

IMPLEMENTING LEAN SERVICE OPERATIONS: A CASE STUDY FROM TURKISH BANKING INDUSTRY

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ABSTRACT

This paper describes lean management and its application in banking industry. Since lean management eliminates waste effectively in manufacturing environment with significant outputs, service industry has started to focus on lean implementations. In this sense, this paper is a pioneer especially for banking in service sector in Turkey to eliminate waste by means of lean methods. For this reason, a branch of a nationwide state bank in Aegean region was selected as pilot to collect data by observing customers, employee and operations. After analyzing the collected data, some improvements due to eliminations of unnecessary operations were offered. Our results show that significant improvements in banking sector are easy to achieve just by focusing value adding operations. Obtained results are also valid for other branches of the bank.

Keywords: *Lean Service Management, Lean Thinking, Efficiency in Banking*

YALIN HİZMET İŞLEMLERİ UYGULAMASI: TÜRK BANKACILIK ENDÜSTRİSİNDE BİR ÖRNEK OLAY ANALİZİ

ÖZET

Bu çalışmada yalın yönetim ve bankacılık uygulaması ele alınmaktadır. Yalın yönetimin imalat ortamında anlamlı çıktılar sağlayacak şekilde atıl kaynakları ortadan kaldırmasından dolayı hizmet endüstrisi de yalın uygulamalarına odaklanmaya başlamıştır. Buradan hareketle, bu çalışma, özellikle yalın araçları kullanılarak Türkiye'de bankacılık sektöründeki atıl kullanımın ortadan kaldırılması anlamında öncü çalışmalardan birisi olmaktadır. Bu amaçla devlet bankalarından birisinin Ege Bölgesi'ndeki şubelerinden birisi pilot uygulama alanı olarak seçildi ve bu pilot çalışma alanında müşteriler, banka müşteri temsilcileri ve operasyonlar üzerinde gözlemler yapılarak veri toplanmıştır. Toplanan veriler analiz edildikten sonra gereksiz işlemlerin ortadan kaldırılmasına bağlı olarak bazı iyileştirmeler önerilmektedir. Elde edilen sonuçlar bankacılık sektörü için; katma değerli iş elemanlarına yoğunlaşmak suretiyle yapılan basit iyileştirmelerle anlamlı sonuçlara ulaşabileceğini göstermektedir. Elde edilen sonuçlar bankanın diğer şubelerine de aynı şekilde uygulanabilmektedir.

Anahtar Sözcükler: *Yalın Hizmet Yönetimi, Yalın Düşünce, Bankacılıkta Etkinlik*

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INTRODUCTION

In today's turbulent competitive environment, a company more than ever needs a strategy that specifies the kind of competitive advantage that it is seeking in its marketplace and articulates how that advantage is to be achieved (Hayes and Pisano, 1994: 77). One of the most important issues when producing goods and services is to use resources efficiently. This is a key factor in increasing productivity as well as increasing outputs under the same amount of inputs. Increasing performance of office and service operations will be crucial for highly competitive markets and rising living standards.

Lean production directly descended from and is frequently used as a proxy for Toyota Production System (TPS), which itself evolved from Taichi Ohno's experiments and initiatives over three decades at Toyota Motor Company (Shah and Ward, 2007: 5).

Many improvement techniques were developed during the manufacturing era, and nowadays many of the methodologies have been successfully adapted to work in the services business (Naval, 2008: 1). The most successful approach to the industrialization of office and service processes is Lean Thinking, originally pioneered by Toyota (Lean Management Institute, 2004: 2).

According to Radnor and Walley (2008), there is some evidence that this concept has transferred to the service sector. It is used at supermarkets especially by adapting the techniques for improving the flow of customers and the term is now used in many contexts, whether it focuses on the organization (as 'lean manufacturing' or 'lean service').

Arbos (2002) demonstrates the application of lean production in service operations by applying this type of approach to a case that is related to the telecommunication service.

Ahlstrom (2004) describes a framework for lean production and translates into service companies, using an empirical base consisting of descriptions of lean production applications in the service sector, made by practitioners from service companies.

Cuatrecasas (2004) describes a methodology to evolve from a classical model of behavior of a production system to a lean production one; this methodology is quite flexible and may cover a very wide spectrum of production systems with an application of the service sector (the check-out service of a hotel type establishment).

Radnor and Walley (2008) analyze a series of case studies of Lean in the public sector around four themes—process-based view, focus on

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value, elimination of waste and employee-driven change—before considering the implementation approach taken and outcomes achieved.

As can be seen easily in literature review, there is a great lack of lean service implementations in banking operations. If a medium sized branch of a bank is assumed to achieve thousands of operations daily by 10 to 30 people, lean service management will have great contributions in many ways such as effective usage of resources, reduced customer waiting times, highly satisfied customers and reduced workloads.

In this study we selected a branch of a country wide national bank in Turkey in order to investigate from lean service management viewpoint and whether there are any potential efficiency increases. We introduce changes as eliminating wastes and suggest new ideas by considering lean philosophy.

This study is important in several ways. Firstly, lean service management applications are newly introduced and there are a few of banking applications in the literature and none of the studies are related with banking services in Turkey. Secondly, if there are potential improvements in banking sector due to lean philosophy, its results can be generalized over thousands of other branches both in the selected bank and other national and international bank branches. Thirdly, lean management offers great improvements even if no additional input is used to increase the existing efficiency. Fourthly, banks which implement lean philosophy will gain cost leadership through great competitive advantage as eliminating waste of resources. Finally, further potential improvement issues will rise by deploying other existing operations on electronic banking implementations. If lean philosophy can be adapted to the banking sector today, improvements with the technological developments can be easily handled in the future.

Our research is based on mid-term real observations during 2 months in the selected branch of XYZ bank in Aegean Region. We observe the branch of the bank in terms of performance of the banking services to obtain performance indicators that are commonly used in a conventional service system. After determining the performance measures, source of wastes are investigated and some improvements are suggested by expressing the effects of the new system. Then findings of the existing and suggested system are compared.

The rest of the paper is organized as follows: Section 2 describes lean management and lean banking operations, Section 3 focuses on implementation area, description of the pilot bank branch as application

area, data collection and analysis of current process flows. Eliminations of unnecessary operations and other improvements are demonstrated in Section 4. Section 5 concludes the paper by presenting remarks and discussions based on our work.

LEAN MANAGEMENT

Lean Manufacturing is a philosophy that is common and is used around the world with well-known and tested results (Naval, 2008: 2). National Institute of Science and Technology (NIST) Manufacturing Extension Partnership (MEP) in India defines lean as a systematic approach to identifying and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection (Buzby et al., 2002: 513).

