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Business Process Automation Efficiency

Bachelor thesis

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Author's declaration of originality

I hereby certify that I am the sole author of this thesis and this thesis has not been

presented for examination or submitted for defense anywhere else. All used materials,

references to the literature and work of others have been cited.

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Abstract

In this thesis the author analyzes business processes about accounting.

The main goal is to analyze the effect of business management software on business process efficiency.

The main problems with the business process in hand are the amount of repetitive tasks, sub-processes and high chance for mistakes.

Using purpose developed business management software it is possible to reduce repetitive tasks by automating parts of the process, increase the overall performance and reduce the risk for mistakes in the process.

The thesis is in English and contains 32 pages of text, 5 chapters, 10 figures, 4 tables., etc.

List of abbreviations

AS-IS – Current state.

TO-BE – Updated state.

ICT – Information and communication technology

BPMN – A standard Business Process Model and Notation [1]

BPM – Business Process Management

BPR – Business Process Reengineering

DMAIC – Define, Measure, Analyze, Improve, Control

Six Sigma - Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects [9]

DFSS – Design for Six Sigma, also known as DMADV or IDDOV

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1. Introduction

Repetitive business processes, for example accounting, include a lot of data inserting and processing. It starts with basic input data (Invoices, expenses) which need to be filed, journalized and ends with reports for the management and governments based on said input data, which leads us to the next point: business process efficiency. As business management software becomes more relevant, there is a certain amount of advertised gains by software developers regarding efficiency in the work process. Efficiency is usually a measureable unit, for example time and money. Because of that, it is possible to measure how big of a difference it actually makes to start using business management software.

1.1 Background

The purpose of this thesis, is to introduce readers the capabilities and gains of business management software like Standard Books by HansaWorld.

Using ICT software like business management software, it is possible to achieve a higher level of efficiency for a simple business process. In order to prove that and see the difference we need to answer a few questions.

1.2 Research question

To understand the thesis better, we have to establish a main research question: How to make a business process more efficient using business management software?

We will divide the research question into three parts:

- What makes the process inefficient? (Chapter 3)

- What steps in the process can be optimized using software? (Chapter 4)

- What are the efficiency gains using software? (Chapter 5)

In order to make a business process efficient, we need determine which parts of the process are the reason for the overall inefficiency. Secondly we need to know the possibilities of the software and how it could be used to modify said parts of the process. Third, we need to compare the modified process to the original, so we could see the efficiency gains.

1.3 Method

The thesis consists of three parts: Detection of inefficiency, software capability, efficiency comparisons.

We start by mapping the original business process after which we carry out measurements to support the map. Using business process management related work, we analyse the business process and detect the main issues. Secondly we redesign the business process using best practices and software, after which we carry out similar measurements for the last part where we analyse both processes and compare them in order to see if and how big of an efficiency gain we achieve.

For mapping the process, the author used BPMN (Business Process Modeling Notation). A standard Business Process Model and Notation (BPMN) will provide businesses with the capability of understanding their internal business procedures in a graphical notation and will give organizations the ability to communicate these procedures in a standard manner. Furthermore, the graphical notation will facilitate the understanding of the performance collaborations and business transactions between the organizations. This will ensure that businesses will understand themselves and participants in their business and will enable organizations to adjust to new internal and B2B business circumstances quickly. [1]

1.4 Overview of the thesis

In the first part of the thesis, will focus on the business process efficiency and determining what makes a business process inefficient.

The second part of the thesis will cover the improvement of the business process using software.

The third part of the thesis compares the results for the gains in efficiency.

2. Business management software

Business management software is a broad term. It represents every piece of software which is used to perform business functions. In this thesis the author will be introducing the capabilities of business management software through business process redesign. The software used for the thesis is Standard Books by HansaWorld and Microsoft Excel.

2.1 Microsoft Excel

Excel is an Electronic Spreadsheet Program. An electronic spreadsheet is a computer software program that is used for storing, organizing and manipulating data. Electronic spreadsheet programs were originally based on paper spreadsheets used for accounting. As such, the basic layout of computerized spreadsheets is the same as the paper ones. Related data is stored in tables - which are a collection of small rectangular boxes or cells organized into rows and columns. Current versions of Excel and other spreadsheet programs can store multiple spreadsheet pages in a single computer file. The saved computer file is often referred to as a workbook and each page in the workbook is a separate worksheet. [3]

2.2 Books by HansaWorld

Books by HansaWorld is the easy accounting suite for small businesses for Mac OS X and Windows. It includes fully functional Accounts Receivable, Accounts Payable and General Ledger modules. The level of integration means that the consequences of every transaction are handled automatically. For example, after creating a sales invoice or receiving a payment, your Accounts Receivable and General Ledgers will be updated automatically. [2]

3. Business process efficiency

The backbone of measuring and redesigning a business process is the analysis process of the existing process. It is necessary to map the process in order to understand the process better and calculate the efficiency, so there would be a benchmark where to start from. Essentially, what we are doing, is working with a subject called "Business process efficiency".

