BUSINESS PROCESS REENGINEERING:

THE CASE OF A CHEMICAL COMPANY IN TURKEY

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ABSTRACT

Business Process Reengineering: The Case of a Chemical Company in Turkey

In this thesis, it is aimed to redesign the sales process of a company operating in the private sector in accordance with the methodology of business process reengineering by using simulation technique in order to improve the process.

In this context, a literature survey is performed to determine the business processes reengineering methodologies and the difficulties that may be encountered in the redesign process have been examined.

In the application phase, the sales process of a company operating in the private sector is examined and the models of the existing process and the redesigned process have been created using the simulation software. The performance results of the existing sales process and the redesigned sales process are compared.

ÖZET

İş Süreçlerinin Yeniden Yapılandırılması: Türkiye'de Bir Kimya Şirketi Örneği

Bu tez çalışmasında, simülasyon tekniği kullanılarak özel sektörde faaliyet göstermekte olan bir firmanın satış sürecinin, iş sürecinin yeniden yapılanması metodolojisine uygun şekilde sürecin iyileştirilmesi amacıyla yeniden tasarlanması amaçlanmaktadır.

Bu doğrultuda literatürdeki farklı iş süreçlerinin yeninden yapılanması sürecinde karşılaşılabilecek zorluklar ve farklı metodolojiler incelenmiştir

Uygulama kısmında, özel sektörde faaliyet göstermekte olan bir firmanın satış süreci incelenmiş ve bir simülasyon yazılımı ile hem mevcut sürecin hem de yeniden tasarlanan sürecin modelleri oluşturulmuştur. Mevcut satış süreci ile yeniden yapılanma sonrasındaki sürecin performans sonuçları karşılaştırılmıştır.

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CHAPTER 1

INTRODUCTION

An organization's fundamental aim of existence is merely creating value and sustaining existence through adaptation to the growing competition and the changes in the global economy. Since the way of doing business or business processes significantly affects the value created, process management plays a vital role in the success of an organization in this competition.

Process management can be described as a systematic way of defining, maintaining, and improving the processes aiming the continuity of the operations in line with the organizational mission, vision, and strategies. Early studies about the process management focused more on process definition and modeling, and some approaches were developed. In the 1990s when the concept of business process reengineering (BPR) first appeared, it promised a novel approach to corporate change, and was described by its originators as "fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical measures of performance such as cost, quality, service and speed" (Hammer & Champy, 1993). Business process reengineering is a long-established process than change, including the reassembling of the organizational structures and units to be more productive. It can also be characterized as a management discipline, where the design of existing processes and business components is analyzed and changed according to efficiency and value added to business objectives criteria.

With the help of the dramatic success stories touted in the business press and the influence of the globalization, business process reengineering has become one of the most striking and spectacular methods and have been applied across many fields

all over the world. Rigby and Bilodeau (2005) cited in Jain, Chandrasekaran, and Gunasekaran (2010) stated that the use of BPR was 69 percent in 1995, have gone down to 38 percent in 2000, and raised again to 61 percent in 2004. In 2009, a Gartner survey revealed that improving business processes is the top priority of the CIOs (Rowsell-Jones & Roberts, 2009). Today's rapidly changing economic environment and competitive conditions made it necessary for the companies to apply these innovations.

In this thesis, the answer to the research question “Does Business Process Reengineering can be applied to a chemical company?” will be given. The study will cover the discovery of existing processes, exploration of problems, rethinking, and redesign of the sales process by making suggestions for the areas that can be improved.

CHAPTER 2

LITERATURE REVIEW

Page (2010) describes process as everything that requires to follow a series of actions or steps to bring about a result and also, according to Page, all of the work getting done in a company or even in a life consists of processes. Harrington (1991) cited in Griesberger, Leist, and Zellner (2011) define business process in their study as “a sequence of activities, but focuses on fulfilling an organizational task”.

As the basis of competition changes from cost and quality to flexibility and responsiveness in the global market, the value of process management is being recognized. All the processes of the business functions of a company need to be appropriately integrated to assure working of all functions of the company in harmony and to reach world-class organization level (O'Neill & Sohal, 1999).

2.1 The definition of BPR

The origin of the reengineering concept traces back to the nineteenth century when the management theories were developed. There are so many definitions of BPR as belong to the authors publishing on the topic, even though multiple aspects they have in common, there is no universally accepted definition. (Bhaskar & Singh, 2014). Several BPR definitions are given below.

- Davenport and Short (1990) define BPR as “the analysis and design of workflows and processes within and between organization”.
- Hammer and Champy (1993) define reengineering as “the fundamental rethinking and radical redesign of business processes to achieve dramatic

improvements in critical, contemporary modern measures of performance, such as cost, quality, service, and speed".

- Petrozzo and Stepper (1994), define BPR as "concurrent redesign of processes, organizations, and their supporting information systems to achieve radical improvement in time, cost, quality, and customers' regard for the company's products and services".
- Peppard (1995) claims that BPR is beginning to emerge as a principal element in a framework of approaches that are complementary and broadly consistent in seeking performance improvement. Reengineering is a significant change and a rethinking process, not a process speeding up, fine-tuning or 5-10% improvement.
- According to Covert (1997), BPR means dramatic change and revamp of organizational structures, management systems, employee responsibilities and performance measurements, incentive systems, skills development, and the use of information technology.
- According to Grover and Malhotra (1997), BPR has proved to be an innovative management technique to achieve dramatic improvement in the processes and significantly influenced the operations of service and manufacturing firms. BPR strives to break away from the old rules of organizing and conducting business.
- According to Valiris and Glykas (1999), BPR is the elimination of nonvalue-added activities and best re-allocation of resources to reduce the gap between identified differences about business activities and current productivity with the organizational strategy and desired productivity.
- Page (2010) describes business process improvement (BPI) as a study for the elimination of errors, identification of opportunities to yield a more effective and

efficient process, clarification of the relationship between departments and the roles and responsibilities, improvement of productivity, and elimination of redundancy.

Hall and Johnson (2009) cited in Griesberger et al. (2011) stated that "BPI seems to be rather art than science the research concerning the act of improving a business process is still at its beginning." The objectives of reengineering are recovery, and increase business performance through a corporate restructuring and radical remodeling of business processes. It involves recognizing and rejecting some of the business processes and then finding imaginative ways and suitable new rules to accomplish the work with achievements in performance improvement (Hammer & Champy, 1993). Besides, the aim of reengineering should be to facilitate the match between market opportunities and corporate capabilities, and in doing so, ensuring corporate growth (O'Neill & Sohal, 1999). In addition, multi-fold performance improvements in cycle time, quality, customer service or cost through revamping and redesigning of the existing processes from a clean slate are among the goals of BPR (Grover & Malhotra, 1997).

The three driving forces behind the radical improvement were summarized by Hammer and Champy (1993) as:

- - Customers who can be very diverse, segmented, and are expectant of consultation,
- - Competition that is intensified to meet the needs of customers in every niche, and
- - Change that has become pervasive, persistent, faster and in some markets a pre-requisite.

2.2 Factors affecting the success of BPR

Holland and Kumar (1995) note that 60 to 80 percent of reengineering programs have been unsuccessful. Besides, Rock and Yu (1994) cited in Goksoy, Ozsoy and Vayvay (2012) found that 85% of executives surveyed were not satisfied with their BPR project outcomes. Various methodologies have been developed for BPR, and there are so many context-specific successful and unsuccessful examples. Gunasekaran and Ichimura (1997) advocate that an activity-based analysis with the linkage of financial and strategic considerations is essential for successful BPR programs. According to Hammer and Champy (1993), a focus on processes rather than organizational boundaries, the ambition to create breakthrough performance gains, a willingness to break with old traditions and rules, and the creative use of new information technology are the main themes of successful reengineering programs. Besides, Holland and Kumar (1995) stated that targeting the right processes and balanced and sustained executive support are the critical aspects for the success of BPR. In addition, non-strategically driven reengineering methodologies lead firms to lose vital components of the workforce that will enhance the creativity and the productivity in the long-run (Grover & Malhotra, 1997). Griesberger et al. (2011) evaluated business processes improvement techniques and conclude that in addition to the goal oriented and transparent results, the creative techniques for generating innovative ideas is essential for improvement.

Obtaining management support is an essential factor that has to be considered for a successful BPR initiative (Tsalgatidou, 1995). Hammer and Champy (1993), advocate that any reengineering project, which seeks to bring in operational changes or alters the working style, it is necessary that the management should keep the pressure and maintain the momentum until the change is accepted and

institutionalized. According to Champy (1995), top management should be aware of the type of improvement needed, and the best way and the sources that are necessary for achievement of such productivity. Planning the organizational change from vision until goal setting and outlining the implementation is vital for the success of the BPR initiative. They advise preparing a change plan considering the issues like inadequate opportunity, lack of direction, improper involvement of IT, considering a change as a normal process and the issues that can be faced during implementation like lack of management commitment towards the application of BPR process, status quo for incapability of vision communication, and organizational goal expectations from BPR. Moreover, according to them, besides an effectively prepared plan, involving the most loyal and willing people to change, selecting areas and emphasize on efficiency and effectiveness, keeping of contingency plans, and designing of the effective control system are also necessary for the success of the BPR initiative.

The people factor is also one of the critical success factors of BPR projects. Champy (1995), observe that, strategies such as using authority and power, deal-making or manipulation to ensure compliance does not work since it cannot gain the support needed for the change. The top-down management approach wherein the top management considers itself to be rational, objective and innovate, and ignoring the emotional and personal issues of others has proved to be unsuccessful in most cases. Similarly, Hall, Rosenthal and Wade (1993), observe that the bureaucratic management style, which the changes are linear like the top-down management approach, does not suit project implementation. Emotional and personal issues play a critical role and have an essential for evolving a proper shift in the process, so, it is necessary for corporate members to be involved in the process of bringing organizational change.

Sandberg (2001) hypothesized the impact of organizational culture on BPR that fosters resistance to change. Some of the employees affected by the change are afraid to be openly critical of their superiors or are not even aware of their resistance. On the other hand, in case the employees are informed and involved in projects, the resistance is lower, the positive changes take place and easy transition to the new working environment is enabled. Hall et al. (1993), similarly, state that the management should acknowledge the emotional and personal issues without considering their expression as resistance to change. According to Champy (1995), process reengineering requires the adoption of an approach, which reorganizes the valid concerns of affected people while managing the resistant behavior.

Champy (1995), argues that the language used may be always an indicator of the approach. According to them, soft and mild language need not necessarily mean a constructive approach; just as harsh language need not necessarily mean a negative or destructive approach. It is necessary to identify the type of communication like overt or covert and the individual resistance, and take remedial action accordingly. On the other hand, Hammer and Champy (1993), say that a critic communicates openly and shows a constructive approach towards the goals of the BPR project. Even though a critic may not agree with some aspects of a project or the approach of the management, it is a precious contribution to the success of the project in terms of different ideas. Involving the skeptic people, who are doubtful about various aspects of the project content or project management, is required since skeptics also can contribute to ideas towards the outcome of the project.

Sandberg (2001) say that the behavior resisters adversely affect the outcome of the project. The resisters usually show a negative attitude, express their dislike for the project objectives, and announce their line of resistance. These resisters should be

taken seriously by the project management team and while trying to persuade them in time to avoid any friction in the future. When the project is successful, this group tends to be positive on the other hand, in case of any signs of failure such people tend to be destructive in their approach and so it is necessary to carefully manage them. Hammer and Champy (1993), emphasize that there is always a tendency to shift back to the old style and destructive personality of some employees may lead a destructive behavior. They underline that destructive behavior within the organization should not be supported in order to prevent the damage of organizational efforts. According to Hammer and Champy (1993), group pressures may compel the group members to behave destructively. In addition, losing of supervisory control or power over other people because of the reengineering project may lead the affected individual to react covertly to sabotage the results of the BPR initiative. Managing the feeling of loss of power can be managed by explaining the new roles and responsibilities clearly. Hall et al. (1993), advice organizations to meet with managers and ask them to list all their responsibilities, which sometimes includes performing duties in different functional areas, such as accounting and human resources. They also advise showing the managers reengineered organizational structure and ask them for their opinions about comparing with their current responsibilities. Job descriptions should be written for each position to make sure each employee fits into the new structure and to ensure the accurate filling of the positions created by the reconfigured organization structure.

2.3 BPR methodologies

The BPR methodology is also a critical success factor of BPR projects. Estimations indicate that more than 70 percent of organizations are doing some form of BPR

study. On the other hand, estimations also indicate that approximately 75% to 85% of BPR efforts fail. (Wanner & Franceschi, 1995) The high rate of fails shows the requirement of the right methodology. A well-attested methodology is necessary for the deployment of reengineering programs, which produce the desired business results (Lockamy & Smith, 1997).

According to Leavitt (1965), the four interacting variables of the organizations need to be concerned during a BPR study that are task variables, structural variables, technological variables and human variables. The interaction between these variables are shown in Figure 1. Task variables refers to the produced goods and services, people variables refers to the personnel, technology variables refers to the computers, other machines and programs, and structure variables refers to communication, systems of authority and workflow.

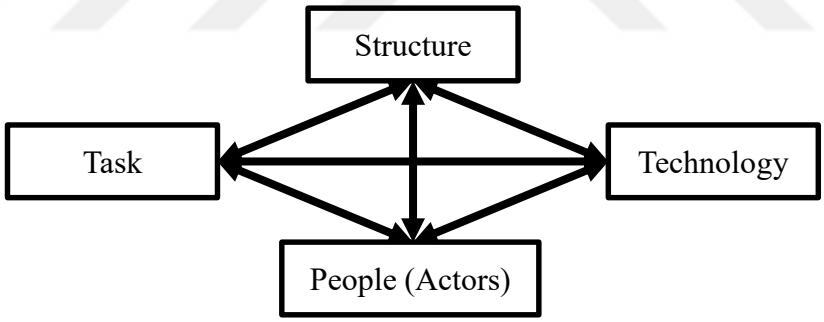


Figure 1. The four interacting variables of the organizations (Leavitt, 1965)

Valiris and Glykas (1999) reviewed the existent BPR methodologies and classified them as management accounting methodologies, IS influenced methodologies and theory based organizational methodologies. According to them, management accounting methodologies satisfies the establishment of business objectives, identification of core business processes, streamlining and continuous

improvement. On the other hand, IS influenced methodologies satisfies the establishment of the business objectives, identification of the core business processes and analysis of the business environment.

For a successful BPR initiative, several factors have to be considered including the selection of the right method, commitment of top management, the project team and the use of IT (Tsalgatidou, 1995). Without a methodology, stakeholders would easily get lost in the "improvement black box", because of the absence of the directions and the rules that support the act of process reengineering (Zellner, 2011). Since a method helps to resolve theoretical and practical tasks, it is a required instrument for a goal-oriented systematic approach (Braun, Wortmann, Hafner, & Winter, 2005). A clearly defined and explained BPR method facilitates communication and enables the involved parties to understand their functions and roles.

An assessed methodology is necessary for different cases due to various business objectives, the rate of utilization of IT and the evolution of the field itself. BPR practitioners and theorists that are involved in a BPR study emphasize the principles of BPR rather than on remediation (Vakola & Rezgui, 2000).