Researchers at the Lean Aerospace Initiative (LAI) at the Massachusetts Institute of Technology describe lean as adding value by eliminating waste, being responsive to change, focusing on quality, and enhancing the effectiveness of the workforce. (Cook and Graser, 2001: 8)

United States Environmental Protection Agency (EPA) emphasizes strongly the importance of eliminating waste, encourages lean implementations. From this point of view, EPA defines lean manufacturing as the systematic elimination of waste from all aspects of an organization's operations, where waste is viewed as any use or loss of resources that does not lead directly to creating the product or service a customer wants when they want it. In many industrial processes, such non-value added activity can comprise more than 90 percent of a factory's total activity. (EPA, 2003: 1)

Womack et al. (1991: 5) exposed the fact that much of lean production has wide applicability, even outside the Japanese business environment. They suggest that it would likely benefit all manufacturing firms to employ the lessons taught by lean production.

Lean methods typically target eight types of waste. These waste types are listed in Table 1.

There are numerous methods and tools that organizations use to implement lean production systems. Eight core lean methods are described briefly below. The methods include (Radhakrishnan and Balasubramanian 2008: 99):

- i. Kaizen Rapid Improvement Process
- ii. Five S (5S)
- iii. Total Productive Maintenance (TPM)

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- iv. Cellular Manufacturing / One-piece Flow Production Systems
- v. Just-in-time Production / Kanban
- vi. Six Sigma
- vii. Pre-Production Planning (3P)
- viii. Lean Enterprise Supplier Networks

Table 1: Eight Types of Waste in Manufacturing

| Waste Types | Examples |
|----------------------------|----------------------------------------------------------------------------|
| Defects | Scrap, rework, replacement production, inspection |
| Waiting | Stockouts, lot processing delays, equipment downtime, capacity bottlenecks |
| Processing | Unnecessary or incorrect processing |
| Overproduction | Manufacturing items for which there are no orders |
| Movement | Human motions that are unnecessary or straining |
| Inventory | Excess raw material, WIP, or finished goods |
| Transport | Carrying WIP long distances, inefficient transport |
| Unused employee creativity | Lost time, ideas, skills, improvements |

Source: (The Productivity Development Team, 1999: 2)

Kaizen is the Japanese word for a continuous endeavor for perfection, and it has become popular in the west as a paramount concept behind good management (Abdullah, 2003: 11). 5S which is the acronym of five Japanese words of the following meanings; Seiri (Sort), Seiton (set in order), Seiso (shine), Seiketsu (standardize), and Shitsuke (sustain), a way of organizing and managing the workspace and work flow with the intent to improve efficiency by eliminating waste, improving flow and reducing process unevenness (Michalska and Szewieczek, 2007: 211). Total Productive Maintenance (TPM) is a maintenance program, which involves a newly defined concept for maintaining plants and equipment, aims to markedly increase production while, at the same time, increasing employee morale and job satisfaction (Venkatesh, 2007: 1). In a cellular manufacturing system, which is one of the main tools for Lean Manufacturing, workstations are arranged in sequences to allow for a smooth flow of materials and components through the process to make

a group of similar products into families that can then be processed on the same equipment in the same sequence, cellular manufacturing offers companies the flexibility to give customers the variety they require (Krar, 2007: 2).

Just in Time (JIT) manufacturing is a Japanese management philosophy applied in manufacturing which aims the elimination of non-value added activities (Cheng et al. 1998:16). JIT can also be defined as producing the necessary units, with the required quality, in the necessary quantities, at the last safe moment. It means that company can manage with their own resources and allocate them very easily (Radisic, 2009: 4). Six Sigma is a process improvement methodology to reduce defects in production processes. Its goal was to achieve a level of performance equal to a defect rate of 3.4 defects per million opportunities which is a virtually defect free environment. (Bevan et al., 2005: 4). Whereas other lean methods take a product and its core production process steps and techniques as given, the Pre-Production Planning (3P) focuses on eliminating waste through "Greenfield" product and process redesign. 3P represents a key pivot point, as organizations move beyond a focus on efficiency to incorporate effectiveness in meeting customer needs (EPA, 2003: 13). Lean enterprise supplier networks aim to deliver products effectively by considering lean philosophy.

The road to lean requires training and employee empowerment, such that each decision is made as close as possible to the product and many of the tools of lean production are actually the results of prior work in systems management, optimization, and control (Hallam, 2001).

Lean Management in Banking

In developing countries, life standards and customer needs are growing and changing. New indicators are used to assess to measure the quality of delivering goods and service to express the performance such as responsiveness, flexibility and availability. The increasing and more demanding expectations of customers require smooth processes, right at the first time and with short lead times. (Productivity Center, 2008: 1).

A bank is a financial intermediary accepting deposits and granting loans; offers the widest menu of services of any financial institution (Rose, 2002: 4). By this definition, it provides a payment settlement mechanism based on demand deposit accounts and makes commercial loans to business units (Warner, 1996: 325). Banks are one of the most important points and most widely spread points of providing service by means of thousands of branches in any country.

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As stated by Mandacı and Soydan (2002), commercial banks, among the others, have the most important and complex situation in the financial system. According to Mandacı and Soydan (2002) they increase their services and activities that make them the most important financial institution by providing financial advising, providing leasing services, security brokerage services and mutual funds.

Nowadays, online banking or electronic banking is getting very popular. Electronic banking is a generic term encompassing the use of increasingly sophisticated, computer-based technologies for delivering, transferring, recording, and developing banking and related financial services (Williams, 1998: 113)

Electronic point-of-sale (POS) systems allow the buyer of goods and services to have his/her bank account debited at purchase by the seller through the use of a terminal which activates an EFT system (Williams, 1998: 115). It can perform most of the services in anywhere, at any time. Electronic banking saves both customers' and service providers' resources.

In financial services, the increasing use of centralized operations and shared services is continuing, leading to the key operational strategies of integration and rationalization. To merge and standardize operations, a firm in this position needs to consider using Lean tools. Typically, 5-10% of any process is adding value to the customer within financial services, in many cases it is probably even less (Henry, 2008: 2).

LEAN SERVICE MANAGEMENT IN XYZ BANK

XYZ Bank is Turkey's largest and oldest bank. XYZ Bank's origins reached to 19th century, and it is headquartered in Ankara, Turkey. XYZ is ranked as one of the most profitable banks in the world, with nine international branches, more than a thousand national branches and more than 20 000 employees.

XYZ Bank provides retail, corporate, and agricultural banking services. Its retail banking services include;

- i. Deposit Accounts,
- ii. Investment Products,
- iii. Loan Products,
- iv. Overdraft Checking Accounts,
- v. Credit Cards,

- vi. Small Business Loans,
- vii. Insurance Services,
- viii. Automated Bill Payments,
- ix. Automated Pass Systems,
- x. Safe-Deposit Box, and
- xi. Member Business Services

The company offers corporate banking services, such as corporate collections, cash collections, check and note collections, payments, deposit accounts, investment products, member business services, cash loans, foreign trade and financing, and non-cash loans. Its agricultural loan products comprise farmer loans, production loans on contract, and agricultural insurance, as well as projected loans.