Business processes are the substrate on which every organization is formed and without them an organization simply would not function. By definition, a business process is a collection or sequence of related activities and tasks that together produce a desired outcome. A process may be structured ('tick-the- box' processes) such as processing customer orders or unstructured ('dynamic' processes) such as budgeting or responding to customer correspondence. All organizations will have processes that fit both of these descriptions, however many will fall somewhere in between. As a business process is executed, each step imposes a friction which increases the overall latency of the process. The amount of friction each step creates can vary enormously. When business processes are repetitive, which almost all are, this friction accumulates further over each cycle. In high volume transactional scenarios where the individual process may seem efficient, the friction generated over these high volumes can again become significant. This friction acts as an inhibitor which slows the organization down and increases its operating costs. In the current climate, the efficiency of business processes could not be more important. With more competitive global markets, subdued demand and competitive pricing pressures all placing greater stress on maintaining margins, organizations must seek the efficiencies needed to protect them. Where business processes involve the interaction of the workforce, efficiency becomes even more critical. For most organizations the workforce represents the single most costly asset and in many cases can account for upwards of 70% of total operating costs. Improving process efficiency and reducing process cycle times by reducing the friction in business processes increases overall productivity, enabling the organization to utilize fewer resources to achieve their objectives. To optimize the efficiency of business processes, business management and their teams need to look closely at their process structures to identify where change is needed to eliminate the unnecessary friction within these processes. By looking at the overall process flow, unnecessary steps or more efficient flows should be identified. The objective then needs to be

to look where elements of the business process can be automated or streamlined to improve their efficiency. Manually re-keying the information from a customer application form is a good example, especially if the number and frequency of documents processed is high. [8]

3.1 The process (AS-IS)

We take a look at a business process which involves accounting. Our main goal is to answer the question: What makes the business process inefficient?

Before taking any measurements, it is necessary to map the process itself, so we could analyze which steps of the process are the main problems for efficiency. As mentioned before, the process we are working with involves accounting. To be more accurate, we will be working with the sales process: creating an invoice, journalizing the invoice, creating the receipt and journalizing it also.

The basic accounting process for sales is described (Figure 1) using Bizagi Modeler software which is used for mapping business processes:
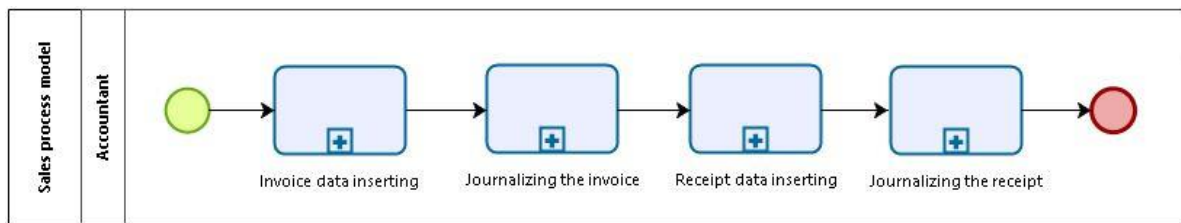

Figure 1 - The accounting process for invoices

The main differences in the business process will be in the sub-processes, for example Invoice data inserting. Each of the sub-processes will be carried out in Microsoft Excel in a row and time will be measured for how long it took to complete all of these sub-processes.

Next we will cover each sub-process for individual analysis.