Successful practices and methodologies of the business process reengineering which were applied and mentioned in the literature are examined in order to identify the right methodology for this thesis. Some of the methodologies of the business process reengineering which were mentioned in the literature are explained in the following.

2.3.1 The Hammer/Champy methodology

Hammer and Champy (1993) define BPR as the “fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed”. During a BPR study almost everything in the organization like people, jobs, managers, and values can change because they are linked each other. Hammer and Champy (1993) call these aspects as the four points of the business system diamond, which is depicted in Figure 2.

Hammer and Champy (1993) state that “since reengineering is about innovation and not automation, one of its most difficult parts is identifying the “new” capabilities of technologies”. According to them, IT plays a crucial role in BPR, mainly when it is used in the work processes that have not been used before. Inductive thinking is needed to determine the IT that can be used and to visualize the future after its application. Instead of initially defining a problem, and then seeking and evaluating different solutions for it, it is more efficient first to recognize a robust solution, and then explore the problems it might solve. Hammer and Champy (1993) claim that inadequate management, unclear objectives, and human factors are the main problems for BPR success.

Hammer and Champy (1993) suggested a methodology for BPR, which was refined by Champer's Consultant Company. The six phases of the method are briefly given below.

2.3.1.1 Introduction to business reengineering

According to Hammer and Champy (1993), preparing and declaring the “case for action” and the “vision statement” have the first priority for a BPR study. The “case

for action" describes the organization's business problems and the current situation and presents a justification for the need for change. The "vision statement" outlines the achievements aimed in the study and describes the outputs of the BPR as how the organization is going to operate in the future. This vision statement can also be used during the BPR study as a reminder of reengineering objectives, as a metric for measuring the progress of the project, and as a motivator to keep momentum of the reengineering study. The communication of the case for action and the vision statement is the top management's responsibility.

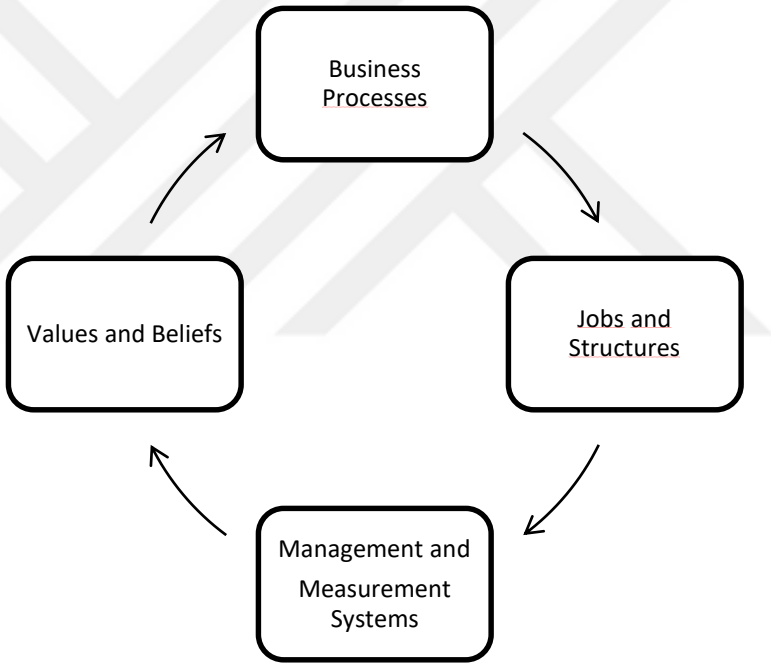


Figure 2. The business system diamond (Hammer & Champy, 1993)

2.3.1.2 Identification of business processes

Hammer and Champy (1993) claim that the identification of the most critical business processes is vital for the success of the BPR study. Identified processes can be described using a set of process maps. Process maps consist of the process workflows through the company. After the preparation of the high-level process

maps, the decomposed sub-process maps are prepared. Process maps visualize the current process flows and used as a means of communication to help people discuss reengineering.

2.3.1.3 Selection of business processes

According to Hammer and Champy (1993), it is unrealistic to reengineer all the critical processes of an organization at the same time and a prioritization has to be made to determine the processes that are going to be redesigned. This is an essential part of a BPR effort. The processes can be grouped as the most problematic processes, those with high impact on customers, processes with more chances to be successfully reengineered, processes that contribute to the organization's objectives, and so on. According to the organization’s strategic objectives and the objectives of the BPR study, criteria could be defined for the selection of the processes for BPR study.

2.3.1.4 Understanding of selected business processes

Hammer and Champy (1993) state that before proceeding to redesign, the reengineering team first needs to gain a better understanding of the selected processes in terms of the issues that leads to their poor performance. The detailed analysis and documentation of current processes that were prepared in the second phase can be used for this purpose. The objective of this phase is the understanding of a high-level view of the process under consideration, which enables the team members to have the intuition, and insight required to create an entirely new and superior design.

2.3.1.5 Redesign of the selected business processes

According to Hammer and Champy (1993), inductive thinking, creativity, visualization and imagination is necessary in this phase because new rules and new ways of work is going to be devised. Hammer and Champy (1993) suggest three kinds of techniques that can help reengineering teams to generate new ideas: (1) boldly apply one or more principles of re- engineering, (2) search out and destroy assumptions, (3) go looking for opportunities.

As redesign proceeds, teams can consider these or more techniques again to stimulate additional ideas.

2.3.1.6 Implementation of redesigned business processes

The implementation phase is the last phase of this BPR methodology. Hammer and Champy (1993) believe that the success of the implementation depends on whether the five preliminary phases have been adequately performed.

2.3.2 The Condor methodology

CONDOR is a BPR model derived from the composition of the BPR models of the best practices in the literature (Vakola & Rezgui, 2000). The model consists of a cycle of eight successive steps (Figure 3). The stages are briefly described in the following parts.

2.3.2.1 Develop a business vision and process objectives

According to the Vakola and Rezgui (2000), firstly, evaluation of the current practices, prioritization of the objectives and setting-up the targets is necessary to develop a business vision. Developing a business vision and process targets require a

clear understanding of organizational strengths, weaknesses, market conditions, opportunities, and threats as well as knowing the other organizations and competitors. Besides, reviewing of the business processes and information management practices is also necessary to determine the IT strategy. External forces like market pressures, customer needs and other environmental factors, and internal factors like organizational capabilities and information management practices have a significant effect on the determination of business strategy and process of objectives.

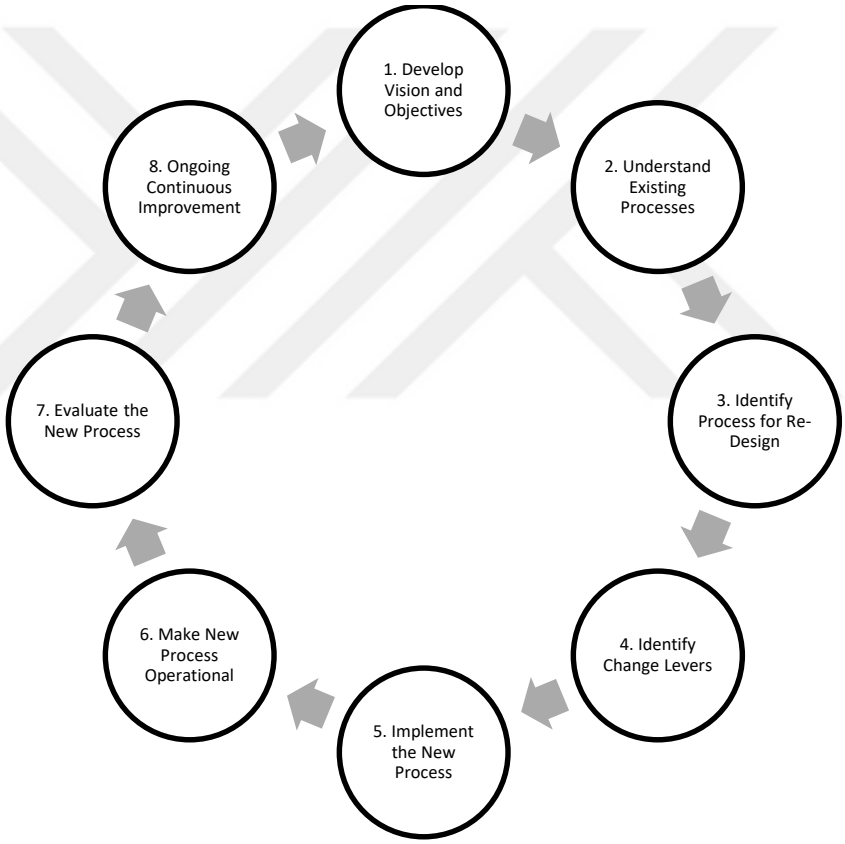


Figure 3. CONDOR model for BPR (Vakola & Rezgui, 2000)

2.3.2.2 Understand existing processes

For a BPR project, understanding of the existing processes is necessary concerning the recognition of the problems in the existing processes and it facilitates communication among BPR team. During this stage, developing a common shared

understanding of the current processes and identification of the problems is aimed (Vakola & Rezgui, 2000).

2.3.2.3 Identify the process for the redesign

In this phase, core business processes and document management practices are determined according to their impact on the company business performance, existing problems in the processes and their value potential. The challenge is to synthesize process activities in a way that would facilitate redesigned business (Vakola & Rezgui, 2000).

2.3.2.4 Identify change levers

Analysis of a change lever requires an adequate knowledge of the business processes and exploring the ways of applying the potential of IT to reach breakthrough outcomes for the reengineered processes (Davenport, 1993). According to Vakola and Rezgui (2000), IT is commonly utilized both for supporting the business processes and for redesigning of reengineered processes in the BPR studies.

Vakola and Rezgui (2000) claims that end-user and organizational requirements can be grouped as functionality, usability, user acceptability and organizational acceptability. The brief explanations of these requirements are in the following:

Functionality: the technical specification and the functions of the designed system that will be able to perform and a clear explanation of its range of support for organizational tasks.

Usability: the functionality and ease of use the system that the users will be able to use it without undue strain on their capacities and skills.

User acceptability: the users perceive of the system that makes ease of their work with offered services.

Organizational acceptability: the new system should be served as a tool to support organizational goals instead of just serving for immediate tasks.

2.3.2.5 Implement the new processes

Vakola and Rezgui (2000) state that the aim of this phase is to implement the identified processes during the “Identify the process for the redesign” stage. Implementation is necessary in terms of the system that being implemented.

2.3.2.6 Make the new process operational

According to Vakola and Rezgui (2000), the aim of this phase is making the redesigned processes operational. A set of field trials is required to test and validate the redesigned processes and the supporting IT systems. In addition, during this phase, the participating shareholders have the opportunity to operate and simulate the redesigned processes functions and assess the outcomes.

2.3.2.7 Evaluate the new process

Vakola and Rezgui (2000) advocate that the evaluation stage is also required for the reengineered BPR model. During this phase, the achievements and the provided advantages of the BPR study is evaluated. The designed process and supporting IT systems are assessed by end-users with the changes to working practices to maximize benefits and the estimated time saved. These estimations can be grouped under four aspects as the system functionality, the system efficiency, the user-friendliness, and the technical aspects.

2.3.2.8 Ongoing continuous improvement

BPR should be regarded as a continuous and ongoing process and an improvement strategy that enables companies to determine weaknesses and fixing them through adequate integrated solutions.

2.3.3 The methodology of Davenport and Short

Davenport and Short (1990) place IT at the heart of BPR. They realize the existence of a recursive relationship between IT capabilities and BPR (Figure 4), and claimed that IT must support new or redesigned business processes, and recursively business processes and process improvement should be considered in terms of the capabilities IT can provide. Davenport and Short (1990) recommends a five-step approach to BPR.

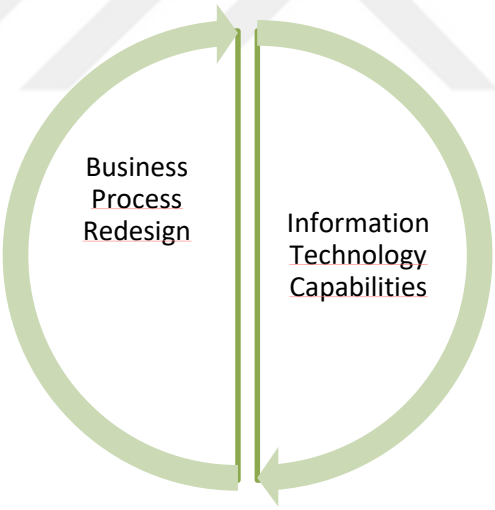


Figure 4. The recursive relationship between IT and BPR (Davenport & Short, 1990)

2.3.3.1 Develop business vision and process objectives

According to Davenport and Short (1990), developing a business vision and process objectives requires a clear understanding of the organization in terms of its strengths, weaknesses, opportunities, and threats as well as knowing the market conditions and

the competitors like other organizations. During this phase, the objectives of the study and the business vision of an organization are defined. A business vision implies specific goals for process redesign, such as cost reduction, time reduction, output quality, the quality of work life and the quality of learning. During this phase, the objectives of the study determined, and stretch targets are set.

2.3.3.2 Identify processes to be redesigned

Identifying and selecting processes to be redesigned is a crucial step for process change. In this phase, the most critical part is determining core business processes, which have a significant impact on the company's overall business performance and bring great value to its customers.

That is why during this step, the most critical processes are identified and prioritized according to their redesign potential. Critical business processes are determined either by identification and prioritization of all processes or by identification of essential processes or processes in conflict with the business vision and process objectives.

2.3.3.3 Understand and measure existing processes

Although Hammer and Champy (1993) have criticized that understanding of the existing processes is an impeding factor for creativity, on the other hand, it is essential to comprehend and get a clear picture of the existing business processes before the BPR study. Recognizing problems in current processes is vital because it can help ensure that they are avoided in the designed processes. Understanding the existing processes also facilitates communication among the BPR team members.

Models and documentation of the current processes enable the BPR team members to develop and share a common understanding of the current state.

At this stage, key performance indicators (KPI's) are determined for the selected processes. After that, their functionalities are analyzed and their existing performance in terms of KPI's are measured. Based on these data, the reengineering objectives can be determined.

2.3.3.4 Identify change levers

IT is a powerful tool, which is commonly utilized during the BPR studies. Change levers provide adequate support for existing business processes and setting the targets for BPR initiatives in terms of competitiveness, effectiveness, and efficiency of the organization.

2.3.3.5 Design and build a prototype of the process

The final step in a redesign effort is the design of the new process. The actual design of the new process should be viewed as a prototype and successive amendments should be expected.

2.3.4 The methodology of Love and Gunasekaran

Love and Gunasekaran (1997) reviewed the enablers of process reengineering and realized that traditional reengineering studies mostly utilized nonscientific methods, philosophical, emphasizes the communication process improvements. On the other hand, a radical and revolutionary approach requires application of scientific methods to process thinking. Love and Gunasekaran (1997) stated, "Process reengineering can be considered to be a combination of industrial engineering techniques, operations

research methods, management theory, and information systems analysis that utilize the power of information technology to radically change an organization's processes to achieve dramatic performance improvements so that they can effectively compete in their markets within which they operate".

Love and Gunasekaran (1997) suggested a framework for BPR. The methodology consists of eight stages that are shown in Figure 5 and explained in the following.