Based on our observations, the number of mostly used transactions that performed in XYZ Bank are only 16, whereas total number of different types of transactions is about 3000. When a customer comes in the branch of XYZ Bank, requested his/her operation to be performed, and then bank officer operates the related transaction screen over banking information system.

In XYZ Bank, three different receipt numbers are given by queue machine to the customers. These are classified as follows:

- i. Receipt numbers between 1 and 500 are given for Cash-Desk Operations
- ii. Receipt numbers between 501 and 950 are given for Fix Term Accounts and Current Accounts Operations
- iii. Receipt numbers between 951 and 999 are given for Foreign Exchange Operations

There are four financial performance criteria in the XYZ Bank determined as Profitability, The Size of Deposits Account and Loan, The Size of Active/Passive, and Collections. They are using to evaluate the bank's financial performance both itself and between branches of the XYZ Bank. So the bank management aims primarily to increase these criteria for all the branches.

There are some additional criteria that show us the performance of the service system in the service companies. Due to the nature of service and expectation of the customer, bank customers expect high level service performance more than the other service providers. Some additional performance criteria include the number of waiting customers

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in the bank at any time, the waiting time of the customer for the operation and the rate of missing customers.

The number of waiting customers is described as number of customers that are waiting for the operation in the bank after taking queue receipt from the queue-machine. Waiting time of the customer is explained as customer's waiting time between taking queue receipt time and operation time. Lastly, the rate of missing customers is formulated as;

$$\text{The Rate of Missing Customers} = \frac{\text{Printed Receipt Number} - \text{Total Served Customer Number}}{\text{Printed Receipt Number}}$$

Data Collection in XYZ Bank

First, we decided the application area for the pilot study by determining one of the thousands branches of XYZ bank. We collected data for the research by making observations at this branch. Between February 11 and March 13 2009, six observations were made to obtain data about number of customers at any different time period and average waiting time of the customers in each working day. All the queue receipts were collected to get some information about the service performance. In other words, we observed the branch of the bank in terms of performance of the banking service to obtain performance indicators that are commonly used in a conventional service system. One can conduct a research based on our collected data, since its size is enough to make inference significantly.

Table 2 shows the number of customers waiting for service at predefined time (09:30, 10:30, 12:00, 14:00, 15:00 and 17:00). For example, there are 31 customers waiting for service in the waiting room at 2 pm in February 11, and the average of waiting customer is 10.33 at this day. After collecting all the observations, overall average number of waiting customers is found as 48.7. It means that about 49 customers are waiting for their operation at the bank's branch. It is a sign of a problem to be solved since too much people are waiting for service. It means that as the number of customers waiting for service decreases, waiting time of each customer will increase naturally and of course customers' satisfaction due to service quality will decrease.

Table 1: The Number of Waiting Customer (Pieces)

| DATE / TIME | 09:30 | 10:30 | 12:00 | 14:00 | 15:00 | 17:00 | AVERAGE |
|----------------|-------|-------|-------|-------|-------|-------|--------------|
| 11.02.2009 | 11 | 8 | 1 | 31 | 11 | 0 | 10.33 |
| 12.02.2009 | 10 | 8 | 0 | 54 | 18 | 0 | 15.00 |
| 13.02.2009 | 5 | 12 | 3 | 63 | 15 | 3 | 16.83 |
| 16.02.2009 | 94 | 83 | 80 | 120 | 93 | 10 | 80.00 |
| 17.02.2009 | 39 | 32 | 34 | 68 | 45 | 0 | 36.33 |
| 18.02.2009 | 45 | 16 | 10 | 47 | 17 | 0 | 22.50 |
| 19.02.2009 | 32 | 11 | 0 | 30 | 26 | 0 | 16.50 |
| 20.02.2009 | 38 | 61 | 33 | 109 | 103 | 0 | 57.33 |
| 23.02.2009 | 53 | 65 | 83 | 165 | 113 | 24 | 83.83 |
| 24.02.2009 | 49 | 63 | 48 | 78 | 48 | 6 | 48.67 |
| 25.02.2009 | 33 | 49 | 42 | 68 | 47 | 6 | 40.83 |
| 26.02.2009 | 35 | 55 | 40 | 63 | 48 | 6 | 41.17 |
| 03.03.2009 | 55 | 83 | 91 | 128 | 117 | 28 | 83.67 |
| 04.03.2009 | 39 | 68 | 37 | 73 | 64 | 1 | 47.00 |
| 05.03.2009 | 65 | 105 | 117 | 106 | 82 | 17 | 82.00 |
| 06.03.2009 | 58 | 97 | 83 | 112 | 95 | 22 | 77.83 |
| 09.03.2009 | 43 | 95 | 88 | 122 | 98 | 45 | 81.83 |
| 10.03.2009 | 23 | 39 | 36 | 52 | 45 | 15 | 35.00 |
| 11.03.2009 | 15 | 33 | 22 | 64 | 55 | 16 | 34.17 |
| 12.03.2009 | 24 | 27 | 23 | 59 | 55 | 4 | 32.00 |
| 13.03.2009 | 43 | 41 | 36 | 78 | 98 | 5 | 50.17 |
| AVERAGE | 38.52 | 50.05 | 47.74 | 80.48 | 61.57 | 13.87 | 48.70 |

Here Table 3 and Table 4 show the summary of collected data about the customers in the queue (i.e., in front of the service points) in the bank branch.

Another data set is collected for determining the waiting time of customers at predefined time instances as 09:30, 10:30, 12:00, 14:00, 15:00 and 17:00 that is shown in Table 3 below. For example, a customer has been waiting for 29 minutes before his operation at 2 pm in February 11, and the average of waiting time is 9.79 minutes at this date. Based on the collected data, the average waiting time for customers is calculated as 33.61 minutes. It might be said that it is quiet high for a primer company of service sector.