3.1.1 Invoice data inserting

Invoice data inserting is the basic process for capturing most valuable information of the invoice. The accountant inserts the following information in Microsoft Excel:
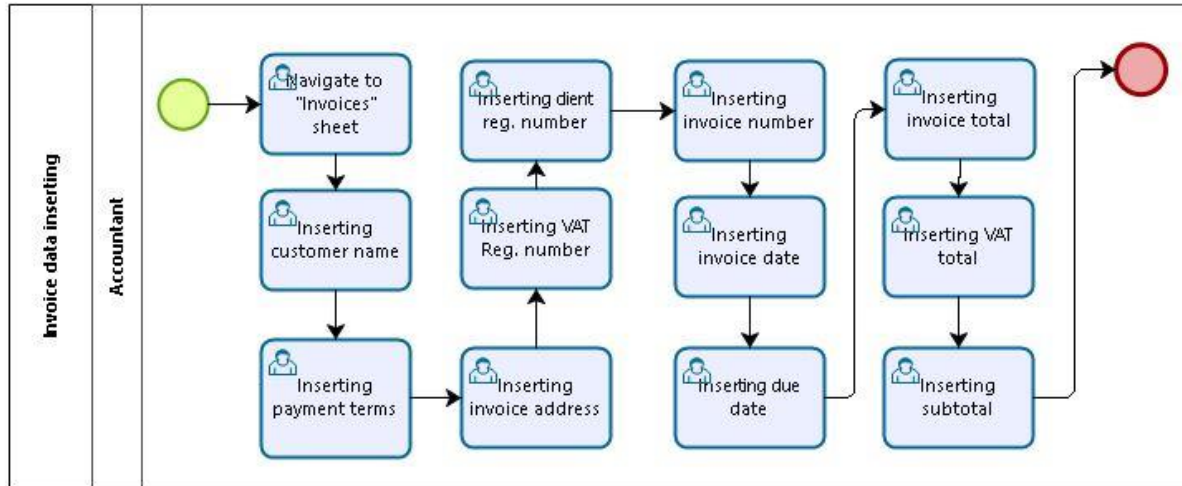

Figure 2 - Invoice data inserting (AS-IS)

As it is visible from the process map, there is a lot of small information entering which takes up a lot of valuable time. For example, for each invoice, the accountant has to enter each piece of information about the customer repeatedly. This means there are a lot of repetitive action involved which could be solved with software.

3.1.2 Journalizing the invoice

After the invoice, the total amount of the invoice needs to be journalized in order to show proper profits in the reports. Mainly journalizing means that transactions are made between accounts. This is necessary for reporting the profit/loss report of the company. When using Microsoft Excel, the accountant needs to insert these transactions manually. The steps of the process are described below:
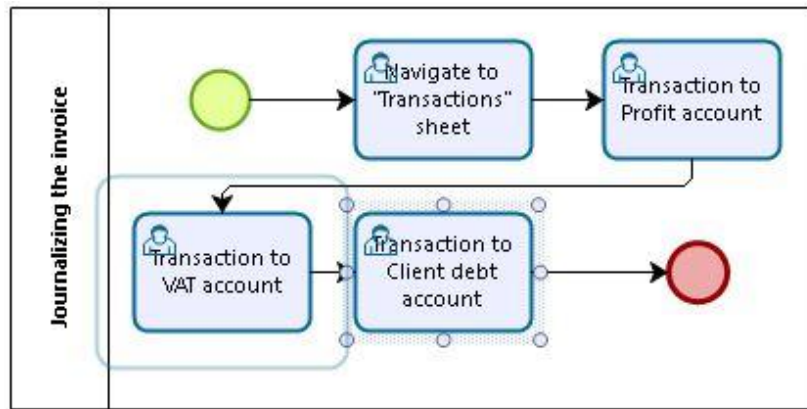
Figure 3 – Journalizing the invoice (AS-IS)