2.3.4.1 Step 1: State a case for process reengineering

The need for change should be communicated effectively to all employees throughout the organization via training and similar methods. Communication with employees is a mandatory requirement.

2.3.4.2 Step 2: Establish process objectives

The objectives of reengineering study should be clearly communicated to all employees. Cost reduction, time saving, quality and customer satisfaction enhancement should be included in the objectives. These objectives will be used to measure the progress of the study.

2.3.4.3 Step 3: Identify the process for reengineering

All the main processes in the organization should be defined first. However, not all main processes should be reengineered at the same time. The current performance of the processes should be evaluated before selecting the processes to be reengineered. The following questions can be used for evaluation:

- Which processes are the most problematic?

- Which processes are likely to be redesigned?
- What are the costs?
- What is the commitment of the workforce?
- Is the process or technology outdated?

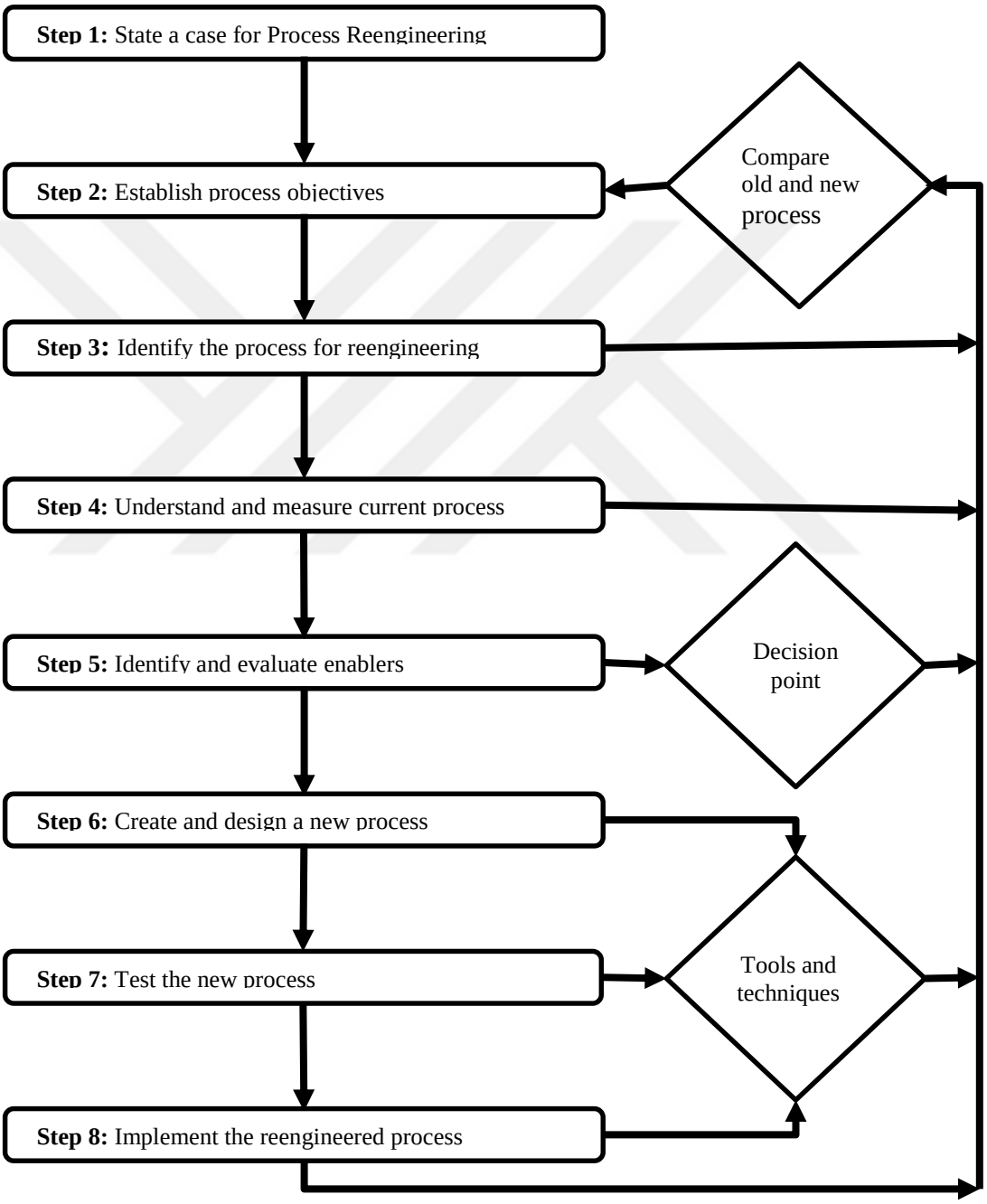


Figure 5. Flow chart for process reengineering **(**Love & Gunasekaran, 1997)

The answers given to the questions should be weighted according to the needs of the organization and employees.

2.3.4.4 Step 4: Understand and measure current process

It is necessary to fully understand the current process and identify problems related to the process. Moreover, current performance parameters of the process are required which can be obtained from the quality system of the organization.

2.3.4.5 Step 5: Identify and evaluate enablers

Information technology, human resources and quality management are some of the enablers of the process reengineering. Additional enablers should be identified and evaluated.

2.3.4.6 Step 6: Create and design a new process

Process reengineering requires the removal of the existing process. Process reengineering principles should be applied to create and design a new process. Using reengineering tools and techniques is required to create and design new processes.

2.3.4.7 Step 7: Test the new process

Testing of the designed process is required before implementation. The objectives of the reengineering study can be used for comparisons and estimations of the value added. The simulation method can also be used for testing the new process.

2.3.4.8 Step 8: Implement the reengineered process

The commitment and support of top management enhances the commitment and encouragement of the employees. Work groups and training sessions should be organized to support and praise the efforts of the employees. After the implementation, the old and the newly designed processes should be compared by using the reengineering objectives and process outputs.

2.3.5 Agent relationship morphism analysis (ARMA) methodology

Valiris and Glykas (1999) studied the existent BPR methodologies and created the BPR methodology called agent relationship morphism analysis (ARMA). ARMA methodology combines the BPR principles (like improvements in efficiency, effectiveness, cost savings, etc.) with organizational theoretic concepts (like roles, responsibilities, etc.), and with IS development modelling techniques and methodologies. An overview of ARMA is presented in Figure 6.

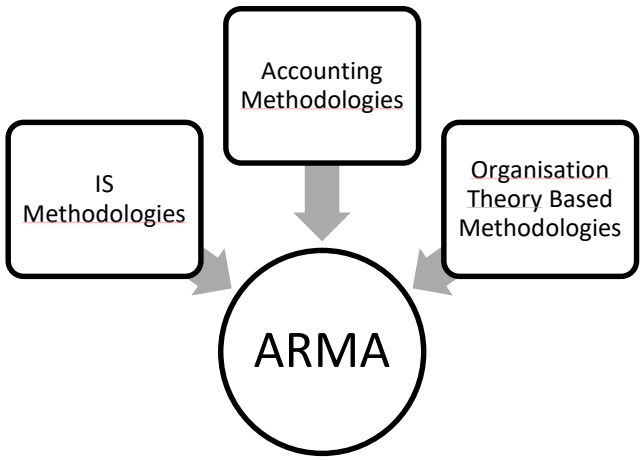


Figure 6. An overview of ARMA (Valiris & Glykas, 1999)

2.3.5.1 A Diagnostic phase at the beginning of BPR

Valiris and Glykas (1999) stated that the alignment between organizational strategy and the business processes that has been noted in other methodologies (Davenport, 1993) place significant importance about the need of communication of a strategic vision of the organization at the beginning of the redesign effort. During this phase, top management should communicate future performance targets of the organization to all levels. Future performance targets also helps to identify scope of the BPR study and the BPR vision.

2.3.5.2 A Contractual view of BPR

According to Valiris and Glykas (1999), one of the main benefits that BPR brings to the organization is outsourcing. Organizations tend to outsource non-core tasks, jobs and processes to third party organizations and focus on its core business processes. In this phase, the relationships and all the processes of the organization are reviewed from a contractual perspective. Continuously assessing the value created by each organizational process comparing its cost against the cost of subcontracting this process to an outside vendor develops a sense of continuous improvement in the organization (Valiris & Glykas, 1999).

2.3.5.3 Relationship between organizational structure and processes

According to Valiris and Glykas (1999), some methodologies also tried to provide some insight to the relationship between organizational structure and processes. ARMA achieves the relationship between organizational structure and processes with the use of structural, behavioral and process based perspectives in the business modelling stage. Existing methodologies are not achieved the issue of the

relationship of organizational structure and processes but left as an area of further research (Valiris & Glykas, 1999). ARMA methodology introduces and defines organizational theoretic concepts in all three perspectives in an integrated manner.

2.3.5.4 Link between BPR, systems thinking and object orientation

Valiris and Glykas (1999) claim that applying systems thinking there are great benefits that can emerge from ideas in BPR. Adopting the systems thinking is required because of the need for modelling the complexity of the organizational environment.

2.3.5.5 Formalized BPR models

Valiris and Glykas (1999) advocate that BPR methodologies generally use diagrammatic notations (like use case diagrams, dataflow diagrams, the entity relationship diagrams, etc.) for modelling business processes, however, even though these diagrams provide informal frameworks, the semantic content is also required to support reasoning.

During this phase, formal mathematical notations are also required to verify the logical consistency of the existing and designed processes' diagrammatic models and as a means of introducing the concept of business rules.

2.3.5.6 A Different view of redesign

According to Valiris and Glykas (1999), "most BPR methodologies view the implementation of redesign as a means of transforming the organizational structure from a hierarchical to a process team based", ARMA methodology requires in this

phase to create functional units provided by the organizational hierarchies and using the flexibility of process thinking while preserving the organizational cohesion.

2.3.6 The methodology of Susan Page

Page (2010) describes business process improvement as a pragmatic approach to increase the effectiveness, efficiency, and adaptability of business processes and to create a process inventory to keep business processes continually deliver value to the business. According to the Page (2010), BPI does affect the entire business system, including the employees, the information technology systems that support the process, the measurements established to assess the effectiveness, efficiency, and adaptability of the processes, and reward and recognition programs that exist in a company. The methodology of Page (2010) has ten steps.

2.3.6.1 Develop the process inventory

Every department or business area has many business processes. A process inventory of all the processes is required to decide a starting point for a business process improvement study. Each process in the inventory is evaluated according to prioritization criteria. Preparing a process prioritization table is useful to determine the business process that needs to be focused on. A sample process prioritization table is given in Table 1.

2.3.6.2 Establish the foundation

According to Page (2010), the scope definition is the blueprint of the BPR study. This definition is a guide that defines the process boundaries, provides the baseline information about the business processes and keeps the work on the track. Preparing

a scope definition helps to avoid scope creep or scope changes that mean an increase in time, resources, or money.

Table 1. Sample Process Inventory Table

Process	Impact		Implementation			Current State			Value	
	Number Affected	Client Level	Time to Market	Funding	Timing of Next Cycle	Client Satisfaction	Pain Level	Process Exist?	Benefit /Return	Total Score
	3= large number 2= average number 1= small number	3= senior 2= management 1= other	3= short 2= average 1= long	3= small 2= medium 1= large	3= close 2= intermediate 1= far	3=low 2= medium 1= high	3=high 2= medium 1= low	1= no 0= yes	3=high 2= average 1= low	
Salary Planning										
Budgeting										

Source: Page, 2010.

2.3.6.3 Draw the process map

According to Page (2010), drawing the process map enables everyone involved to visualize and understand how the existing business process works and the interaction between other processes and departments.

2.3.6.4 Estimate time and cost

The process time and the cycle time is necessary to understand the activities of a business process. According to Page (2010), process time is the labor required to deliver a business process, and cycle time identifies how long the process takes from beginning to end, a key metric that customers/clients usually list as a top concern. These values can be used as parameters while defining improvement targets.

2.3.6.5 Verify process map

According to Page (2010), a review and validation of the process map are required to map the existing processes accurately that decreases the possibility of any future challenges. Also, it provides a solid foundation for the process improvement work.

2.3.6.6 Apply improvement techniques

Page (2010) introduces six key improvement methods. They can be summarized as (Figure 7):

- Eliminating bureaucracy: Bureaucracy can be specified as “productivity’s enemy” and states that each activity in the business process must be traced for any cycle time overburdened with multiple layers of approvals.
- Value-added: Every activity in business process means cost in terms of labor, overhead or other expenses and the value-added analysis identifies how each activity in a business process contributes to value created.
- Eliminate duplication: Duplication occurs because each department maintains its separate dataset while being involved in a business process without integration.
- Simplification: Simplification in a business process can be accomplished by reducing or eliminating the complexity and making the business process easier to understand. Keeping the business process simple makes it easier to sustain and to be more flexible.
- Reduce Cycle Time: Cycle time is the overall time it takes to complete an entire process from the first step to the last, including waiting or elapsed time. The cycle time is important for clients and customers since reducing cycle time increases productivity and frees up resources.

- Automation: The technology can increase the effectiveness and efficiency of a business process. On the other hand, automation must be applied to an efficient process.

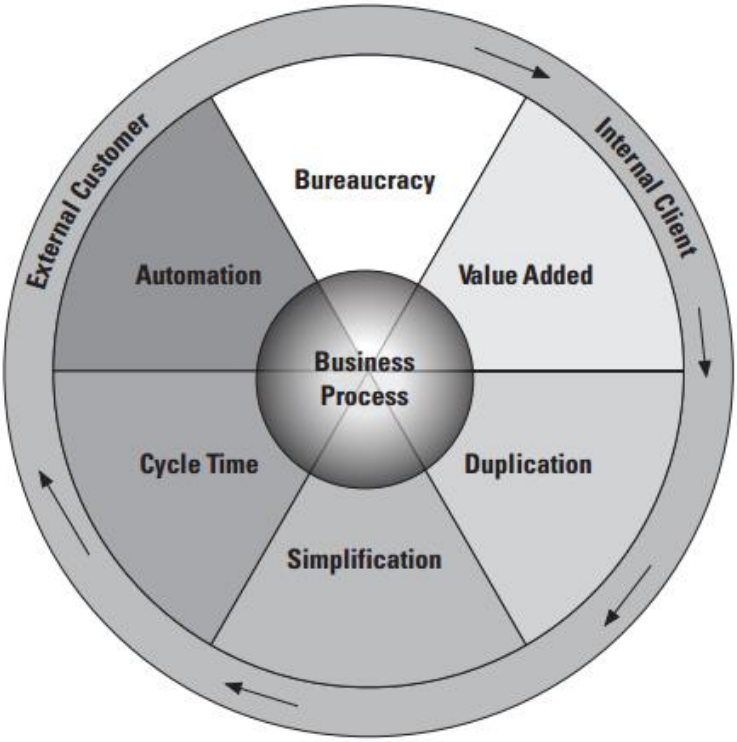


Figure 7. Wheel of improvement methods (Page, 2010)

2.3.6.7 Create internal controls, tools, and metrics

According to Page (2010), internal controls help to prevent and identify the errors in a business process like human errors and prevents the business process to get outdated.

2.3.6.8 Test and rework

According to Page (2010), the test plan covers the scope, time and responsibilities of related parties and ensures that new process and tools work as planned, and resolve any bugs before fully implementing the change.