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Table 2: The Waiting Time of Customer (Minutes)

| DATE / TIME | 09:30 | 10:30 | 12:00 | 14:00 | 15:00 | 17:00 | AVERAGE WAITING TIME (Minutes) |
|----------------|-------|-------|-------|-------|-------|-------|--------------------------------------|
| 11.02.2009 | 12 | 6 | 0.5 | 29 | 11 | 0.25 | 9.79 |
| 12.02.2009 | 3.5 | 2 | 5 | 35 | 27 | 0.3 | 12.13 |
| 13.02.2009 | 1 | 12 | 4 | 38 | 10 | 0.7 | 10.95 |
| 16.02.2009 | 45 | 55 | 20 | 102 | 91 | 12 | 54.17 |
| 17.02.2009 | 28 | 22 | 6 | 43 | 39 | 0.3 | 23.05 |
| 18.02.2009 | 20 | 25 | 12 | 30 | 34 | 0.5 | 20.25 |
| 19.02.2009 | 22 | 20 | 0.5 | 16 | 25 | 0.3 | 13.97 |
| 20.02.2009 | 23 | 73 | 47 | 48 | 66 | 0.4 | 42.90 |
| 23.02.2009 | 22 | 45 | 58 | 65 | 107 | 52 | 58.17 |
| 24.02.2009 | 21 | 43 | 59 | 36 | 55 | 7 | 36.83 |
| 25.02.2009 | 18 | 11 | 27 | 51 | 36 | 4 | 24.50 |
| 26.02.2009 | 21 | 43 | 47 | 67 | 13 | 9 | 33.33 |
| 03.03.2009 | 25 | 49 | 54 | 88 | 80 | 49 | 57.50 |
| 04.03.2009 | 21 | 33 | 35 | 20 | 25 | 2 | 22.67 |
| 05.03.2009 | 24 | 37 | 38 | 40 | 51 | 12 | 33.67 |
| 06.03.2009 | 20 | 57 | 27 | 98 | 106 | 38 | 57.67 |
| 09.03.2009 | 14 | 27 | 115 | 140 | 136 | 58 | 81.67 |
| 10.03.2009 | 17 | 24 | 27 | 43 | 31 | 11 | 25.50 |
| 11.03.2009 | 21 | 18 | 22 | 37 | 36 | 18 | 25.33 |
| 12.03.2009 | 18 | 14 | 23 | 29 | 26 | 6 | 19.33 |
| 13.03.2009 | 32 | 40 | 48 | 49 | 65 | 21 | 42.50 |
| AVERAGE | 20.40 | 31.24 | 32.14 | 52.57 | 50.95 | 14.37 | 33.61 |

The last dataset collected for determining the number of missing customers and missing customer rate are shown in Table 4 below. For example, in February 11, there were 626 customers who came into the bank and had queue receipt, and 527 of them waited until getting service. It can be said that there were 99 customers (626-527) left or went out to come back in another day or time. For this day, missing customer rate was 15.81% (99/626).

Table 4 also shows that the average of overall missing customers is 399.24 every day, and the average of overall missing rate is calculated as 39.81 percent. It means that, about 40 percent of customers coming in the bank are unsatisfied and left the service point.

Table 3: Missing Customer Number and Missing Customer Rate

| DATE | TOTAL SERVICED CUSTOMER NUMBER (1) | PRINTED RECEIPT NUMBER (2) | MISSING CUSTOMER NUMBER (3) = (2 -1) | MISSING CUSTOMER RATE (4) = (3/2) |
|----------------|------------------------------------|----------------------------|--------------------------------------|-----------------------------------|
| 11.02.2009 | 527 | 626 | 99 | 15.81% |
| 12.02.2009 | 553 | 713 | 160 | 22.44% |
| 13.02.2009 | 467 | 609 | 142 | 23.32% |
| 16.02.2009 | 714 | 1284 | 570 | 44.39% |
| 17.02.2009 | 667 | 1015 | 348 | 34.29% |
| 18.02.2009 | 552 | 775 | 223 | 28.77% |
| 19.02.2009 | 560 | 772 | 212 | 27.46% |
| 20.02.2009 | 707 | 1065 | 358 | 33.62% |
| 23.02.2009 | 752 | 1241 | 489 | 39.40% |
| 24.02.2009 | 622 | 995 | 373 | 37.49% |
| 25.02.2009 | 503 | 834 | 331 | 39.69% |
| 26.02.2009 | 590 | 971 | 381 | 39.24% |
| 03.03.2009 | 587 | 1227 | 640 | 52.16% |
| 04.03.2009 | 632 | 1250 | 618 | 49.44% |
| 05.03.2009 | 601 | 1371 | 770 | 56.16% |
| 06.03.2009 | 461 | 1019 | 558 | 54.76% |
| 09.03.2009 | 606 | 1121 | 515 | 45.94% |
| 10.03.2009 | 577 | 981 | 404 | 41.18% |
| 11.03.2009 | 671 | 1052 | 381 | 36.22% |
| 12.03.2009 | 689 | 1059 | 370 | 34.94% |
| 13.03.2009 | 636 | 1078 | 442 | 41.00% |
| AVERAGE | 603.52 | 1002.76 | 399.24 | 39.81% |

As a summary, by considering Table 2, Table 3 and Table 4, there are approximately 49 customers who are waiting for their requests for approximately 33.61 minutes in branch of the bank, and for these reasons (high number and time) about 40 percent of customers leaves the branch.

Consequently, we decided to investigate transactions and process flows in detail to reduce customer's waiting time, number of customers waiting in the queue, and missing customer rate.

Between March 13-19, 2009, 959 receipts were collected as supportive purposed observations for the main study just by observing one of the customer representatives. In this part of the study, the type of

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service the customer wants from branch and the frequency of the receipts taken from queue machine are noted. Findings of the observations are demonstrated in Table 5. There were eight operators in most of the working time in bank branch. However, these 959 receipts were collected from the customers who are giving the receipts only to the selected operator. As an illustration, totally 1078 receipts are printed by the queue machine in 13.03.09 and 164 of them arrived to selected operator. Table 5 also shows that 60 customers arrived for different operations at time interval of 12:00-14:00 and 24 customers at time interval of 14:00-15:00. We might also assume that, the busiest time intervals for the customer to take receipt from queue machine are 09:00-10:00 and 12:00-14:00.

Table 4: The Number of Customer Coming on the Basis of Time Interval

| Date / Time Interval | 09:00 10:00 | 10:00 11:00 | 11:00 12:00 | 12:00 14:00 | 14:00 15:00 | 15:00 16:00 | 16:00 17:30 | Grand Total |
|----------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 13.03.2009 | 37 | 23 | 8 | 60 | 24 | 8 | 4 | 164 |
| 16.03.2009 | 70 | 39 | 31 | 54 | 20 | 0 | 3 | 217 |
| 17.03.2009 | 47 | 41 | 8 | 59 | 35 | 12 | 2 | 204 |
| 18.03.2009 | 46 | 29 | 16 | 45 | 24 | 23 | 6 | 189 |
| 19.03.2009 | 37 | 50 | 14 | 40 | 15 | 15 | 14 | 185 |
| Average | 47.4 | 36.4 | 15.4 | 51.6 | 23.6 | 14.5 | 5.8 | 191.8 |

According to 959 receipts collected by observing the selected operator, operations which are the most frequently used are listed in Table 6.

Table 6 shows the operation list with respect to frequency in descending order. For example, in 13.03.2009, "Fix Term Accounts Updating" transaction's percentage is 10.37%, "Corporate Collections and Repayment Operations" transaction's percentage is 23.17% and "Current Account Depositing Money" transaction's percentage is 12.80%.