3.1.3 Receipt inserting

When the invoice has been paid by the customer, the next step is to create a receipt. This needs to be documented the same way an ordinary invoice. Like the invoice, it consists of customer and invoice information. The step for the receipt inserting process is described next:
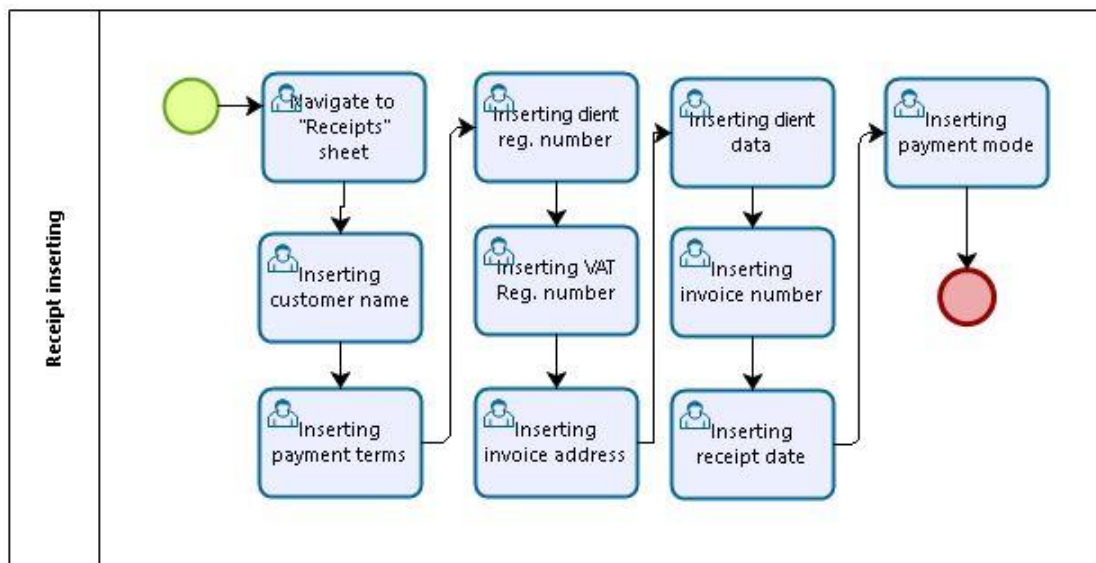

Figure 4 – Inserting the receipt (AS-IS)

3.1.4 Journalizing the receipt

As for the invoice, the receipt needs to be journalized and necessary transactions are made on certain accounts. The process for journalizing the receipt is described next (Figure 5).
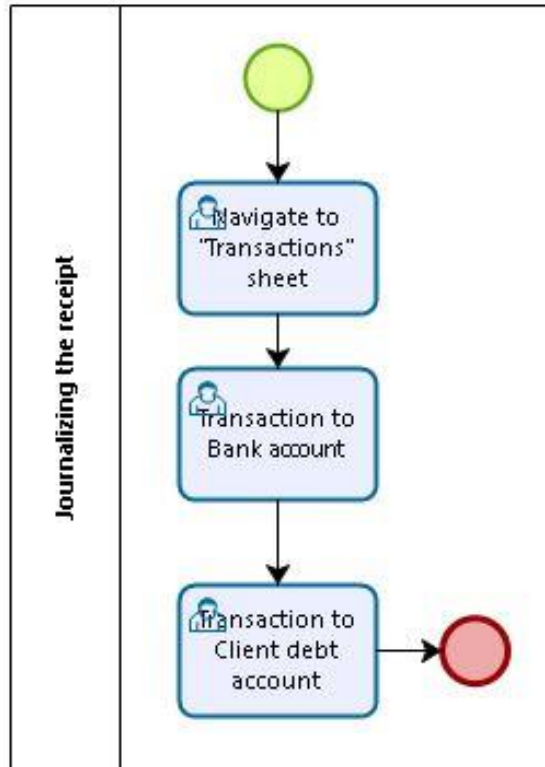

Figure 5 – Journalizing the receipt (AS-IS)

3.2 Monitoring

Now that the sub-processes have been drawn out, we need to monitor the process so we can measure the efficiency. The experiment consisted of 20 accountants who were all familiar with both applications: Microsoft Excel and Standard Books. The accountants were given 20 invoices that needed to be inserted and journalized. The processes were measured using time. The results for the time measured are described in table 1.

	Min	Avg. Time	Max
Microsoft Excel	1 h 15 minutes	1 h 29 minutes	1 h 45 minutes

Table 1 – Process measurements (AS-IS)

Using Microsoft Excel, the fastest time recorded was 1 hour and 15 minutes. Said time was produced by a test subject who was slightly more familiar with the software.

Slowest time recorded was 1 hour and 45 minutes, which brings us to the total average of 1 hour and 29 minutes.

3.3 Analysis

Monitoring the 20 accountants showed many shortcomings in the process. As the measurements reveal, the time consumed for said process is unusually long. All of the accountants spent a lot of time inserting each invoice because of the repetitive information which needed to be covered manually. Secondly, the test subjects had to check the information each time an invoice was created, because of the amount of manual tasks that were carried out. This raised the possibility for mistakes and made the process consume even more time.

To sum up and answer our question, what makes the business process inefficient?

- Repetitive actions for each invoice/receipt.
- Prone to mistakes.
- Extra time consumed for checking errors.

4. Business process redesign

When talking about business process redesign, what we will be mentioning is business process management.

Business process management can be defined as the set of all management activities related to business processes. In essence, the management activities related to business processes can be idealistically arranged in a life cycle. [4]

In this chapter, we will attempt to redesign our accounting business process using software Standard Books by HansaWorld. Our main goal is to answer the question: What steps in the process can be optimized using software?