2.3.6.9 Implement the change

According to Page (2010), before implementing a new business process an impact assessment is required to identify related parties about the change, who need to know, and how to communicate the right information to the right people.

2.3.6.10 Drive continuous improvement

According to Page (2010), improvement means not only a one-time event but also achieving a mindset by which improvement is the natural course of the business. The continuous improvement is a life cycle that has four phases as evaluate, test, assess, and execute. Continuous improvement keeps the business process up to date and validates that the business process continually delivers effectiveness, efficiency, and adaptability to the organization.

2.4 BPR case studies from the literature

2.4.1 A BPR case study for ground handling process

Bevilacqua, Ciarapica, Mazzuto, & Paciarotti, (2013) performed a case study on the handling service of an airport that mainly includes the airport assistance, cleaning, catering and maintenance of the aircrafts services. The applied BPR method consists of the following steps:

- Define process boundaries (identification of process inputs and outputs, selection of the metrics)
- Observe process step (recording of the relevant process steps information)
- Collect process related data (identification of the quantitative data like time, number of people, etc.)

- Analyze collected data (summarization of the data to for meaningful analysis)
- Identify improvement areas (definition of the improvement areas on the model)
- Develop improvement (resolution of the identified errors and application of the process improvement ideas)
- Implement and monitor improvements (implementation of the developed improvements)

Statistical distribution is used to simulate the durations of the processes for evaluation. The main purpose of the study was to identify possible solutions for the same problem before their implementation and to determine the best solution. According to the simulation result, the performance of turnaround time is improved up to 23%.

2.4.2 A BPR case study on a maintaining process within chemical industry

McAdam & O'Hare (1998) performed a BPR study on the global maintaining process of one of the multinational chemical manufacturing organization named Du Pont. Maintenance excellence recognition process (MERP) method was applied for the study. MERP has two main objectives, which are mainly benchmarking of the cost, management and performance of the maintenance function and identification of the actions required to take to improve the impact of the maintenance function on business results. The BPR study revealed the following results:

- Since the competition and networking within organizations are increasing, enabling processes are becoming more important.
- There are limited BPR studies about enabling processes in the literature,
- Addressing of the key people and process issues is required in the BPR methodology,

- Supporting communication and a clear definition are required in the BPR methodology,
- Establishment of the strategic and operational networks is required to ensure the consistency of the processes across multi-site organizations,
- Self-assessment and benchmarking should be an integral part of the BPR methodology.

2.4.3 A BPR case study of materials management system

Mohanty & Deshmukh (2001) performed a BPR study in the cement industry in India. In recent years, the cement industry in India have been growing rapidly at an annual rate of 15% with the domestic demand for housing and infrastructure. The company that the reengineering study was carried on was the largest cement producer and market leader in India, named ABC Ltd. The company had an annual production of two million tons of cement. The company had 600 employees and 60% to 65% of the total cost of the final product was the material cost.

The used BPR methodology consists of five stages, which are briefly described, in the following.

1- Diagnostic phase: the materials management system is analyzed and the problems related with the sub systems and their qualifications are identified. The management of the company determined that reducing lead times, enhancing customer service, and optimizing the operations are required to maintain the competition. In addition, the following problems are determined during this phase:
    - High inventory levels,
    - High lead times of store items and spares,

- No good relations with vendors.

2- Process analysis phase: The BPR team members are asked to enumerate the processes related to the critical success factors. The determined processes flow charts were developed to achieve a clear understanding of the processes and their relations.

3- Process design phase: The non-value adding activities are eliminated and the processes are simplified.

4- Evaluation phase: Key metrics were defined for evaluation. Each selected process was analyzed in detail after applying value-adding activities and removing non-value adding activities. Moreover, each process is evaluated in terms of the development possibility of digitalization, communication and automation of IT means.

5- Appraisal phase: The BPR efforts and benefits are presented to the top management and BPR team members. The recommendations of the BPR teams resulted in a big saving of lead-time from 171 days to 94 days.

CHAPTER 3

METHODOLOGY

All the BPR methodologies encountered in the literature review are assessed for this thesis study. Bhaskar and Singh (2014) evaluated the BPR tools and techniques in the literature and conclude that even though various BPR definitions includes the radical improvement, they do not put forward the specific tools and techniques for a successful outcome of business processes reengineering study. On the other hand, Page's (2010) methodology is up to date and each process step is explained in detail with examples. In addition, implementation of IT is also included in that methodology, which is a prerequisite for the selection of the methodology of this study. As a result, Page's methodology is considered as the most suitable for this thesis. In this chapter, performed reengineering study for the sales process of the Chemical Company is analyzed. The name of the company will not be denounced and it will be called as the Company in the following sections. Analysis is made by following the steps of Page (2010) as stated in below sections.

3.1 The process inventory

Every department and business area of the company is inspected and several meetings have been held for identification of the existent business processes. Human Resources Department of the company prepared a job description form for each role, on the other hand, no documentation can be found related to the business processes of the company.

The company requested its sales process to be included in this thesis, which was evaluated as problematic by the top management. According to the request of the company, flowcharts of the sales process are prepared.

3.2 Establish the foundation

The scope of this study is limited with the company's sales process, as requested by the company.

3.3 Draw the process map

The company was visited several times and at least one sales personnel at each hierarchical level was interviewed. According to the gathered information flowchart of the sales process was prepared and validated with each personnel (Figure 8).

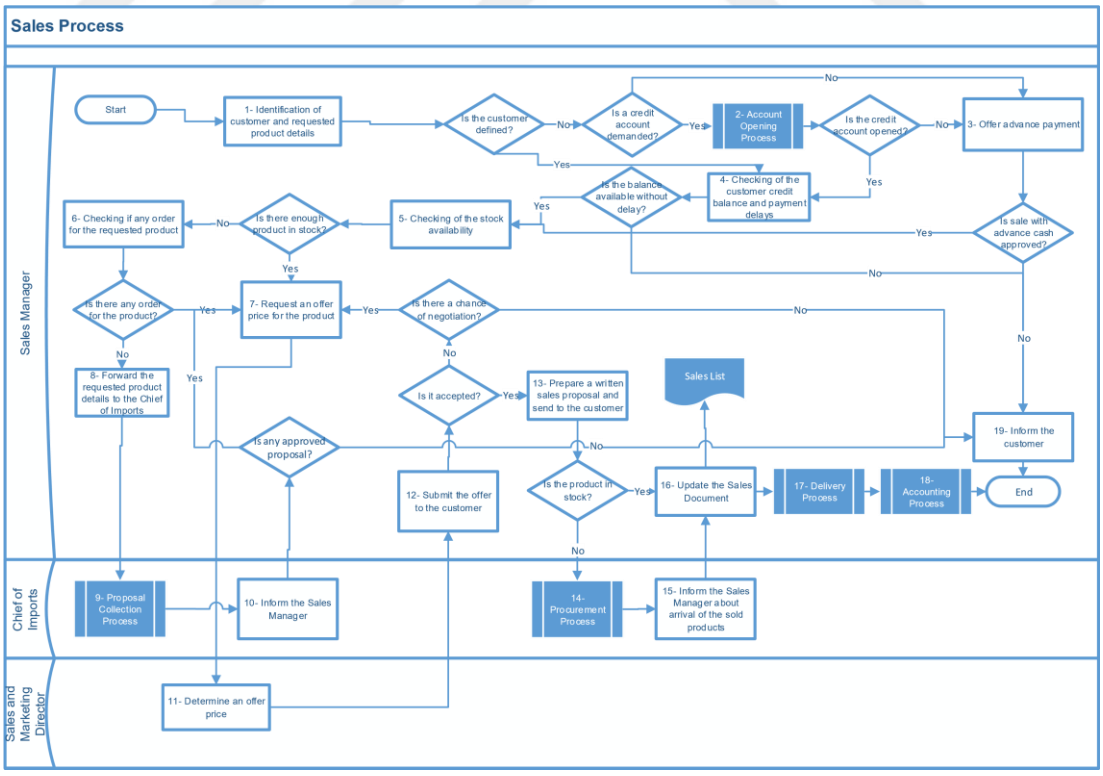


Figure 8. The current sales process of the company

Appendix A includes all the sub process diagrams related to the sales process of the company and Appendix B includes the sub process description forms of the sales process.

3.4 Estimate time and cost

The process time which is the labor required to deliver a business process and cycle time which is the amount of time for the process takes from beginning to end are the key metrics of this thesis. During the company visits, three sales managers were observed for 45 sales. The cycle time and activity times of 33 successful sales were recorded. Witnessed eight sales were unsuccessful due to high price, inadequate supply or insufficient credit balance of the customer. Appendix C includes the time records of the witnessed 33 successful sales.

Since the company refused to provide a detailed information related to its sales records, inventory records, amount of sales, etc., the cost metrics could not be defined. On the other hand, for the sales that time records are collected, anonymized customer and product information was received for enrichment of the collected data.

3.5 Verify the process map

The flowchart of the sales process is reviewed and validated by the sales manager and the sales and marketing director. The correctness of the sales process was also corrected during time keeping study.

3.6 Apply improvement techniques

The current existing problems are determined and then the improvement methods of the methodology are applied.

3.6.1 Problems in the current sales process

Problems in the current sales process can be itemized as:

- Stock records are not up-to-date:
    - Stock records of the products in the warehouse is kept both on Micro (the accounting application) and in MS Excel file named Stock Records. The sales managers are expected to enter each successful sale to the MS Excel document named Sale Records. The two MS Excel files are linked so that each sale record updates the stock information on the Stock Records file. The stock records on Micro is updated after the completion of the accounting process. In addition, the company also makes supply chain agreements so that it is obligated to have stock of some products. Sales managers cannot trust the Stock Records file all the time due to not entered sales records or the chance of the current stock waiting for supply chain agreements. In addition, the stock records on Micro are usually not up to date. In some cases, the actual stock is requested from the warehouse manager.
    - Some of the sold products are retained in the warehouse until the customer wants it to be shipped. In some cases, these products cause the warehouse capacity problem when the new products arrive.
    - Sales records are not instantly entered to the Sale Records file, which leads to outdated stock records and in some cases, successive sale of the same product in the stock by different sales managers.
- No pre-determined prices for the products:
    - The sales director determines the price for each sale.

    - During price negotiation, each time the sales manager asks the sales director for price discount.
    - The rate of profit is determined by considering the actual cost according to the first-in-first-out principle and the company's current profit target for each sale. Top management's assessment and total sale amount of the current month determine the profit target.
- No customer segmentation:
    - Customers are distributed among the sales managers. A sales manager can sell any product from the product portfolio to his/her customers.
    - The price of a product can only change according to the requested amount but not according to the customer.
- Unsuccessful sales due to high price, inadequate supply or insufficient credit balance of the customer that is called as sale loss and price proposals given to a customer are not recorded.

3.6.2 Applied improvement techniques

The applied improvement techniques are automation, reduce cycle time, eliminate duplication, and simplification. Each of them are explained in detail below.

Eliminate Bureaucracy: The current sales process is analyzed in terms of unnecessary activities or approvals and nothing has been eliminated because of bureaucracy.

Value-added: The value-added analysis is an examination of how each activity in a process contributes value to the created service/product and to the client. The value-added analysis is revealed that adding the following activities to the sales process will contribute to the value created.

- The products related to the customer's business sector can be seen on the customer sale screen during a sales process that will improve service time and enhance the cross selling potential.
- The sale loses will be recorded to the database of the new (developed) application and the sales and marketing director will be able to analyze them.

Eliminate duplication: The duplications in the sales process were carefully inspected and questioned. As a result, some of sub-processes are eliminated.

According to the current sales process, Sales and Marketing Director determines the offer price for each sale proposal and during price negotiations. On the other hand, according to the re-designed sales process the Sales and Marketing Director will determine the minimum and maximum price range of each product for each customer segment and enter the price range to the application. The Sales Managers will be able to negotiate the price without interviewing the Sales and Marketing Director. As a result, "7- Request an offer price for the product", "11- Determine an offer price" sub-processes of the current sales process are eliminated. In addition, "12- Submit the offer to the customer" sub-process is also merged with the new sub-process.

Simplification: After the simplifying the process, the decision nodes are decreased from 11 to 9 in the designed sales process.

According to the current sales process different information sources are used for these sub-processes: "4- Checking of the customer credit balance and payment delays", "5- Checking of the stock availability" and "6- Checking if any order for the requested product". On the other hand, according to the re-designed sales process, the customer credit balance and payment delays and the stock availability products

related to the customer's business sector can be seen on the customer sale screen. As a result, these sub-processes are merged.

In addition, according to the re-designed sales process, when a sale record is entered to the application, the stock of the product will be updated and the written sales proposal will be prepared and sent by the application automatically. The "13- Prepare a written sales proposal and send to the customer" and "16- Update the Sales Document" sub-processes are eliminated.

Reduce Cycle Time: A new application is proposed to improve the sales process and automate the possible sub-processes. The features of the proposed application are summarized under the automation heading. In addition, eliminating the duplications and simplifying the redundant activities will help to reduce the cycle time.

Automation: A new application is necessary for the automation of the sales process. The requirements of the application are given in the following:

- Interface requirements
    - Customer Management screen is used to define customer segments, assigning of the customers to the defined segments, associating segments with products in the product range and change the assigned segments of a customer.
    - Product Price Management screen is used to define price range of a product according to customer segments and purchase amount.
    - Customer Sales screen is used to access and see the customer's current credit balance, payment history of previous purchases, previous successful sales, in stock and in transit products and price ranges of these products associated with the customer's segment, previous offers/sales. In

addition, it is used to create and finalize an offer after the price negotiation phase as a successful sale or a sale loss. In addition, it is used for in transit product sales to enter a delivery date after the product arrives. Moreover, for successful sales, a written sale proposal is sent to the customer's defined e-mail address systematically. Lastly, it is used for advance payments, to see in stock and in transit products and their price ranges.

    - User Rights Management screen is used to manage the authority of the users for accessing to the screens and user rights management.

- Business Requirements
    - Clicking the Approve button opens a pop-up screen with the summary of the operation.
    - The application administrator can manage the user rights for the screens and processes.
    - All personnel using the system will be trained.
- Regulatory/Compliance Requirements
    - The database will have a functional audit trail.
    - The application will have a functional audit trail.
    - The system will limit access to authorized users.
- Security Requirements
    - Members of the Sales Managers group can enter and approve sale proposal but cannot delete.
    - Members of the Administrators group cannot enter or approve requests but can delete requests.

The areas that will increase the effectiveness and efficiency of a business process are determined. A newly designed application can help:

- the Sales Manager on the customer sale screen to see up-to-date stock information of the products in the warehouse,
- the Sales Manager on the customer sale screen to see up-to-date stock information of the products in the shipment status,
- the Sales Manager on the customer sale screen to see customer account balance availability,
- the Sales Manager on the customer sale screen to see previous offers and status related to the customer,
- the Sales Manager on the customer sale screen to see negotiable price range determined by the sales and marketing director for the customer.

As a result of the applied improvement techniques phase, a re-designed sales process is prepared (Figure 9).