Table 5: Operation List Arranging in Order on the Basis of Frequency

| OPERATIONS | 13.03.2009 | 16.03.2009 | 17.03.2009 | 18.03.2009 | 19.03.2009 | Average % |
|----------------------------------------------------------|------------|------------|------------|------------|------------|-----------|
| Corporate Collections And Repayment Operations | 23.17% | 13.36% | 15.69% | 22.75% | 20.00% | 18.67% |
| Current Account Depositing Money | 12.80% | 13.36% | 15.69% | 12.70% | 14.59% | 13.87% |
| Current Account Withdrawal Money | 9.76% | 13.82% | 11.76% | 8.99% | 11.35% | 11.26% |
| Foreign Exchange Operations | 11.59% | 9.22% | 10.29% | 11.11% | 13.51% | 11.05% |
| Fix Term Accounts Updating | 10.37% | 10.60% | 6.86% | 7.94% | 4.86% | 8.13% |
| Credit Card Collections | 7.32% | 7.37% | 9.80% | 6.88% | 7.57% | 7.82% |
| Transfer In The Bank | 5.49% | 5.07% | 3.92% | 4.23% | 4.32% | 4.59% |
| Electronic Funds Transfer | 3.05% | 1.84% | 3.92% | 3.70% | 5.41% | 3.55% |
| Fix Term Account Withdrawal Money | 3.05% | 2.76% | 2.45% | 3.70% | 4.32% | 3.23% |
| Fix Term Account Closing | 1.22% | 5.99% | 2.45% | 3.70% | 1.08% | 3.02% |
| Current Account Closing | 2.44% | 1.38% | 3.43% | 4.76% | 2.70% | 2.92% |
| Fix Term Account Opening | 3.66% | 2.30% | 3.92% | 4.23% | 0.00% | 2.82% |
| Current Retirement Withdrawal Money | 1.22% | 4.15% | 2.94% | 0.53% | 3.78% | 2.61% |
| Other | 1.22% | 3.69% | 1.96% | 2.12% | 3.24% | 2.50% |
| Personal Loans Insurance Provisional-Account Collections | 1.22% | 2.30% | 3.43% | 2.12% | 2.16% | 2.29% |
| Agricultural TL Loan Capital Payback Operations | 1.83% | 0.92% | 0.98% | 0.00% | 1.08% | 0.94% |
| Cheque Payment Operations | 0.61% | 1.84% | 0.49% | 0.53% | 0.00% | 0.73% |
| Grand Total | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

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Current situation: Process flow charts and operations' times. As a summary of Table 6, the most frequently used operations are Corporate Collections and Repayment Operations as 18.67%, Current Account Depositing Money as 13.87%, Current Account Withdrawal Money as 11.26%, Foreign Exchange Operations as 11.05%, and Fix Term Accounts Updating as 8.13%. These five operations include totally 62.98 percent of all transactions that are completed in the branch. According to Table 6, the most important operation in terms of transaction volume is Corporate Collections and Repayment Operations. We also agreed with branch management to work on operations that have high transactional volume. Therefore, we focused on the most crucial set of operations among others.

As an illustration, if "Corporate Collections and Repayment Operations" is inspected in detail, process flow is shown in Figure 1 and process elements, types, descriptions and required time to complete each element is tabulated in Table 7.

- i. Four Control Points as 9.86 seconds
- ii. Twenty Operation Points as 61.08 seconds,
- iii. Three Waiting Points as 13.41 seconds,

The total completion time is calculated as 84.35 seconds with 27 operational elements. The number of operational elements and their durations for other leading operations are tabulated in Table 8 and Table 9 respectively.

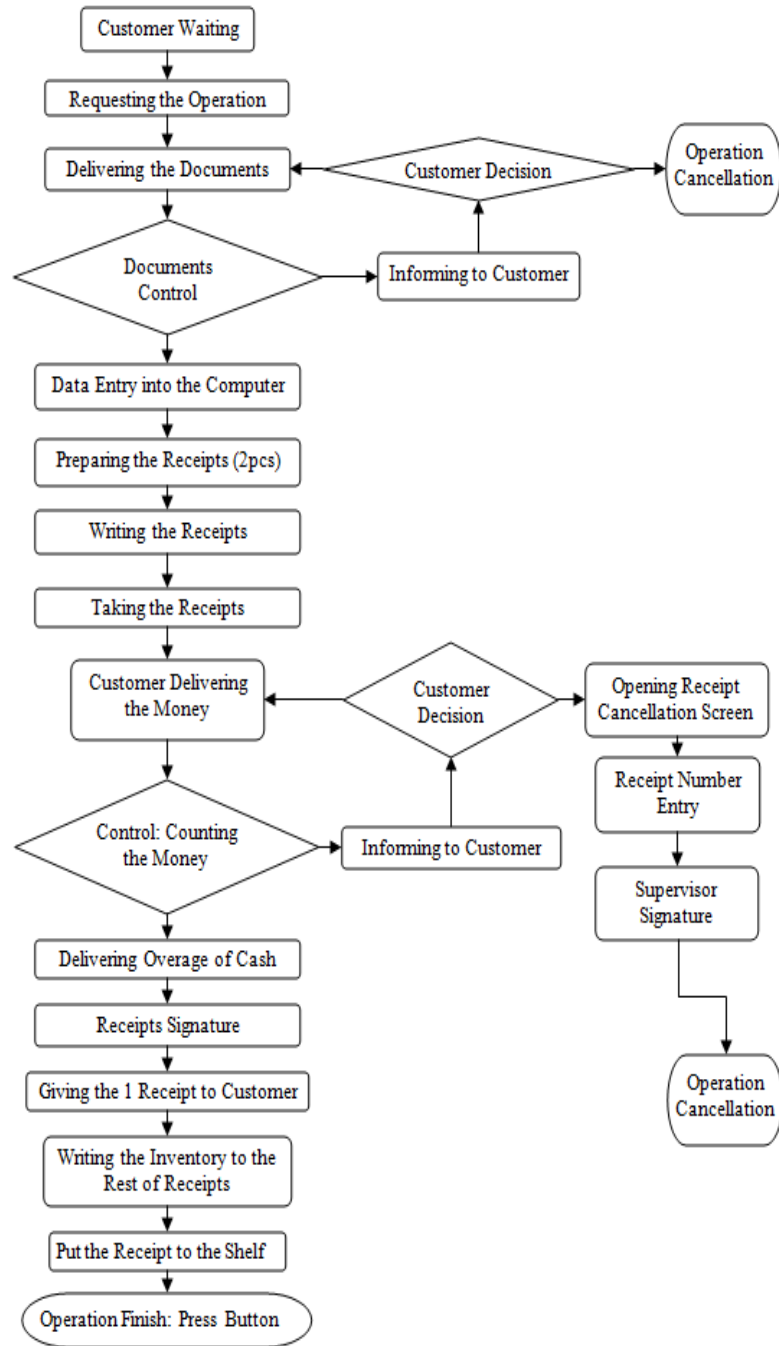


Figure 1: Current Process Flow of Corporate Collections and Repayment Operations

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Table 6: "Corporate Collections and Repayment Operations" Operational Flow List and Average Times for Each Operations

