able to share load of the work and focusing on small tasks would reduce defects.	Reduce Overprocessing	Managers and Employees.
Looking For Information Manually (Motion Waste)	Andon Signal To Identify Abnormality (Jidoka) and visual management asfor codes as well as file management (5s).	Employees have to look through account statements to find if there is a change in salary and a website to look for product codes and look for papers through drawers.	Reduce Motion Waste	Employees and IT.
Requiring Multiple Signatures (Motion Waste Due To Centralisation)	Empower the employees by decentralising the system so employees can easily align their policies with higher management; also allowes them to finalise signature of documents. (Hoshin Kanri)	Employees are required to send documents to the back office and await their signature to complete the process.	Reduce motion waste and waiting time.	Employees and Managers.

About the author

Mohamad Alnajem is currently an assistant professor of Business Administration in Operations Management at Gulf University for Science and Technology (GUST), where he has been since September 2016. All of his qualifications were obtained from the University of Portsmouth (UoP), UK. He received a BEng in Communication System Engineering in 2004, MSc in Technology Management in 2009 and received his PhD in Engineering Management/Industrial Engineering in 2014. His research interests are situated in the field of Lean Management System, Supply Chain Management (SCM), Six Sigma, Sustainable management, Entrepreneurship, Service Quality and ISO 9000. Much of his work has been on developing lean readiness level assessment frameworks. His current research projects focus on measuring lean readiness level within Kuwaiti hospitals. Mohamad Alnajem can be contacted at: alnajem.m@gust.edu.kw