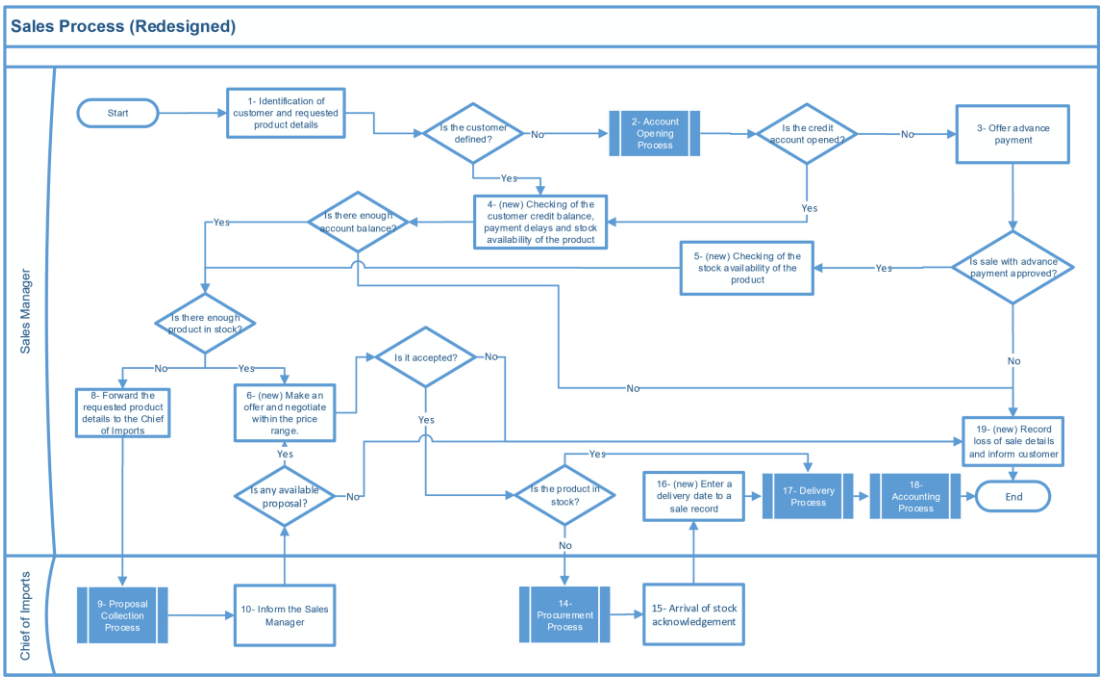


Figure 9. The redesigned sales process

3.7 Create internal controls, tools, and metrics

The company requested not to include internal controls phase of the study. Therefore, creating the internal controls, tools, and metrics studies are excluded from the study.

3.8 Test and rework

The designed sales process is presented to the sales manager and the sales and marketing director. On the other hand, the company refused to proceed to the implementation phase. Test and rework studies are excluded from the study.

3.9 Implement the change

Since the company refused to proceed to the implementation phase, the developed process cannot be implemented. For justification of the designed sales process, a simulation method is applied. For this purpose, the current and the designed processes are embedded in a simulation software and the results are compared. Arena simulation software is used for this purpose.

Simulation results are given in Table 2. Time distribution of sales records given in Appendix C can be found in Table 3. According to the simulation results, the average cycle time of a process is reduced by 453% (Table 4). The simulation report of current sales process is given in Appendix D, and the simulation report of designed sales process is given in Appendix E.

3.10 Drive continuous improvement

Improvement means not only a one-time event but also achieving a mindset by which improvement is the natural course of the business. The earnings that are revealed

because of this study will help the change of the mindset of the top management.

Table 2. Simulation Results

Sub-Process	Current Sale Process Avg. Time (in seconds)	Designed Sale Process Avg. Time (in seconds)	Improvement Percentage
1- Identification of customer and requested product details	152	152	0%
2- Account Opening Process	0*	0*	-
3- Offer advance payment	60	60	0%
4- Checking of the customer credit balance and payment delays 5- Checking of the stock availability 6- Checking if any order for the requested product 4- (new) Checking of the customer credit balance, payment delays and stock availability of the product	94 107 123	91	356%
5- Checking of the stock availability (advance payment) 6- Checking if any order for the requested product (advance payment) 5- (new) Checking of the stock availability of the product	107 123	90	256%
7- Request an offer price for the product 11- Determine an offer price 12- Submit the offer to the customer 13- Prepare a written sales proposal and send to the customer 16- Update the Sales Document 6- (new) Make an offer and negotiate within the price range	140 154 110 236 64	121	582%
8- Forward the requested product details to the Chief of Imports	0*	0*	-
9- Proposal Collection Process	0*	0*	-
10- Inform the Sales Manager	0*	0*	-
14-Procurement Process	0*	0*	-
15- Inform the Sales Manager about arrival of the sold products	0*	0*	-
16- Update the Sales Document (arrival of not-in-stock product) 16- (new) Enter a delivery date to a sale record	64	64	0%
17- Delivery Process	0*	0*	-
18- Accounting Process	0*	0*	-
19- Inform customer 19- (new) Record loss of sale details and inform customer	60	60	0%

* Since there is no data for the sub-process, constant “0” is entered for the simulation.

Table 3. Time Distributions of the Sale Records given in Appendix C

Sub-Process	Min Value (in seconds)	Max Value (in seconds)	Mean	Triangular Expression	Constant Expression
1- Identification of customer and requested product details	60	300	152	TRIA(60, 132, 300)	-
2- Account Opening Process	-	-	-	-	0
3- Offer advance payment	60	60	60	-	60
4- Checking of the customer credit balance and payment delays	60	420	94	TRIA(60, 96, 420)	-
4- (new) Checking of the customer credit balance, payment delays and stock availability of the product	60	120	91	TRIA(60, 115, 121)	-
5- Checking of the stock availability	0	300	107	TRIA(0, 90, 300)	-
5- (new) Checking of stock availability of the product	62	119	90	TRIA(61, 70, 120)	-
6- (new) Make an offer and negotiate within the price range	92	147	121	TRIA(91, 130, 148)	-
6- Checking if any order for the requested product	30	480	123	TRIA(30, 75, 480)	-
7- Request an offer price for the product	60	780	140	TRIA(60, 120, 780)	-
8- Forward the requested product details to the Chief of Imports	-	-	-	-	0
9- Proposal Collection Process	-	-	-	-	0
10- Inform the Sales Manager	-	-	-	-	0
11- Determine an offer price	60	600	154	TRIA(60, 105, 600)	-
12- Submit the offer to the customer	60	240	110	TRIA(60, 135, 240)	-
13- Prepare a written sales proposal and send to the customer	120	660	236	TRIA(120, 282, 660)	-
14-Procurement Process	-	-	-	-	0
15- Inform the Sales Manager about arrival of the sold products	-	-	-	-	0
16- Update the Sales Document	60	120	64	TRIA(59.5, 60, 121)	-
16- (new) Enter a delivery date to a sale record	50	70	60	TRIA(50, 59, 71)	-
17- Delivery Process	-	-	-	-	0
18- Accounting Process	-	-	-	-	0
19- Inform customer	60	60	60	-	60
19- (new) Record loss of sale details and inform customer	-	-	-	-	60

Table 4. Simulation Results Comparison

Sub-Process	Current Sale Process	Designed Sale Process	Improvement Percentage
Average Number of Customer Requests Out	69	154	223%
Average Service (Value-added) Time of a Customer Request (in seconds)	1654	201	823%
Average Request Completion Time (in seconds)	1715	379	453%
Average Resource Utilization (Sales Managers)	23.04%	7.6%	302%

CHAPTER 4

CONCLUSION

In this thesis, sales process of a company operating in the private sector is reengineered according to the selected BPR methodology.

Firstly, the current sales process flows were documented and problems related to the sales process were identified. Secondly, a future sales process was designed using the selected BPR methodology. In order to compare, validate and verify the results of this study, simulation models of the current sales process and designed sales process have been developed. ARENA simulation software was used to develop simulation models.

After running the generated simulation models for one week (five days), performance outputs were obtained. It has been observed that the average cycle time is reduced by 453%. On the other hand, significant improvements are obtained in terms of number of customer requests out which is 223% and resource utilization, which is 302%. In addition, the designed system can provide new capabilities in terms of seeing previous price offers and keeping records of unsuccessful sales.

Appropriate evaluation of the developed system requires implementation. On the other hand, according to the results of the simulation, determined problems related to the sales process are solved and performance improvements are made in the designed sales process.

The actual aim of a simulation study is to foresee the results of a modeled process. The reports about the designed sales process provides a scientific basis for making decisions, on the other hand, it is the management's responsibility to evaluate the results and choose to apply the new sales process or not.

One of the limitations of this study is that, during the study, one of the two sale teams of the company that consists of recent employees and in the favor of reengineering of the current sales process has left the job. After their leave, this study was completed with a minimal support from the company and without access to all the data required. The designed sales process can be improved with the contribution of past sales data.

Another limitation of this study is that, this reengineering study is limited by the sales process due to the request of the managers of the company. The extent of the reengineering study can be expanded organization wide to receive the maximum benefit.

Lastly, simulating multiple case studies in order to increase the number of scenarios is required to achieve a greater accuracy of implementation results in real life. It will allow evaluating whether significant improvements can be made in the developed sales process.

REFERENCES

Bevilacqua, M., Ciarapica, F. E., Mazzuto, G., & Paciarotti, C. (2013). A BPR approach for ground handling process: A case study. *IFAC Proceedings Volumes, 46(7),* 180-185.

Bhaskar, H. L., & Singh, R. P. (2014). Business process reengineering: A recent review. *Global Journal of Business Management, 8*(2), 24-51.

Braun, C., Wortmann, F., Hafner, M., & Winter, R. (2005). Method construction-a core approach to organizational engineering. *In Proceedings of the 2005 ACM symposium on applied computing* (pp. 1295-1299). ACM.

Champy, J. (1995). Reengineering management: The mandate for new leadership. *Industry Week, 244*(4), 32-36.

Covert, M. (1997). *Successfully performing business process reengineering*. Needham, MA: Visible Systems Corporation.

Davenport, T. H. (1993). *Process innovation: Reengineering work through information technology*. Boston, MA: Harvard Business School Press.

Davenport, T. H., & Short, J. E. (1990). The new industrial engineering: Information technology and business process redesign. *Sloan Management Review*, 31(4), 1-11.

Goksoy, A., Ozsoy, B., & Vayvay, O. (2012). Business process reengineering: Strategic tool for managing organizational change an application in a multinational company. *International Journal of Business and Management,* 7(2), 89.

Griesberger, P., Leist, S., & Zellner, G. (2011). Analysis of techniques for business process improvement. *Proceedings of European Conference on Information Systems (ECIS)* (p. 20) Retrieved July 5, 2019 from http://aisel.aisnet.org/ecis2011/20

Grover, V., & Malhotra, M. K. (1997). Business process reengineering: A tutorial on the concept, evolution, method, technology and application. *Journal of Operations Management, 15(3),* 193-213.

Gunasekaran, A., & Ichimura, T. (1997). Business process reengineering: Modelling and analysis. *International Journal of Production Economics, 50(2-3),* 65-68.

Hall, G., Rosenthal, J., & Wade J. (1993). How to make reengineering really work. *Harvard Business Review*, 71(6), 119-131.

Hall, J. M., & Johnson, M. E. (2009). When should a process be art, not science?. *Harvard Business Review*, 87(3), 58-65.

Hammer, M., & Champy, J. (1993). *Reengineering the corporation: Manifesto for business revolution*. New York: Harper Business.

Harrington, H. J. (1991). *Business process improvement: The breakthrough strategy for total quality, productivity, and competitiveness.* New York: McGraw Hill Professional.

Holland, W. E., & Kumar, S. (1995). Getting past the obstacles to successful reengineering. *Business Horizons, 38(3),* 79-86.

Jain, R., Chandrasekaran, A., & Gunasekaran, A. (2010). Benchmarking the redesign of "business process reengineering" curriculum: A continuous process improvement (CPI). *Benchmarking: An International Journal*, 17(1), 77-94.

Leavitt, H. J. (1965). Applied organizational change in industry: Structural, technological and humanistic approaches. In J. G. March (Ed.), *Handbook of Organizations*, Rand McNally, Chicago, 1965, 1144-1170.

Lockamy III, A., & Smith, W. I. (1997). A strategic alignment approach for effective business process reengineering: Linking strategy, processes and customers for competitive advantage. *International Journal of Production Economics, 50*(2-3), 141-153.

Love, P. E., & Gunasekaran, A. (1997). Process reengineering: A review of enablers. *International Journal of Production Economics, 50(2-3),* 183-197.

McAdam, R., & O'Hare, C. (1998). An improved BPR approach for offline enabling processes: A case study on a maintaining process within the chemical industry. *Business Process Management Journal, 4(3),* 226-240.

Mohanty, R. P., & Deshmukh, S. G. (2001). Reengineering of materials management system: A case study. *International Journal of Production Economics, 70(3),* 267-278.

O'Neill, P., & Sohal, A. S. (1999). Business process reengineering: A review of recent literature. *Technovation*, *19*(9), 571-581.

Page, S. (2010). *The power of business process improvement: 10 simple steps to increase effectiveness, efficiency, and adaptability*. New York: American Management Association.

Peppard, J. (1995). *Broadening visions of BPR: The imperative of strategic integration*. Cranfield, England: The Cranfield School of Management.

Petrozzo, D. P., & Stepper, J. C. (1994). *Successful reengineering*. New York: John Wiley & Sons.

Rigby, D., & Bilodeau, B. (2005). The Bain 2005 management tool survey. *Strategy & Leadership,* 33(4), 4-12.

Rowsell-Jones, A. & Roberts, J. P. (2009). *Improving business processes*. Retrieved July 5, 2019 from https://www.gartner.com/en/documents/967012.

Sandberg, K. D. (2001). Reengineering tries a comeback-this time for growth, not just cost savings. *Harvard Management Update, 6*(11), 3-6.

Tsalgatidou, A. (1995). *Methodologies for business process modelling and reengineering.* Retrieved July 5, 2019 from http://cgi.di.uoa.gr/~pms541/methodologies.doc.

Vakola, M., & Rezgui, Y. (2000). Critique of existing business process reengineering methodologies: The development and implementation of a new methodology. *Business Process Management Journal*, *6*(3), 238-250.