| Row | Action Type | Operation Definition | Average Time (Sec) |
|-----|-------------|---------------------------------------------------------------------------------------------|--------------------|
| 1 | Waiting | Customer Waiting | 13.41 |
| 2 | Operation | Requesting the Operation | 4.33 |
| 3 | Operation | Delivering The Documents | 4.70 |
| 4 | Control | Documents Control | 1.67 |
| 5 | Operation | Informing to Customer | 1.86 |
| 6 | Control | If There is Deficiency in the Documents, Customer Decision | 4.00 |
| 7 | Operation | If There is Deficiency in the Documents, and It is Ready, Deliver it. | 7.53 |
| 8 | Waiting | If There is Deficiency in the Documents, and It is not Ready Operation Cancellation | 0.00 |
| 9 | Operation | Data Entry into the Computer | 9.74 |
| 10 | Operation | Preparing The Receipts (Empty-2pcs) | 3.62 |
| 11 | Operation | Writing The Receipts in the Printer | 3.85 |
| 12 | Operation | Taking The Receipts from the Printer | 0.94 |
| 13 | Operation | Customer Counting and Delivering The Money to the Operator | 6.40 |
| 14 | Control | Control: Counting The Money | 4.19 |
| 15 | Operation | If There is Deficiency-Base Money Informing to Customer | 0.00 |
| 16 | Control | If There is Deficiency-Base Money Customer Decision | 0.00 |
| 17 | Operation | If There is Deficiency-Base Money, and It is Ready, Customer Delivering The Money | 0.00 |
| 18 | Operation | If There is Deficiency-Base Money, and It is not Ready, Opening Receipt Cancellation Screen | 0.00 |
| 19 | Operation | If There is Deficiency-Base Money, and It is not Ready, Receipt Number Entry | 0.00 |
| 20 | Operation | If There is Deficiency-Base Money, and It is not Ready, Supervisor Signature | 0.00 |
| 21 | Waiting | If There is Deficiency-Base Money, and It is not Ready, Operation Cancellation | 0.00 |
| 22 | Operation | Delivering Overage of Cash | 3.47 |
| 23 | Operation | Receipts Signature | 1.85 |
| 24 | Operation | Giving the 1 Receipt to Customer | 2.43 |
| 25 | Operation | Writing the Inventory to the Rest of Receipts | 5.40 |
| 26 | Operation | Put the Receipt to the Shelf | 2.856 |
| 27 | Operation | Operation Finish: Press the Numbering Machine Button to Call for the New Customer | 2.098 |
| | | TOTAL CORPORATE COLLECTIONS AND REPAYMENT OPERATIONS TIME | 84.35 |

Table 7: Number of Operational Elements for Leading Operations

| Transaction | Numbers of Action Types | | | |
|------------------------------------------------|-------------------------|---------|-----------|---------|
| | Approval | Control | Operation | Waiting |
| Corporate Collections And Repayment Operations | 0 | 4 | 20 | 3 |
| Current Account Depositing Money | 1 | 5 | 20 | 3 |
| Current Account Withdrawal Money | 1 | 7 | 18 | 4 |
| Fix Term Accounts Updating | 1 | 2 | 12 | 2 |
| Foreign Exchange Operations | 0 | 7 | 30 | 5 |

Table 8: Duration of Operational Elements for Leading Operations

| Transaction | Times of Action Types (second) | | | |
|------------------------------------------------|--------------------------------|---------|-----------|---------|
| | Approval | Control | Operation | Waiting |
| Corporate Collections And Repayment Operations | 0.00 | 9.86 | 61.08 | 13.41 |
| Current Account Depositing Money | 9.83 | 29.58 | 92.54 | 20.93 |
| Current Account Withdrawal Money | 16.53 | 12.97 | 104.83 | 19.38 |
| Fix Term Accounts Updating | 14.15 | 0.00 | 83.72 | 13.41 |
| Foreign Exchange Operations | 0.00 | 44.65 | 139.46 | 20.93 |

Suggested improvements based on analysis. As mentioned in the Lean Management section in detail, lean philosophy can be easily applied by elimination of wastes. When we look at the process flows of the top five operations, process element to be eliminated can be easily determined by its type. It means that approvals, controls and waiting points are generally non-value adding elements of any operations. Besides, if an analyst looks at the process flow of an operation in Figure 1 1, he/she can see operation cancellations are mostly due to late checking of documents, identity cards and money. In Figure 2 suggested process flow is demonstrated after eliminating process cancellations.

In addition to removing some unnecessary activities, there may be improvements on their costs in approving, controlling and waiting activities. Thus some necessary conditions are suggested to provide with equipments and devices as listed below:

1. **Making Favorite List:** Customers can use their Bank Card (ATM Card or Credit Card) to take receipt before waiting for their operations. Based on the customer historical data, information system knows what operations customers most frequently preferred in the past, and bringing up favorite list for the customer. Banking system can also provide the customers to take receipt quickly and reduce customer waiting time by fast

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forwarding to the right desk that might be differentiated by functions/customers.

2. **Estimation of Waiting Time:** If standard times for all transactions can be determined, the estimated waiting time can be written on the receipt. Because, the system knows how many customers (i.e., number of transactions and different type of transactions) have been waiting at any in the bank branch. Based on this dynamically changed information, customer desks can be re-arranged at any time with respect to volume of transactions.
3. **Use Electronic Panel:** We can prevent operation cancellations in "Foreign Exchange Operations", and by this way, the customers, who just ask the price of foreign exchange, will not wait in the branch. For this purpose electronic panels, that show foreign exchange prices (buying and selling price) instantly, can be used.
4. **Showing Account Inventory:** Some of the customers have troubles with their balance when withdrawing is necessary from their accounts to complete the transaction. Therefore, this waiting time might be removed here by informing bank customers via a fast and limited electronic information system. By this way, the bank branch can prevent operation cancellations for the "Current Account Withdrawal Money", and also, the customers, who ask just balance information, will not wait for service within the bank branch.
5. **Prevent Operation Cancellations:** To prevent operation cancellations through the operations, the bank can notify the customers to check their *Identity Card, Required Account Number(s) and Amount to Pay* via electronic display / announcement.
6. **Use Single Queuing Number:** The customers' arrival time to service desk from the waiting location is approximately 15 seconds if the previous customer is absent because of service person should wait for 5-10 seconds to ensure the customer is really absent. Since there are three different types of queuing receipts, customers who don't understand their purposes usually take all three receipts from the machine in order to guarantee their service. The queue machine might give only a single type of receipt number instead of three types to prevent wastes on the

receipts. It means that approximately 40% of the total customers' absenteeism time cost is 15 seconds for each customer. According to Table 4, approximately 400 customers, as an overall average, produces 6000 seconds (i.e., 2 hrs 40 min) as time cost for the selected bank branch.