In the redesign of the business process we can follow a business process management lifecycle (Figure 6).
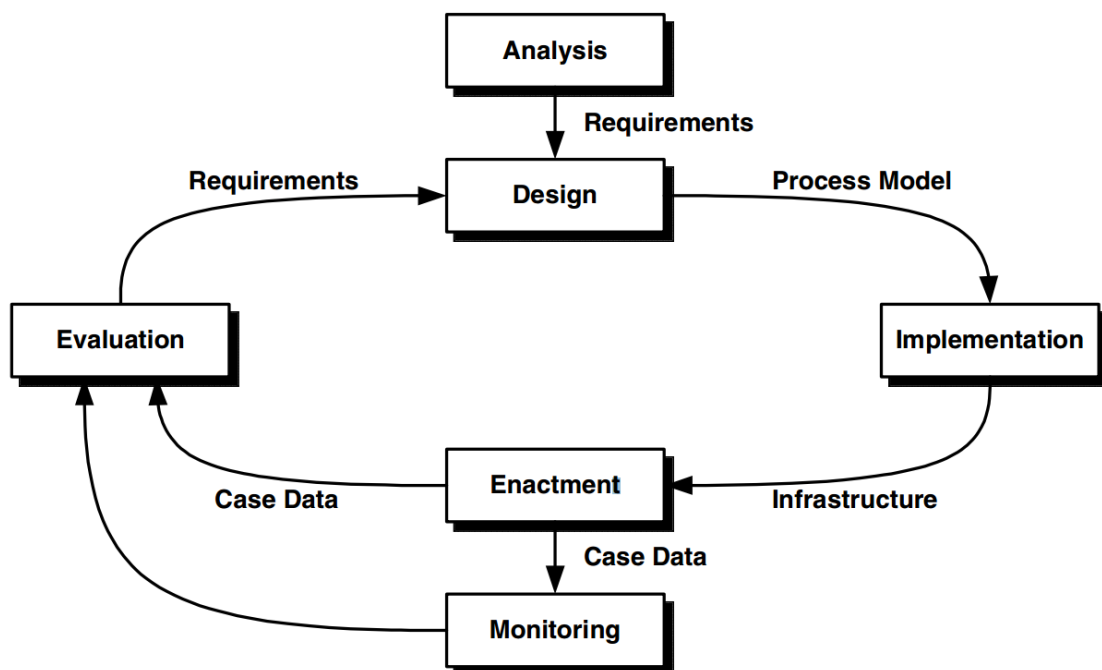
Figure 6 – Business process management lifecycle [4]

- Analysis: The business process management life cycle begins with an analysis activity (see Figure 6). This analysis covers both the environment of the process and the organization structure. The output of this step is a set of requirements for the business process such as performance goals or intentions. [4]

- Design: These requirements drive the subsequent design activity. The design includes the identification of process activities, the definition of their order, the assignment of resources to activities and the definition of the organization structure. These different aspects of process design are typically formalized as a business process model. This model can be tested in a simulation if it meets the design requirements. [4]

- Implementation: The process model is then taken as input for implementation. In this phase, the infrastructure for the business process is set up. This includes training of staff, provision of a dedicated work infrastructure or the technical implementation and configuration of software. If the process execution is to be supported by dedicated information systems, the process model is used as a blueprint for the implementation. [4]

- Enactment: As soon as the implementation is completed, the actual enactment of the process can begin. In this phase the dedicated infrastructure is used to handle individual cases covered by the business process. The enactment produces information such as consumption of time, resources and materials for each handled case. This data can be used as input for two subsequent activities: monitoring and evaluation. [4]

- Monitoring is a continuous activity that is performed with respect to each individual case. Depending on process metrics, for instance maximum waiting time for a certain process activity, monitoring triggers respective counteractions if such a metric indicates a problematic situation. [4]

- Evaluation, on the other hand, considers case data on an aggregated level. The performance results are compared with the original requirements and sources of further improvement are discussed. Evaluation thus leads to new requirements that are taken as input in the next turn of the business process management life cycle. [4]

Business processes are characterized by three elements: the inputs, (data such customer inquiries or materials), the processing of the data or materials (which usually go through several stages and may necessary stops that turn out to be time and money consuming), and the outcome (the delivery of the expected result). The problematic part of the process is processing. Business process reengineering mainly intervenes in the processing part, which is reengineered in order to become less time and money consuming. [5]

BPR assumes that the current processes in a business are inapplicable and suggest completely new processes to be implemented by starting over. Such a perspective enables the designers of business processes to disassociate themselves from today's process, and focus on a new process. The BPR characteristics - outcomes include the following:

• Several jobs are combined into one.