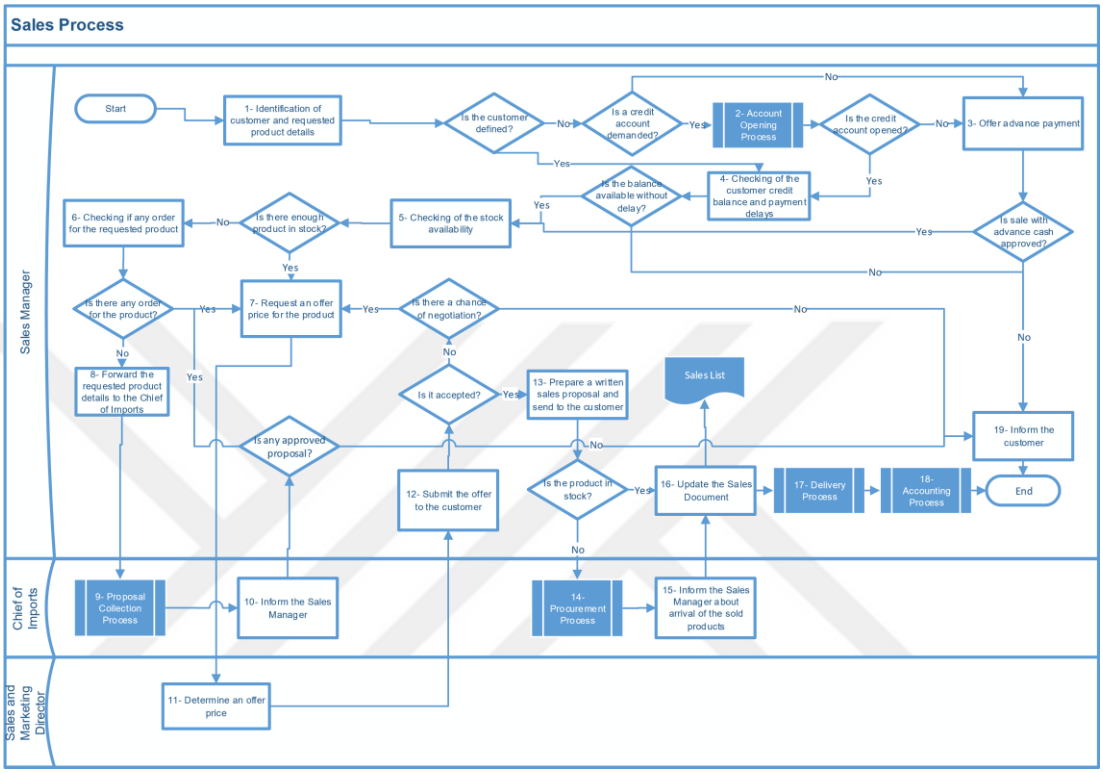
Valiris, G., & Glykas, M. (1999). Critical review of existing BPR methodologies: The need for a holistic approach. *Business Process Management Journal*, *5*(1), 65-86.

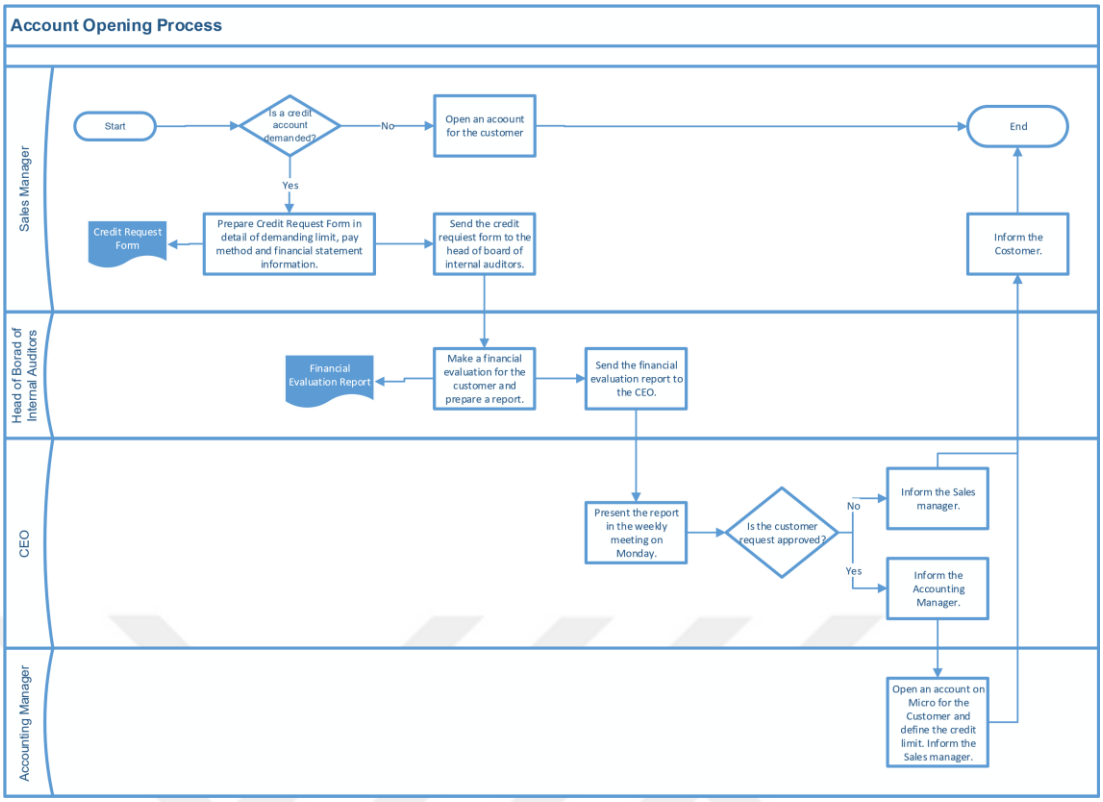
Wanner, R. T., & Franceschi, J. (1995). *Business process reengineering for quality improvement*. New York: Reliability Analysis Center.

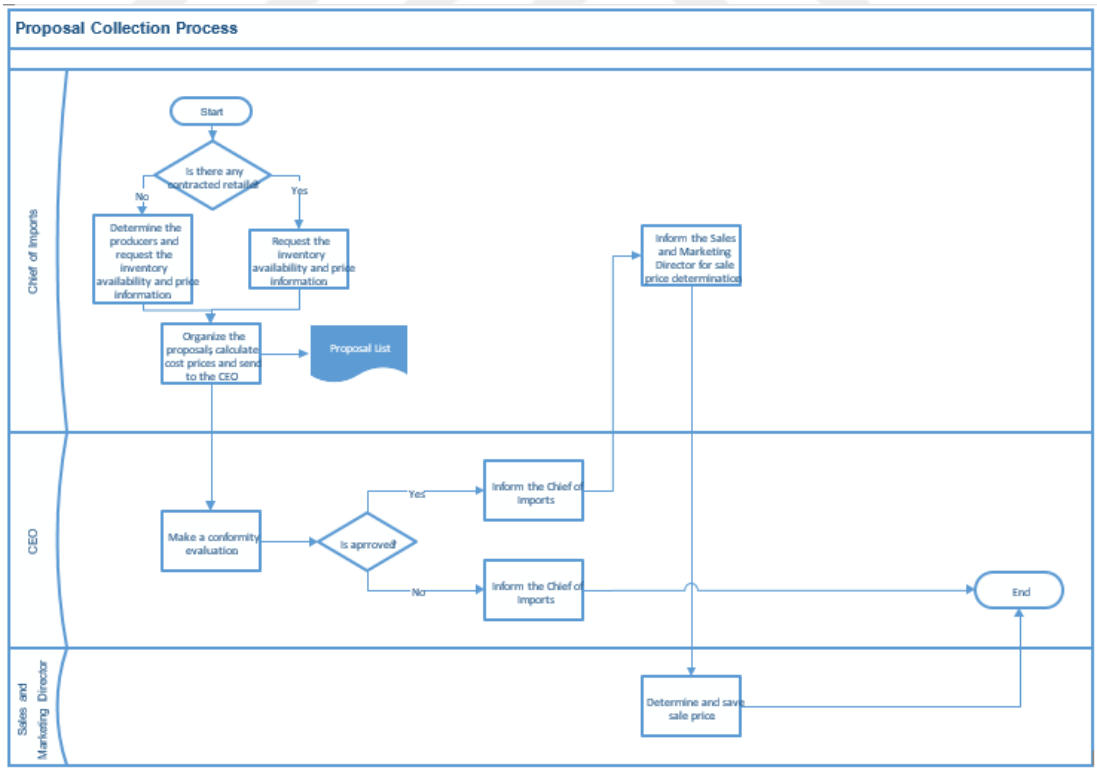
Zellner, G. (2011). A structured evaluation of business process improvement approaches. *Business Process Management Journal, 17(2),* 203-237.