7. **Promote Electronic Banking:** The Bank should involve a unit to encourage customers to utilize online banking system. If it is needed, short introduction or information about "how online banking is effectively used?" can be given by this unit via face-to-face encounters, continuous video tutorials and booklets. Therefore, effectiveness of this unit can be measured by tracking these customers electronically. It is obvious that a portion of all customers will decide to use online banking systems for most of their further banking operations that do not require real money to touch. By this way, some of the missing customers will not leave the bank branch.
8. **Use Continuous Printing:** The bank can speed up the printing receipts that are variable with respect to operation type and customer request. In the current system, receipts are in a form of copy block and operator counts the required number of papers and detaches from the block and feeds the printer. Instead, based on the customer request or operation type, bank receipts can be print in a manner of continuous form or like A5 sized printed papers. It may be more time efficient than the current system. When it saves 5 seconds for each customer, according to Table 4 it produces 5000 seconds (i.e., 1 hrs 23 min) for approximately 1000 daily customers as averagely for the bank branch.
9. **Change the Operation Sequence:** Operator should take the money from customer in the "Current Account Depositing Money" operation before printing receipts in case of inadequate amount of money. Otherwise, the operation has to be terminated and the bank receipts have to be cancelled. This takes quite long and wastes time.
10. **Put the Queue Machine Outside:** The bank opens at 09:30 in the morning and 13:30 at noon. So the busiest times are 09:30-10:30 and 13:30-14:00 time interval, and before the bank branch opens, the customers wait for the queue receipts in front of the bank. In the current situation, many customers arrive at the queue machine at the same time and inter-arrival time between

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queue receipts are too short and waiting times for these group of customers will be longer than the customers who will arrive later. In order to improve customer satisfaction and reduce the waiting time of the customers, the bank might put the queue machine outside, and customers can take the queue receipts easily even if the bank is closed.

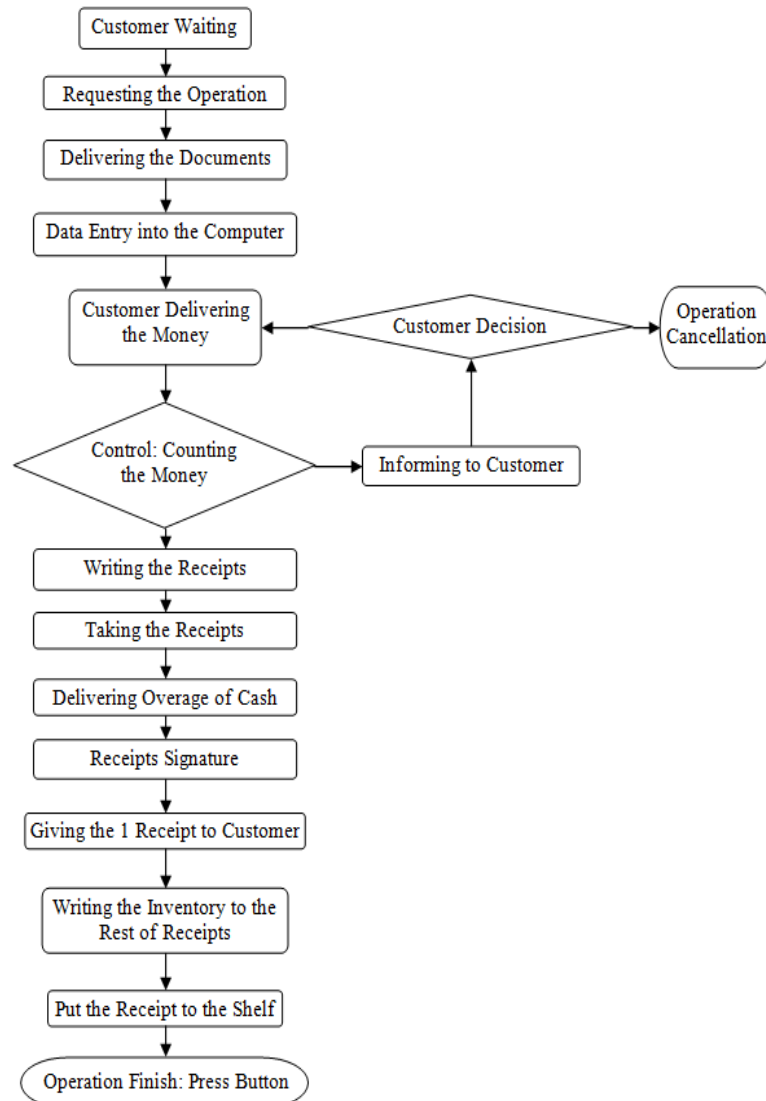


Figure 2: Suggested Process Flow for Corporate Collections and Repayment Operations

Table 9 : Suggested Process Flow of Corporate Collections and Repayment Operations and Average Times for Each Operation

| Row | Action Type | Operation Definition | Average Time (Sec) |
|------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------|--------------------|
| 1 | Waiting | Customer Waiting | 13.41 |
| 2 | Operation | Requesting the Operation | 4.33 |
| 3 | Operation | Delivering The Documents | 4.70 |
| 4 | Operation | Data Entry into the Computer | 9.74 |
| 5 | Operation | Customer Counting and Delivering The Money to the Operator | 6.40 |
| 6 | Control | Control: Counting The Money | 4.19 |
| 7 | Operation | If There is Deficiency-Base Money Informing to Customer | 0.00 |
| 8 | Control | If There is Deficiency-Base Money Customer Decision | 0.00 |
| 9 | Operation | If There is Deficiency-Base Money, and It is Ready, Customer Delivering The Money | 0.00 |
| 10 | Waiting | If There is Deficiency-Base Money, and It is not Ready, Operation Cancellation | 0.00 |
| 11 | Operation | Writing The Receipts in the Printer | 3.85 |
| 12 | Operation | Taking The Receipts from the Printer | 0.94 |
| 13 | Operation | Delivering Overage of Cash | 3.47 |
| 14 | Operation | Receipts Signature | 1.85 |
| 15 | Operation | Giving the 1 Receipt to Customer | 2.43 |
| 16 | Operation | Writing the Inventory to the Rest of Receipts | 5.40 |
| 17 | Operation | Put the Receipt to the Shelf | 2.86 |
| 18 | Operation | Operation Finish: Press the Numbering Machine Button to Call for the New Customer | 2.10 |
| TOTAL SUGGESTED - CORPORATE COLLECTIONS AND REPAYMENT OPERATIONS TIME | | | 65.68 |

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Suggested process flow is shown in Figure 2 and process elements, types, descriptions and required time to complete each element is tabulated in Table 10. Suggested state for "Corporate Collections and Repayment Operations" can be summarized as below;

- i. Two Control Points as 4.19 seconds
- ii. Fourteen Operation Points as 48.07 seconds,
- iii. Two Waiting Points as 13.41 seconds,

The total completion time for "Corporate Collections and Repayment Operations" flow was calculated as 84.35 seconds with 27 operational elements. The number of operational elements and their durations for other leading operations are tabulated in Table 8 and Table 9 respectively.