• Decision-making becomes part of the job of employees (employee empowerment).

• Steps in the processes are performed in natural order, and several jobs get done simultaneously.

• Processes have multiple versions. This enables the economies of scale that result from mass production, yet allows customization of products and services.

• Work is performed where it makes the most sense.

• Controls and checks and other non-value-added work are minimized.

• Reconciliation is minimized by cutting back the number of external contact points and by creating business alliances.

• A single point of contact is provided to customers.

• A hybrid centralized/decentralized operation is used.

BPR is achieving dramatic performance improvements through radical change in organizational processes, rearchitecting of business and management processes. It involves the redrawing of organizational boundaries, the reconsideration of jobs, tasks, and skills. This occurs with the creation and the use of models. Whether those be physical models, mathematical, computer or structural models, engineers build and analyze models to predict

the performance of designs or to understand the behavior of devices. More specifically, BPR is defined as the use of scientific methods, models and tools to bring about the radical restructuring of an enterprise that result in significant improvements in performance. [5]

4.1 Redesigned process (TO-BE)

In this chapter we will cover the redesigned sub-processes. These processes will introduce a new role: business management software. To be more precise the software in hand is Standard Books by HansaWorld

The main process for accounting remains the same as in chapter 3.2. As mentioned we will only cover the differences in the sub-processes.

4.1.1 Invoice data inserting

Inserting the invoice data in Standard Books is simple. Because of the pre-configured data like customer and invoice information, it is possible to move some tasks over to the software. When the accountant starts inserting a new invoice, regarding the customer, it is only necessary to select the correct company. Standard Books will then copy said customers data over from the customer register. Also, invoice data like the date, due date and invoice number will be generated using user defined settings. This is an important part of the process because we managed to shift the most repetitive tasks to the system. The process is described in more detail (see Figure 7).

The invoice data is inserted using a software form designed for the invoice register which is shown (see Figure 8).
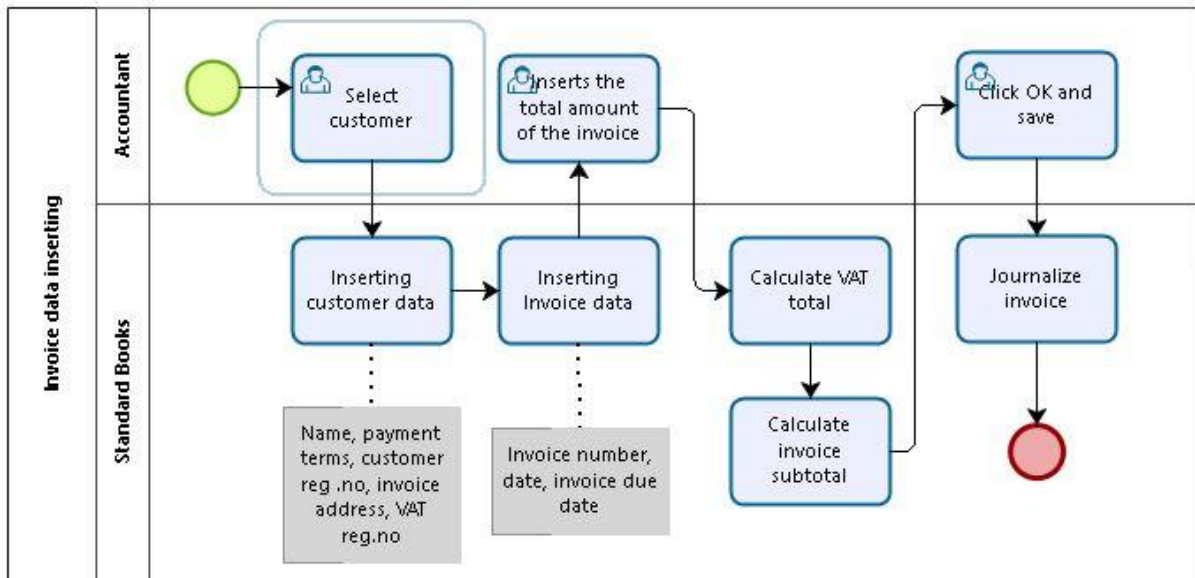

Figure 7 – Invoice data inserting (TO-BE)

Figure 8 – New invoice form in Standard Books

4.1.2 Receipt inserting

The process for inserting a receipt into Standard Books is described in **Figure 9**:

Figure 9 – Receipt data inserting (TO-BE)

When the invoice is inserted into the system, Standard Books automatically categorizes it as an unpaid invoice. This value is used in order to select an unpaid invoice on the new receipt form (Figure 10). Because the receipt is created using the invoice, all of the information is duplicated from said invoice. The accountant then sets the status OK and saves the receipt. Like the invoice, Standard Books will automatically create transactions on certain accounts, so the reports on profit/loss would match.