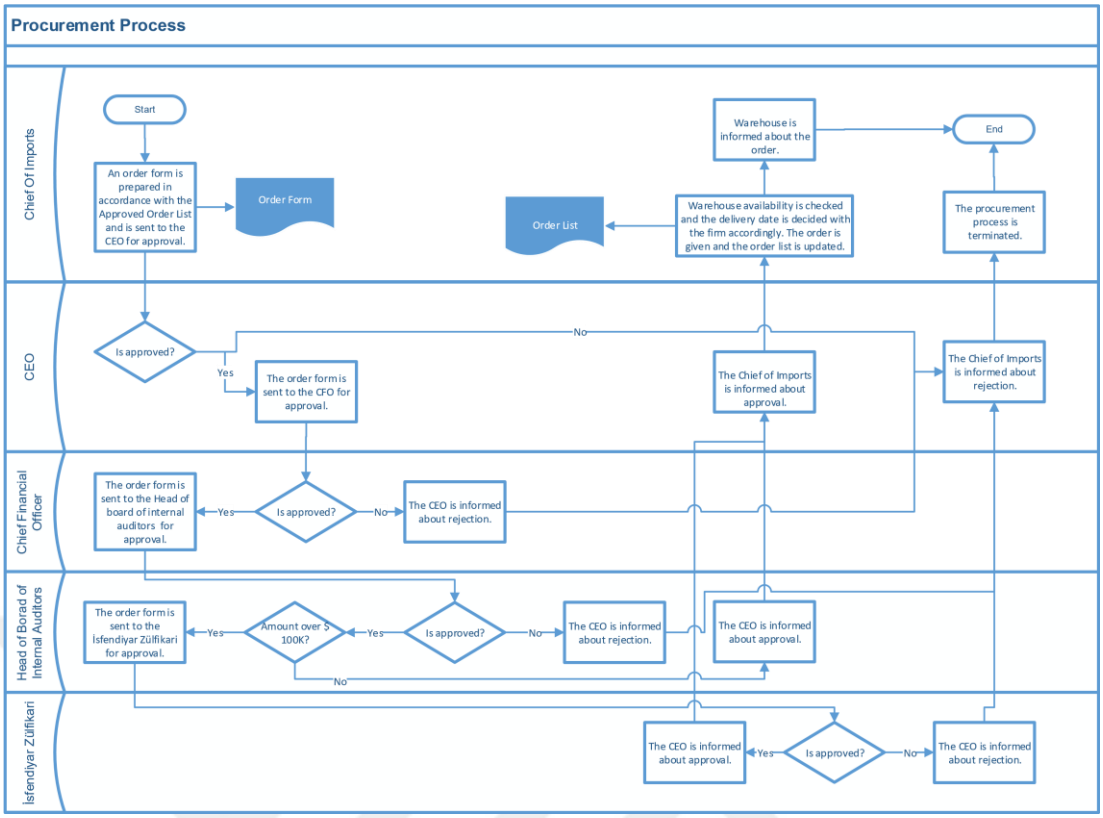
APPENDIX A

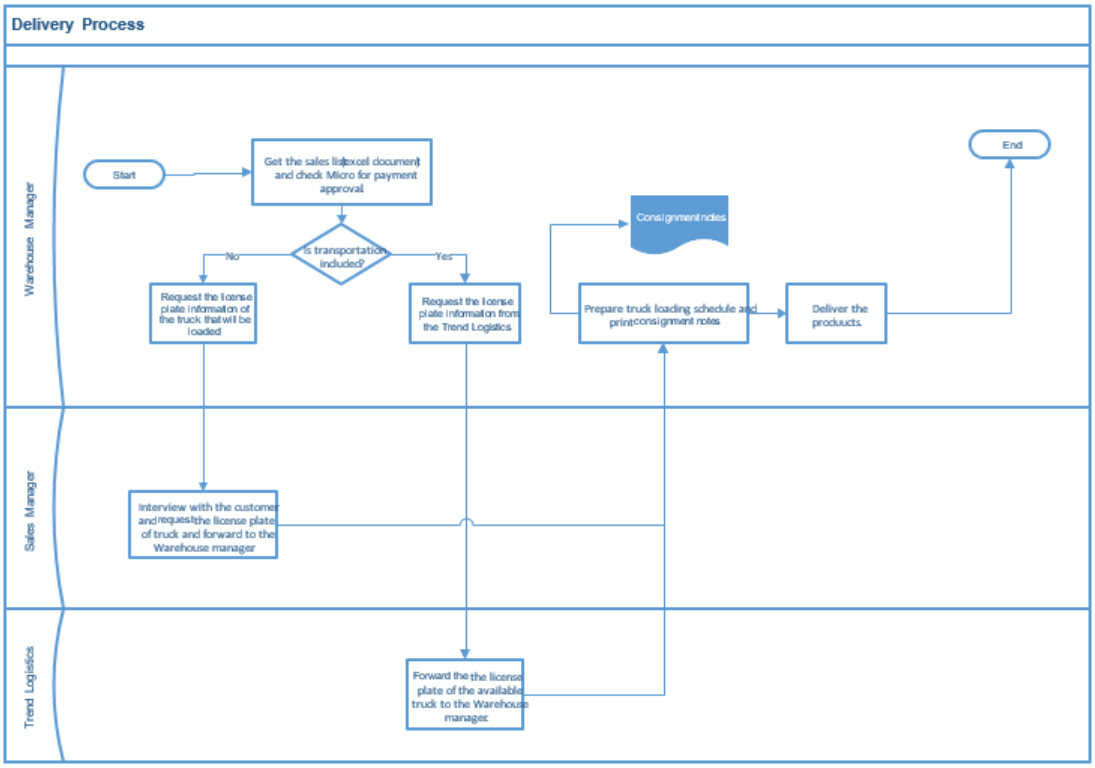
PROCESS DIAGRAMS

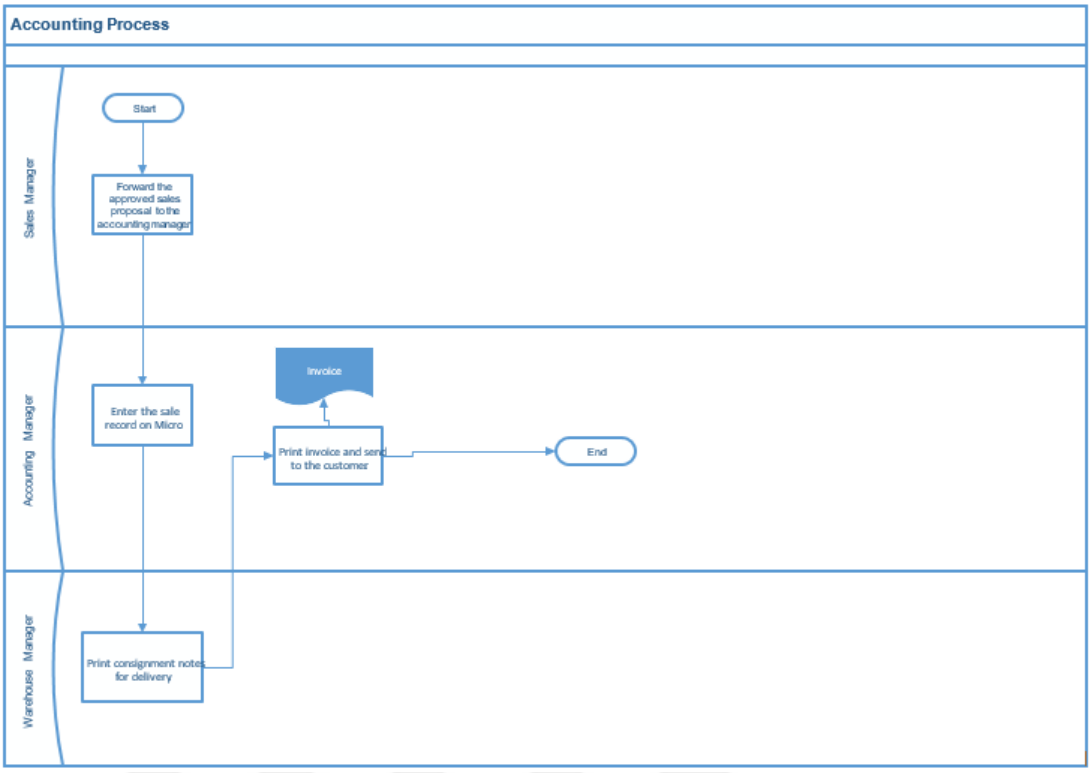


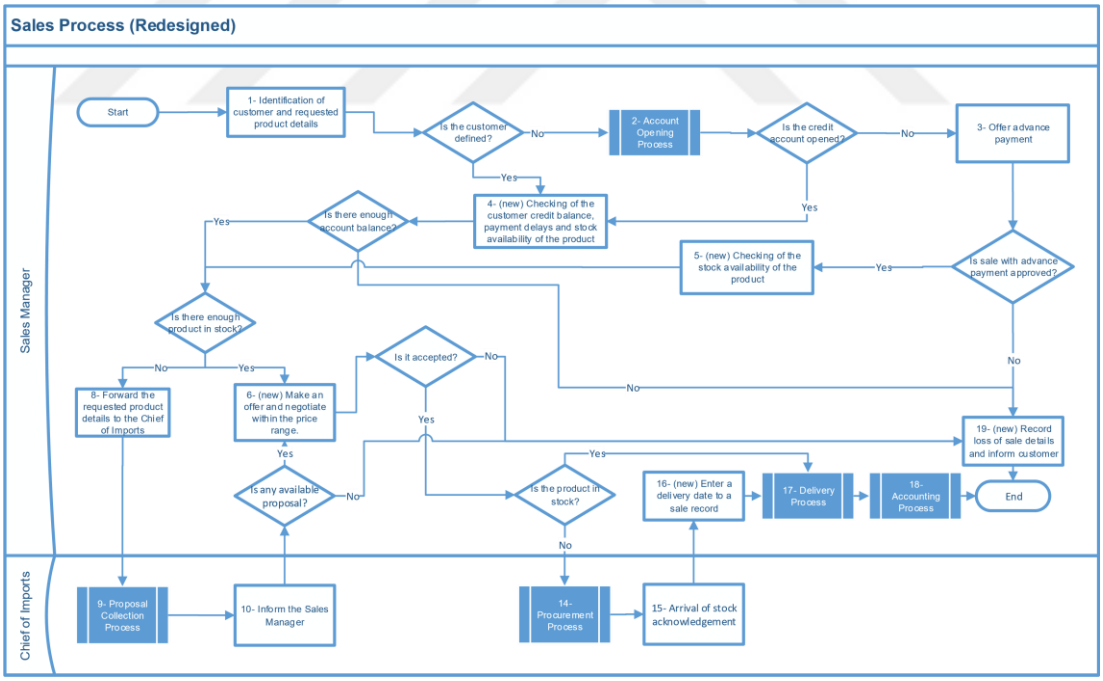

Account Opening Process
Sales Manager
Head of Borad of Internal Auditors
CEO
Accounting Manager
Start
Is a credit account demanded?
No
Yes
Open an acoount for the customer
End
Credit Request Form
Prepare Credit Request Form in detail of demanding limit, pay method and financial statement information.
Send the credit requiest form to the head of board of internal auditors.
Inform the Costomer.
Financial Evaluation Report
Make a financial evaluation for the customer and prepare a report.
Send the financial evaluation report to the CEO.
Present the report in the weekly meeting on Monday.
Is the customer request approved?
No
Yes
Inform the Sales manager.
Inform the Accounting Manager.
Open an account on Micro for the Customer and define the credit limit. Inform the Sales manager.


Proposal Collection Process
Chief of Imports
CEO
Sales and Marketing Director
Start
Is there any contracted retailer
No
Yes
Determine the producers and request the inventory availability and price information
Request the inventory availability and price information
Organize the proposals, calculate cost prices and send to the CEO
Proposal List
Inform the Sales and Marketing Director for sale price determination
Make a conformity evaluation
Is aprroved?
Yes
No
Inform the Chief of Imports
Inform the Chief of Imports
End
Determine and save sale price


Procurement Process
Chief Of Imports
CEO
Chief Financial Officer
Head of Borad of Internal Auditors
Isfendiyar Zülfikari
Start
An order form is prepared in accordance with the Approved Order List and is sent to the CEO for approval.
Order Form
Order List
Warehouse availability is checked and the delivery date is decided with the firm accordingly. The order is given and the order list is updated.
Warehouse is informed about the order.
End
The procurement process is terminated.
Is approved?
No
Yes
The order form is sent to the CFO for approval.
The Chief of Imports is informed about approval.
The Chief of Imports is informed about rejection.
The order form is sent to the Head of board of internal auditors for approval.
Is approved?
No
The CEO is informed about rejection.
The order form is sent to the İsfendiyar Zülfikari for approval.
Amount over $ 100K?
Yes
Is approved?
No
The CEO is informed about rejection.
The CEO is informed about approval.
No
The CEO is informed about approval.
Is approved?
No
The CEO is informed about rejection.


Delivery Process
Warehouse Manager
Sales Manager
Trend Logistics
Start
Get the sales list(excel document) and check Micro for payment approval
End
Is transportation included?
No
Yes
Consignment notes
Request the license plate information of the truck that will be loaded
Request the license plate information from the Trend Logistics
Prepare truck loading schedule and print consignment notes
Deliver the productcts.
Interview with the customer and request the license plate of truck and forward to the Warehouse manager
Forward the the license plate of the available truck to the Warehouse manager


Accounting Process
Sales Manager
Start
Forward the approved sales proposal to the accounting manager
Accounting Manager
Enter the sale record on Micro
Invoice
Print invoice and send to the customer
End
Warehouse Manager
Print consignment notes for delivery


Sales Process (Redesigned)
Sales Manager
Start
1- Identification of customer and requested product details
Is the customer defined?
No
2- Account Opening Process
Is the credit account opened?
No
3- Offer advance payment
Yes
4- (new) Checking of the customer credit balance, payment delays and stock availability of the product
Is there enough account balance?
Yes
5- (new) Checking of the stock availability of the product
Yes
Is sale with advance payment approved?
Is there enough product in stock?
No
Yes
Is it accepted?
No
8- Forward the requested product details to the Chief of Imports
6- (new) Make an offer and negotiate within the price range.
Yes
No
19- (new) Record loss of sale details and inform customer
Is any available proposal?
Yes
No
Is the product in stock?
Yes
16- (new) Enter a delivery date to a sale record
17- Delivery Process
18- Accounting Process
End
No
Chief of Imports
9- Proposal Collection Process
10- Inform the Sales Manager
14- Procurement Process
15- Arrival of stock acknowledgement

APPENDIX B

SALES PROCESS DESCRIPTION FORMS

<table>
<tr><td colspan="3">Code: 1</td><td colspan="3">Name: 1- Identification of customer and requested product details</td></tr>
<tr><td colspan="6">Purpose: Interview with the customer, receive the requested product, amount, delivery date, and transport requirement details.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Identification and keeping a record of requested product details, checking if the customer defined or not.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
1</td><td colspan="2">Input Supplier:
Customer</td><td colspan="2">Output:
Customer and requested product details</td><td>Output Customer:
Sales Manager</td></tr>
<tr><td colspan="6">Resources: Micro</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process,
2- Account Opening Process
4- Checking of the customer credit balance and payment delays</td><td colspan="3">Processes Affected by: None.</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
152</td><td>Actual:
152</td><td>Difference:
0</td></tr>
<tr><td colspan="6">Current Problems: None.</td></tr>
</table>

<table>
<tr><td colspan="3">Code: 3</td><td colspan="3">Name: 3- Offer advance payment</td></tr>
<tr><td colspan="6">Purpose: Offering an advance payment for the customer that has no credit account.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Keeping a record of the customer response.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
2</td><td colspan="2">Input Supplier:
Sales Manager</td><td colspan="2">Output:
Approval or Non-approval</td><td>Output Customer:
Customer</td></tr>
<tr><td colspan="6">Resources:</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
5- Checking of the stock availability,
19- Inform the customer</td><td colspan="3">Processes Affected by:
2- Account Opening Process</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
60</td><td>Actual:
60</td><td>Difference:
0</td></tr>
<tr><td colspan="6">Current Problems: None.</td></tr>
</table>

<table>
<tr><td colspan="3">Code: 4</td><td colspan="3">Name: 4- Checking of the customer credit balance and payment delays</td></tr>
<tr><td colspan="6">Purpose: Identification of the available customer credit balance is enough and recent purchases are paid without delay.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Open Micro and reach to the customer account. Check the available credit balance and compare with the possible amount of the requested products. Also, check if any delayed payment for the recent purchases.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
4</td><td colspan="2">Input Supplier:
Micro</td><td colspan="2">Output:
Customer credit balance and recent payment records.</td><td>Output Customer:
Sales Manager</td></tr>
<tr><td colspan="6">Resources: Micro</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
5- Checking of the stock availability,
19- Inform the customer</td><td colspan="3">Processes Affected by:
1- Identification of customer and requested product details,
2- Account Opening Process</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
10</td><td>Actual:
94</td><td>Difference:
84</td></tr>
<tr><td colspan="6">Current Problems: No periodical update of credit balances.</td></tr>
</table>

<table>
<tr><td colspan="3">Code: 5</td><td colspan="3">Name: 5- Checking of the stock availability</td></tr>
<tr><td colspan="6">Purpose: Identification of the stock availability of the requested product type and amount.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Open Micro and check the stock availability of the requested product. In addition, check Inventory records (Excel) document for recent sales. Call and ask to the warehouse manager in any case of uncertainty.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
3</td><td colspan="2">Input Supplier:
Micro, inventory records and Warehouse Manager.</td><td colspan="2">Output:
Stock availability</td><td>Output Customer:
Sales Manager</td></tr>
<tr><td colspan="6">Resources: Micro, inventory records and Warehouse Manager.</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
6- Checking if any order for the requested product,
7- Request an offer price for the product</td><td colspan="3">Processes Affected by:
3- Offer advance payment,
4- Checking of the customer credit balance and payment delays</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
20</td><td>Actual:
107</td><td>Difference:
87</td></tr>
<tr><td colspan="6">Current Problems: No up-to-date record of inventory, a chance of simultaneous sale.</td></tr>
</table>

<table>
<tr><td colspan="2">Code: 6</td><td colspan="4">Name: 6- Checking if any order for the requested product</td></tr>
<tr><td colspan="6">Purpose: Checking if any order for the requested out-of-stock product in the order list.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Open the Order List (Excel) document and check if any order for the requested out-of-stock product.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
5</td><td colspan="2">Input Supplier:
Order List</td><td colspan="2">Output:
Fulfilled orders</td><td>Output Customer:
Sales Manager</td></tr>
<tr><td colspan="6">Resources: Order list (Excel) document.</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
7- Request an offer price for the product
8- Forward the requested product details to the Chief of Imports</td><td colspan="3">Processes Affected by:
5- Checking of the stock availability</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
0</td><td>Actual:
123</td><td>Difference:
123</td></tr>
<tr><td colspan="6">Current Problems: No up-to-date record of inventory, No supply chain management.</td></tr>
</table>

<table>
<tr><td colspan="2">Code: 7</td><td colspan="4">Name: 7- Request an offer price for the product</td></tr>
<tr><td colspan="6">Purpose: Convey the customer details, requested product and amount details, available stock amount or if it is an out-of-stock product order/proposal details and previously offered price (if any) to the Sales and Marketing Director and request an offer price.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Make contact with the Sales and Marketing Director, convey the customer details, requested product and amount details, available stock amount or if it is an out-of-stock product order/proposal details and previously offered price (if any) and request an offer price. Record the offer price determined by the Sales and Marketing Director.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
6</td><td colspan="2">Input Supplier:
Sales Manager</td><td colspan="2">Output:
Requested product, customer, stock or order/proposal details.</td><td>Output Customer:
Sales and Marketing Director</td></tr>
<tr><td colspan="6">Resources: Customer, Chief of Imports, Warehouse personnel, micro, inventory records, order records.</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
11- Determine an offer price</td><td colspan="3">Processes Affected by:
5- Checking of the stock availability,
6- Checking if any order for the requested product,
12- Submit the offer to the customer</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
0</td><td>Actual:
140</td><td>Difference:
140</td></tr>
<tr><td colspan="6">Current Problems: No pre-determined sale price, No customer categorization.</td></tr>
</table>

<table>
<tr><td colspan="2">Code: 8</td><td colspan="4">Name: 8- Forward the requested product details to the Chief of Imports</td></tr>
<tr><td colspan="6">Purpose: Identification of the availability and price of the product in the market.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Submit the requested out-of-stock product details to the Chief of Imports by e-mail.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
7</td><td>Input Supplier:
Sales Manager</td><td colspan="2">Output:
Requested product details.</td><td colspan="2">Output Customer:
Chief of Imports</td></tr>
<tr><td colspan="6">Resources:</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
9- Proposal Collection Process</td><td colspan="3">Processes Affected by:
6- Checking if any order for the requested product</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
No Data</td><td>Actual:
No Data</td><td>Difference:
0</td></tr>
<tr><td colspan="6">Current Problems</td></tr>
</table>

Code: 10	Name: 10- Inform the Sales Manager
Purpose: Identification of the availability and price of the product in the market.	
Category: Basic Process	
Owner: Chief of Imports	
The Process(es) included in: Sales Process	
Sub-Processes / Activities: Inform the Sales Manager about availability, cost price and possible arrival date of the requested product.	
Trigger Cause: Purchase request	

Input: 7	Input Supplier: Chief of Imports	Output: Availability, cost price and possible arrival date of requested product	Output Customer: Sales Manager
Resources: 9- Proposal Collection Process			
Processes Affecting: Sales Process 7- Request an offer price for the product, 19- Inform the customer		Processes Affected by: 9- Proposal Collection Process	
Support and Managerial Processes: No			

Performance Measures:	Goal:	Unit:	Target:	Actual:	Difference:
Time/Duration	Decrease	Seconds	No Data	No Data	0

Current Problems: None

<table>
<tr><td colspan="2">Code: 11</td><td colspan="4">Name: 11- Determine an offer price</td></tr>
<tr><td colspan="6">Purpose: Determine an offer price by considering the cost price, stock amount, requested amount, previously offered price (if any) and submit to the Sales Manager.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales and Marketing Director</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Open Micro and Inventory records (Excel) document. Determine the current cost price by using FIFO principle or get order/proposal cost price. Calculate an offer price by considering the cost price, the requested amount, arrival date of the new order (if any), current sales and profit appetite of the company. Submit the offer price to the Sales Manager.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
6</td><td>Input Supplier:
Sales and Marketing Director</td><td colspan="2">Output:
Offer Price</td><td colspan="2">Output Customer:
Sales Manager</td></tr>
<tr><td colspan="6">Resources: Micro, inventory records, order/proposal details.</td></tr>
<tr><td colspan="3">Processes Affecting: Sales Process
12- Submit the offer to the customer</td><td colspan="3">Processes Affected by:
7- Request an offer price for the product</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
0</td><td>Actual:
154</td><td>Difference:
154</td></tr>
<tr><td colspan="6">Current Problems: No pre-determined minimum and maximum offer price ranges for in terms of amount and customer types, no customer categorization.</td></tr>
</table>

Code: 12	Name: 12- Submit the offer to the customer

Purpose: Make an offer to the customer for the requested product according to the offer price submitted by Sales and Marketing Director.