The total completion time for the suggested "Corporate Collections and Repayment Operations" flow is calculated as 65.68 seconds. There is also only one operation cancellation point. Totally it includes eighteen operations (reduced from twenty-seven operations). Similarly, the number of operational elements and their durations for the other leading operations are tabulated in Table 11 and Table 12 respectively.

Table 10: Number of Operational Elements for Leading Operations after Eliminations of Waste

| Transaction | Number of Action Types | | | |
|------------------------------------------------|------------------------|---------|-----------|---------|
| | Approval | Control | Operation | Waiting |
| Corporate Collections And Repayment Operations | 0 | 2 | 14 | 2 |
| Current Account Depositing Money | 1 | 3 | 14 | 2 |
| Current Account Withdrawal Money | 1 | 3 | 14 | 2 |
| Fix Term Accounts Updating | 1 | 0 | 10 | 1 |
| Foreign Exchange Operations | 0 | 5 | 27 | 3 |

Table 11: Duration of Operational Elements for Leading Operations after Eliminations of Waste

| Transaction | Times of Action Types | | | |
|------------------------------------------------|-----------------------|---------|-----------|---------|
| | Approval | Control | Operation | Waiting |
| Corporate Collections And Repayment Operations | 0.00 | 4.19 | 48.07 | 13.41 |
| Current Account Depositing Money | 9.83 | 21.68 | 84.09 | 15.84 |
| Current Account Withdrawal Money | 16.53 | 6.97 | 92.64 | 17.65 |
| Fix Term Accounts Updating | 14.15 | 0.00 | 83.72 | 13.41 |
| Foreign Exchange Operations | 0.00 | 33.47 | 113.50 | 15.84 |

Results of improvements. If the current system is compared to suggested system based on lean philosophy, remarkable improvements are obtained. For example, for the flow of "Corporate Collections and Repayment Operations", the number of control points reduced from four to two, improvement rate is 50% and time spent for control operations is reduced from 9.86 to 4.19 seconds and improvement rate is 57.5%. The number of operation points reduced from twenty to fourteen, improvement is 30% and 21.3% for the operation times. Other details about improvements on Corporate Collections and Repayment Operations and other leading operations are summarized in Table 13 and Table 14.

Table 12: Improvements on Number of Operational Elements for Leading Operations

| Transaction | STATE | Number of Action Types | | | | |
|------------------------------------------------|--------------------|------------------------|----------------|---------------|---------------|------------|
| | | Approval | Control | Operation | Waiting | Total |
| Corporate Collections and Repayment Operations | Current | 0 | 4 | 20 | 3 | 27 |
| | Suggested | 0 | 2 | 14 | 2 | 18 |
| | Improvement | 0.00% | 50.00% | 30.00% | 33.33% | 33% |
| Current Account Depositing Money | Current | 1 | 5 | 20 | 3 | 29 |
| | Suggested | 1 | 3 | 14 | 2 | 20 |
| | Improvement | 0.00% | 40.00% | 30.00% | 33.33% | 31% |
| Current Account Withdrawal Money | Current | 1 | 7 | 18 | 4 | 30 |
| | Suggested | 1 | 3 | 14 | 2 | 20 |
| | Improvement | 0.00% | 57.14% | 22.22% | 50.00% | 33% |
| Fix Term Accounts Updating | Current | 1 | 2 | 12 | 2 | 17 |
| | Suggested | 1 | 0 | 10 | 1 | 12 |
| | Improvement | 0.00% | 100.00% | 16.67% | 50.00% | 29% |
| Foreign Exchange Operations | Current | 0 | 7 | 30 | 5 | 42 |
| | Suggested | 0 | 5 | 27 | 3 | 35 |
| | Improvement | 0.00% | 28.57% | 10.00% | 40.00% | 17% |

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Table 13: Improvements on Duration of Operational Elements for Leading Operations

| Transaction | STATE | Times of Action Types | | | | |
|------------------------------------------------|--------------------|-----------------------|---------------|---------------|---------------|------------|
| | | Approval | Control | Operation | Waiting | Total |
| Corporate Collections and Repayment Operations | Current | 0.00 | 9.86 | 61.08 | 13.41 | 84.35 |
| | Suggested | 0.00 | 4.19 | 48.07 | 13.41 | 65.67 |
| | Improvement | 0.00% | 57.48% | 21.29% | 0.00% | 22% |
| Current Account Depositing Money | Current | 9.83 | 29.58 | 92.54 | 20.93 | 152.88 |
| | Suggested | 9.83 | 21.68 | 84.09 | 15.84 | 131.44 |
| | Improvement | 0.00% | 26.70% | 9.14% | 24.32% | 14% |
| Current Account Withdrawal Money | Current | 16.53 | 12.97 | 104.83 | 19.38 | 153.71 |
| | Suggested | 16.53 | 6.97 | 92.64 | 17.65 | 133.79 |
| | Improvement | 0.00% | 46.25% | 11.62% | 8.93% | 13% |
| Fix Term Accounts Updating | Current | 14.15 | 0.00 | 83.72 | 13.41 | 111.28 |
| | Suggested | 14.15 | 0.00 | 83.72 | 13.41 | 111.28 |
| | Improvement | 0.00% | 0.00% | 0.00% | 0.00% | 0% |
| Foreign Exchange Operations | Current | 0.00 | 44.65 | 139.46 | 20.93 | 205.04 |
| | Suggested | 0.00 | 33.47 | 113.50 | 15.84 | 162.81 |
| | Improvement | 0.00% | 25.03% | 18.61% | 24.32% | 21% |

CONCLUSIONS

In this paper, we described lean management and its application in banking industry. We observed a branch of a bank in Aegean Region for collecting customer, operation, and service supplier oriented data. We just focused on a few most intensive and critical operations among many and conduct detailed studies on their processes.

We also showed that, as a pioneer application, lean management is considerably applicable in banking industry with significant outputs. As a result of this study we achieve improvements up to 22% in time and 33% in number of operations (Table 13 and Table 14). In other words, selected branch of the national state bank, can handle up to additionally 20% plus of its current number of customers. It is important that reducing time leads to an increase satisfied customers and reducing the number of operations per process leads to enhancing the service level due to decreasing variability and probability of errors.

If this study is spread over the other branches of banks, they will reduce the basic operation expenses with highly satisfied customers and high service levels just by focusing on value adding elements of the operations.

Researchers of lean service management especially in banking industry are also advised to analyze working environment of bank branches in the viewpoint of other lean service tools such as office TPM and office 5S. One can find great improvements from loss in communication to loss in decision making in an office environment.

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