Figure 10 – New receipt form in Standard Books

4.1.3 Journalizing

Journalizing the invoice and receipt is simplified using Standard Books. It is no longer necessary to make each transaction manually. When the accountant enters the invoice to the system and confirms it, the software automatically creates transactions on accounts based on the invoice information. Same goes for the receipt. Standard Books uses registers for said action. When the accountant confirms a receipt or an invoice, new transaction is created into the register.

4.2 Measurements

The experiment was carried out exactly the same way as using Microsoft Excel. It consisted of 20 invoices and receipts, which needed to be created in the system, journalized.

The same 20 accountants used Standard Books for the task. The results for the experiment using Standard Books are shown in table 3.

	Min	Avg. Time	Max
Standard Books	8 min 05 seconds	9 min 48 seconds	12 min 10 seconds

Table 2 – Process measurements (TO-BE)

While monitoring the process, it was discovered that each accountant spent less time checking if the information which was inserted, was correct. Also because Standard Books automated 2 out of 4 sub-processes, accountants were able to focus on the important parts of the invoice. This raised the speed of the process dramatically.

5. Redesign analysis

Business process analysis is very useful for any business since it helps the person to keep an eye on the smooth working of the business. It also gives the information about the technology behind the processes and the complete detail about the occurrence of the business process.

Business process analysis is such a technique which is very useful in any business. Almost every business these days believe in progressing through analyzing its process step by step. The evaluation of the business process for better performance is called business process analysis. There are many business process models which a person can use to check the improvement and evaluate the processes taking place in business.

The main objective of carrying out the analysis is to see all the problems of the business and to give the solution to those problems. The analysis also helps the business in determining and identifying the needs and demands of the business. The development of policy, strategic planning, the changes in the organization and many other processes are analyzed in order to identify the needs and requirements of the business. When you want to discover a new business process or want to improve the existing one, the most helpful tool you have is to perform the business process analysis.

DMAIC is a data-driven quality strategy used to improve processes. It is an integral part of a Six Sigma initiative, but in general can be implemented as a standalone quality improvement procedure or as part of other process improvement initiatives such as lean. [6]

The Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) methodology can be thought of as a roadmap for problem solving and product/process improvement. Most companies begin implementing Six Sigma using the DMAIC methodology, and later add the DFSS (Design for Six Sigma, also known as DMADV or IDDOV) methodologies when the organizational culture and experience level permits. You can read the main differences between DMAIC and DMADV, but we'll focus on the DMAIC in this article.

While the DMAIC methodology presented below may appear linear and explicitly defined, it should be noted that an iterative approach may be necessary – especially for Black Belts and Green Belts that are new to the tools and techniques that make up DMAIC. For instance, you may find that upon analyzing your data (Analyze phase) you did not gather enough data to

isolate the root cause of the problem. At this point, you may iterate back to the Measure phase. In addition, prior knowledge of the tools and techniques is necessary in determining which tools are useful in each phase. Remember, the appropriate application of tools becomes more critical for effectiveness than correctness, and you don't need to use all the tools all the time. [7]

DMAIC Phase Steps	Tools Used
D – Define Phase: Define the project goals and customer (internal and external) deliverables.	
Define Customers and Requirements (CTQs) Develop Problem Statement, Goals and Benefits Identify Champion, Process Owner and Team Define Resources Evaluate Key Organizational Support Develop Project Plan and Milestones Develop High Level Process Map	**Project Charter** **Process Flowchart** **SIPOC Diagram** **Stakeholder Analysis** DMAIC Work Breakdown Structure **CTQ Definitions** **Voice of the Customer Gathering**
Define Tollgate Review	
M – Measure Phase: Measure the process to determine current performance; quantify the problem.	
Define Defect, Opportunity, Unit and Metrics Detailed Process Map of Appropriate Areas Develop Data Collection Plan Validate the Measurement System Collect the Data Begin Developing Y=f(x) Relationship Determine Process Capability and Sigma Baseline	**Process Flowchart** **Data Collection Plan/Example** **Benchmarking** **Measurement System Analysis/Gage R&R** **Voice of the Customer Gathering** **Process Sigma Calculation**
Measure Tollgate Review	
A – Analyze Phase: Analyze and determine the root cause(s) of the defects.	
Define Performance Objectives	**Histogram**