Category: Basic Process

Owner: Sales Manager

The Process(es) included in: Sales Process

Sub-Processes / Activities: Make a contact (phone call, e-mail, SMS etc.) with the customer and submit the offer for requested product. Keep a record of the customer response whether the offer is approved or not. For non-approved offers, seek for negotiation opportunity.

Trigger Cause: Purchase request

Input:	Input Supplier:	Output:	Output Customer:
7	Sales Manager	Offer	Customer

Resources: Sales and Marketing Director

Processes Affecting: Sales Process 13- Prepare a written sales proposal and send to the customer, 7- Request an offer price for the product, 19- Inform the customer	Processes Affected by: 11- Determine an offer price

Support and Managerial Processes: No

Performance Measures:	Goal:	Unit:	Target:	Actual:	Difference:
Time/Duration	Decrease	Seconds	110	110	0

Current Problems:

Code: 13	Name: 13- Prepare a written sales proposal and send to the customer

Purpose: Prepare a written sales proposal that includes the product details, amount, sale price, and delivery date. Send the proposal to the customer for approval.
Category: Basic Process
Owner: Sales Manager
The Process(es) included in: Sales Process
Sub-Processes / Activities: Create a new sale proposal by using the (Word) template document. Fill the necessary fields like product details, amount, sale price, and delivery date. Send the proposal by e-mail.
Trigger Cause: Purchase request

Input: 6	Input Supplier: Sales Manager	Output: Sales Proposal	Output Customer: Customer
Resources: Sale proposal template (Word) document.			

Processes Affecting: Sales Process 14- Procurement Process, 16- Update the Sales Document	Processes Affected by: 12- Submit the offer to the customer
Support and Managerial Processes: No	

Performance Measures:	Goal:	Unit:	Target:	Actual:	Difference:
Time/Duration	Decrease	Seconds	10	236	226

Current Problems: No customer contact list.

Code: 15	Name: 15- Inform the Sales Manager about arrival of the sold products

Purpose: Inform Sales Manager about previously sold products arrived in stock.
Category: Basic Process
Owner: Chief of Imports
The Process(es) included in: Sales Process
Sub-Processes / Activities: Send an e-mail to the Sales Manager about previously sold products are arrived in stock.
Trigger Cause: Purchase request

Input:	Input Supplier:	Output:	Output Customer:
7	Chief of Imports	Product Arrival	Sales Manager

Resources: 14-Procurement Process

Processes Affecting: Sales Process	Processes Affected by:
16- Update the Sales Document	14-Procurement Process

Support and Managerial Processes: No

Performance Measures:	Goal:	Unit:	Target:	Actual:	Difference:
Time/Duration	Decrease	Seconds	No Data	No Data	0

Current Problems:

<table>
<tr><td colspan="2">Code: 16</td><td colspan="4">Name: 16- Update the Sales Document</td></tr>
<tr><td colspan="6">Purpose: Update the sales (Excel) document.</td></tr>
<tr><td colspan="6">Category: Basic Process</td></tr>
<tr><td colspan="6">Owner: Sales Manager</td></tr>
<tr><td colspan="6">The Process(es) included in: Sales Process</td></tr>
<tr><td colspan="6">Sub-Processes / Activities: Open the (shared Excel) Sales Document and insert a record for the new finalized sale. Save the document.</td></tr>
<tr><td colspan="6">Trigger Cause: Purchase request</td></tr>
<tr><td>Input:
8</td><td colspan="2">Input Supplier:
Sales Manager</td><td colspan="2">Output:
Updated Sales Document.</td><td>Output Customer:
Sales Manager</td></tr>
<tr><td colspan="6">Resources: Sales Document</td></tr>
<tr><td colspan="2">Processes Affecting: Sales Process
17- Delivery Process</td><td colspan="4">Processes Affected by:
13- Prepare a written sales proposal and send to the customer
15- Inform the Sales Manager about arrival of the sold products</td></tr>
<tr><td colspan="6">Support and Managerial Processes: No</td></tr>
<tr><td>Performance Measures:
Time/Duration</td><td>Goal:
Decrease</td><td>Unit:
Seconds</td><td>Target:
0</td><td>Actual:
64</td><td>Difference:
64</td></tr>
<tr><td colspan="6">Current Problems: No up-to-date inventory records, chance of a simultaneous sale.</td></tr>
</table>

Code: 19	Name: 19- Inform the customer

Purpose: Inform the customer about ending of the sales process.
Category: Basic Process
Owner: Sales Manager
The Process(es) included in: Sales Process
Sub-Processes / Activities: Make a contact with the customer and make an acknowledgement about ending of the sales process.
Trigger Cause: Purchase request

Input:	Input Supplier:	Output:	Output Customer:
7	Sales Manager	End of the sale	Customer

Resources:	
Processes Affecting: Sales Process	Processes Affected by: 3- Offer advance payment, 4- Checking of the customer credit balance and payment delays, 10- Inform the Sales Manager, 12- Submit the offer to the customer

Support and Managerial Processes: No

Performance Measures:	Goal:	Unit:	Target:	Actual:	Difference:
Time/Duration	Decrease	Seconds	60	60	0

Current Problems: Not keeping of a record for lost sale details.

APPENDIX C

TIME RECORDS

SaleId	1	1*	2	2*	3	4	5	5*	6
CustomerId	81	81	102	102	21	74	114	114	68
ProductId	8	8	3	3	9	22	8	8	1
SalesManagerId	2	2	2	2	3	3	1	1	1
Process 1	120	-	180	-	180	180	120	-	180
Process 3	-	-	-	-	60	-	-	-	-
Process 4	120	-	120	-	-	60	60	-	180
Process 5	60	-	180	-	180	120	180	-	60
Process 6	-	-	120	-	120	-	-	-	60
Process 7	180	60	240	120	120	240	180	60	180
Process 11	120	60	180	60	540	180	120	60	120
Process 12	120	60	60	120	60	120	120	60	60
Process 13	240	-	180	-	240	240	180	-	240
Process 16	60	-	60	-	60	60	60	-	60

-: Process is not timed due to skipped step.

*: Some processes are timed more than once due to new price quotation.

SaleId	7	7*	8	8*	9	10	10*	11
CustomerId	111	111	113	113	79	63	63	11
ProductId	9	9	8	8	1	9	9	20
SalesManagerId	1	1	1	1	1	1	1	1
Process 1	120	-	120	-	180	240	-	240
Process 3	-	-	-	-	-	-	-	-
Process 4	420	-	120	-	120	60	-	120
Process 5	300	-	120	-	-	180	-	0
Process 6	-	-	480	-	-	-	-	-
Process 7	780	60	180	60	180	60	60	180
Process 11	120	120	120	60	180	60	60	180
Process 12	120	60	120	120	180	120	120	240
Process 13	120	-	240	-	240	180	-	360
Process 16	120	-	60	-	60	60	-	60

-: Process is not timed due to skipped step.

*: Some processes are timed more than once due to new price quotation.

SaleId	12	12*	13	14	15	15*	16	17	17
CustomerId	76	76	90	107	53	53	16	75	76
ProductId	3	3	15	3	2	2	9	8	3
SalesManagerId	2	2	2	2	2	2	2	2	2
Process 1	180	-	120	60	120	-	180	60	180
Process 3	-	-	-	-	-	-	-	-	-
Process 4	60	-	60	60	60	-	60	60	60
Process 5	30	-	60	180	60	-	60	60	30
Process 6	30	-	-	-	-	-	-	120	30
Process 7	120	60	60	60	300	60	180	60	120
Process 11	60	60	60	60	300	60	120	60	60
Process 12	120	120	60	60	120	60	60	120	120
Process 13	300	-	300	240	180	-	180	300	300
Process 16	60	-	60	60	60	-	60	60	60

-: Process is not timed due to skipped step.

*: Some processes are timed more than once due to new price quotation.

SaleId	18	19	19*	20	21	21*	22	23	24
CustomerId	75	5	102	102	47	72	72	72	9
ProductId	8	3	3	3	3	3	3	16	10
SalesManagerId	2	2	2	2	2	1	1	1	1
Process 1	-	180	120	-	120	120	-	180	180
Process 3	-	-	-	-	-	-	-	-	-
Process 4	-	60	60	-	120	120	-	60	60
Process 5	-	120	-	-	-	60	-	180	60
Process 6	-	-	-	-	-	-	-	-	60
Process 7	60	60	60	60	-	120	60	120	300
Process 11	300	60	120	60	-	120	120	180	480
Process 12	60	60	60	120	60	180	120	180	120
Process 13	-	240	180	-	120	-	240	120	240
Process 16	-	60	60	-	60	-	60	60	120

-: Process is not timed due to skipped step.

*: Some processes are timed more than once due to new price quotation.

SaleId	25	26	27	28	28*	29	30	31	32	33
CustomerId	74	40	12	78	78	69	17	72	10	109
ProductId	16	8	11	3	3	25	9	1	1	19
SalesManagerId	3	3	2	2	2	2	2	1	1	1
Process 1	180	240	120	300	-	120	180	60	180	120
Process 3	-	60	-	-	-	-	-	-	-	-
Process 4	60	-	120	120	-	60	60	60	60	60
Process 5	60	120	60	60	-	60	180	60	-	180
Process 6	-	-	-	-	-	-	-	60	-	-
Process 7	180	240	-	120	60	60	60	360	60	60
Process 11	420	60	-	120	60	120	60	600	60	420
Process 12	240	120	-	120	60	180	120	120	120	120
Process 13	180	660	-	180	-	180	180	300	120	240
Process 16	60	60	-	60	-	60	60	60	60	60

-: Process is not timed due to skipped step.

*: Some processes are timed more than once due to new price quotation.

APPENDIX D

SIMULATION REPORT of CURRENT SALES PROCESS

Key Performance Indicators

System

	Average
Number Out	69

Entity

Time

VA Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	1653.54	(Insufficient)	277.02	3518.87

NVA Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Wait Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	61.7735	(Insufficient)	0.00	831.19

Transfer Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Other Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Total Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	1715.31	(Insufficient)	277.02	4037.02

Other

Number In	Value
CustomerRequest	72.0000

Number Out	Value
CustomerRequest	69.0000

WIP	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	1.9843	(Insufficient)	0.00	7.0000

Resource

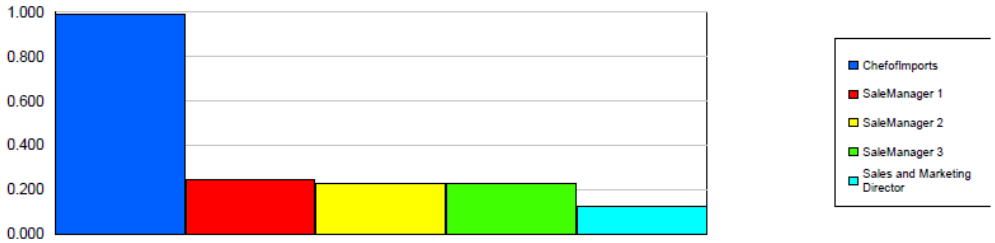
Usage

Instantaneous Utilization	Average	Half Width	Minimum Value	Maximum Value
ChefofImports	0.9901	(Insufficient)	0.00	1.0000
SaleManager 1	0.2423	(Insufficient)	0.00	1.0000
SaleManager 2	0.2239	(Insufficient)	0.00	1.0000
SaleManager 3	0.2251	(Insufficient)	0.00	1.0000
Sales and Marketing Director	0.1234	(Insufficient)	0.00	1.0000

Number Busy	Average	Half Width	Minimum Value	Maximum Value
ChefofImports	0.9901	(Insufficient)	0.00	1.0000
SaleManager 1	0.2423	(Insufficient)	0.00	1.0000
SaleManager 2	0.2239	(Insufficient)	0.00	1.0000
SaleManager 3	0.2251	(Insufficient)	0.00	1.0000
Sales and Marketing Director	0.1234	(Insufficient)	0.00	1.0000

Number Scheduled	Average	Half Width	Minimum Value	Maximum Value
ChefofImports	1.0000	(Insufficient)	1.0000	1.0000
SaleManager 1	1.0000	(Insufficient)	1.0000	1.0000
SaleManager 2	1.0000	(Insufficient)	1.0000	1.0000
SaleManager 3	1.0000	(Insufficient)	1.0000	1.0000
Sales and Marketing Director	1.0000	(Insufficient)	1.0000	1.0000

Scheduled Utilization	Value
ChefofImports	0.9901
SaleManager 1	0.2423
SaleManager 2	0.2239
SaleManager 3	0.2251
Sales and Marketing Director	0.1234



APPENDIX E

SIMULATION REPORT of DESIGNED SALES PROCESS

Key Performance Indicators

System

	Average
Number Out	154

Entity

Time

VA Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	201.25	(Insufficient)	0.00	517.49

NVA Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Wait Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Transfer Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Other Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	0.00	(Insufficient)	0.00	0.00

Total Time	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	378.58	(Insufficient)	254.74	517.49

Other

Number In	Value
CustomerRequest	87.0000

Number Out	Value
CustomerRequest	82.0000

WIP	Average	Half Width	Minimum Value	Maximum Value
CustomerRequest	3.2633	(Insufficient)	0.00	7.0000

Resource

Usage

Instantaneous Utilization	Average	Half Width	Minimum Value	Maximum Value
ChefofImports	0.9933	(Insufficient)	0.00	1.0000
SaleManager 1	0.08394513	(Insufficient)	0.00	1.0000
SaleManager 2	0.07600540	(Insufficient)	0.00	1.0000
SaleManager 3	0.06942917	(Insufficient)	0.00	1.0000

Number Busy	Average	Half Width	Minimum Value	Maximum Value
ChefofImports	0.9933	(Insufficient)	0.00	1.0000
SaleManager 1	0.08394513	(Insufficient)	0.00	1.0000
SaleManager 2	0.07600540	(Insufficient)	0.00	1.0000
SaleManager 3	0.06942917	(Insufficient)	0.00	1.0000

Number Scheduled	Average	Half Width	Minimum Value	Maximum Value
ChefofImports	1.0000	(Insufficient)	1.0000	1.0000
SaleManager 1	1.0000	(Insufficient)	1.0000	1.0000
SaleManager 2	1.0000	(Insufficient)	1.0000	1.0000
SaleManager 3	1.0000	(Insufficient)	1.0000	1.0000

Scheduled Utilization	Value
ChefofImports	0.9933
SaleManager 1	0.08394513
SaleManager 2	0.07600540
SaleManager 3	0.06942917