Identify Value/Non-Value Added Process Steps Identify Sources of Variation Determine Root Cause(s) Determine Vital Few x's, Y=f(x) Relationship	**Pareto Chart** **Time Series/Run Chart** **Scatter Plot** **Regression Analysis** **Cause and Effect/Fishbone Diagram** **5 Whys** **Process Map Review and Analysis** **Statistical Analysis** **Hypothesis Testing** (Continuous and Discrete) **Non-Normal Data Analysis**
Analyze Tollgate Review	
I – Improve Phase: Improve the process by eliminating defects.	
Perform Design of Experiments Develop Potential Solutions Define Operating Tolerances of Potential System Assess Failure Modes of Potential Solutions Validate Potential Improvement by Pilot Studies Correct/Re-Evaluate Potential Solution	**Brainstorming** **Mistake Proofing** **Design of Experiments** **Pugh Matrix** **QFD/House of Quality** **Failure Modes and Effects Analysis** (FMEA) **Simulation Software**
Improve Tollgate Review	
C – Control Phase: Control future process performance.	
Define and Validate Monitoring and Control System Develop Standards and Procedures Implement Statistical Process Control Determine Process Capability Develop Transfer Plan, Handoff to Process Owner Verify Benefits, Cost Savings/Avoidance,	**Process Sigma Calculation** **Control Charts** (Variable and Attribute) **Cost Savings Calculations** **Control Plan**

Profit Growth Close Project, Finalize Documentation Communicate to Business, Celebrate	
Control Tollgate Review	

Table 3 - DMAIC Phase Steps [**7**]

5.1 Efficiency gains

	Min	Avg. Time	Max
AS-IS	1 h 15 minutes	1 h 29 minutes	1 h 45 minutes
TO-BE	8 min 05 seconds	9 min 48 seconds	12 min 10 seconds
Difference	1 h 6 min 55 sec	1 h 19 min 12 sec	1 h 32 min 50 sec

Table 4 – Efficiency gains between AS-IS and TO-BE

As we can see, the difference between process efficiency is more than half. Accountants were able to do the same amount of work in ~10 minutes using purpose developed software Standard Books which took over an hour in Microsoft Excel.

The main aspects for the growth in efficiency are the fact that Standard Books made it possible to eliminate 2 sub-processes for the user and that number of tasks were automated. Feedback from the test subjects was also positive. 100% of the accountants involved agreed that using business management software Standard Books was easier, made it possible to use their time more efficiently and complete more work in the same amount of time.

Conclusion

To conclude the thesis, it is safe to say that using business management software like Standard Books, it is possible to considerably improve business processes in the sense of time and ease of use. The results were even better than the author expected. Because such drastic differences in results it raises questions regarding about other types of business processes. The fact that pre-configured information about the customer and invoice, automation of 2 sub-processes and the easy to use interface made the average time to differ around 1 hour and 19 minutes shows the impact business management software has on the process efficiency. It would be possible to conduct the same experiment using more complex accounting processes which would give more detailed information about the efficiency gains.

As for this thesis, time was the main metric for measurements. For the future, new metrics could be introduced, for example cost of the software and efficiency gains using employee wage.

Based on the findings in the thesis, the overall subject of business process automation efficiency, the author finds that more research should be conducted using several types of business processes and using more metrics.

Summary

The goal for the thesis "Business Process Automation Efficiency" was to find out the efficiency changes when using purpose developed business management software and how to reengineer a business process for the new software.

The author analyzed the business processes regarding accounting when using spreadsheet software Microsoft Office, detected possible weak points and repetitive tasks.

The main problems were the amount of repetitive work which needed to be done. For example, inserting the customer data, each invoice required manual tasks for that. Also processes, which involved journalizing, proved to be time-consuming and good applicants for automation.

The redesigned process addressed said issues because the software took over most of the repetitive tasks and also automated 2 of the journalizing sub-processes. Using this process the author was able to reduce to time consumed drastically.

This thesis proves that using purpose developed software improves the overall performance and efficiency of the business process.

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