Workflow analysis on an invoicing process

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Abstract. The emphasis of this paper is placed on improving the invoicing process of one Finnish SME company. The process consists of transferring the working hours of a measuring engineer to the final invoice which is then being sent to the client. The information about the current invoicing process is gathered by interviewing the functional area representatives of the company for pinpointing the possible problem areas and an improved invoicing process model is then developed.

Keywords: Business Process, Process Improvement, Workflow, Information Technology, Information System

1 Introduction

Business Processes can be described as a series of activities which utilize the resources of the company for performing certain activities in order to keep the company's business running. Business Process improvement projects are conducted for accomplishing better economical competence from streamlining the current processes by making them more efficient and effective, thus consuming less resources and also improving the quality of the final product.

The effectiveness of a Business Process may improve customer satisfaction by adding more value to the finished product or service and by making the current Business Process more efficient it may reduce the amount of resources needed for accomplishing the desired result. There are several quality improvement methods for different size organizations which can be adapted for Business Processes e.g. ISO 9000 - standardization series, Six Sigma, Total Quality Management, Business Process Reengineering, QS9000 -series and many more. This case study applies the approach of Workflow Modeling by Alec Sharp and Patrick McDermott for creating the guideline of the improvement project.

The commissioner company of this case study is an Oulu -based constructional consulting company which operates mainly on surveying, mapping and laser scanning technologies. The commissioner company was established in year 1989 when it was separated to operate as an individual company from the surveying department of its predecessor company. Currently the commissioner company employs around 70 employees (October 2012) with two local offices; the head office is situated in Oulu, and the branch office in Tornio.

The main customers of the commissioner company are:
1) construction companies
2) public sector (which consists of cities and municipalities mainly in northern Finland)
3) factories and plants

The commissioner company mostly offers surveying engineering consulting services which includes: geodetic surveying, high-precision on-site surveying, GPS surveying, and Laser scanning services. Due to the rapid growth within the commissioner company between the years 2000 and 2010, the information systems which support the key Business Processes, have not been developing correspondingly which have brought some slight problems within the organization. [1]

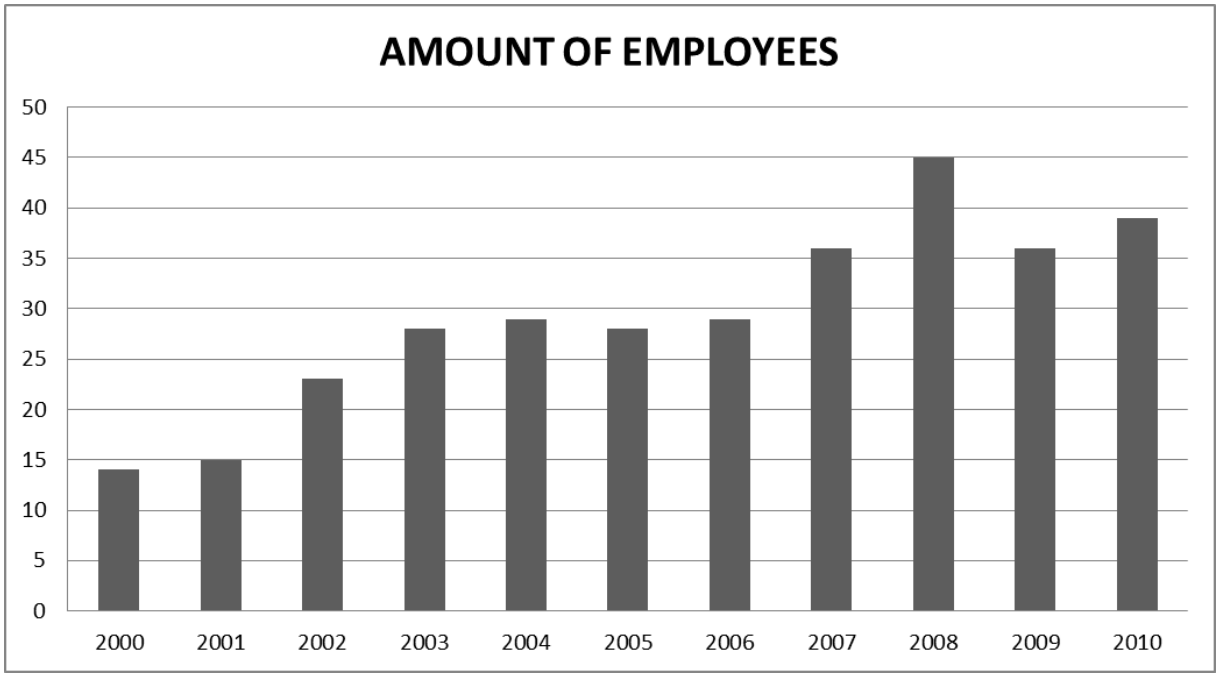

Fig. 1. The growth of the commissioner company between years 2000-2010

The growth within the commissioner company occurred rather slowly, until the constructional boom preceded by the economic growth of the late nineties and early 2000's in Finland, expanded the company to be one of the biggest surveying engineering companies in Finland. Between the years of 2000 and 2008 the company growth was so rapid that the amount of employees nearly tripled which can be seen in figure 1 and the turnover of the company had a quite massive five-fold increase which can be seen in figure number 2.

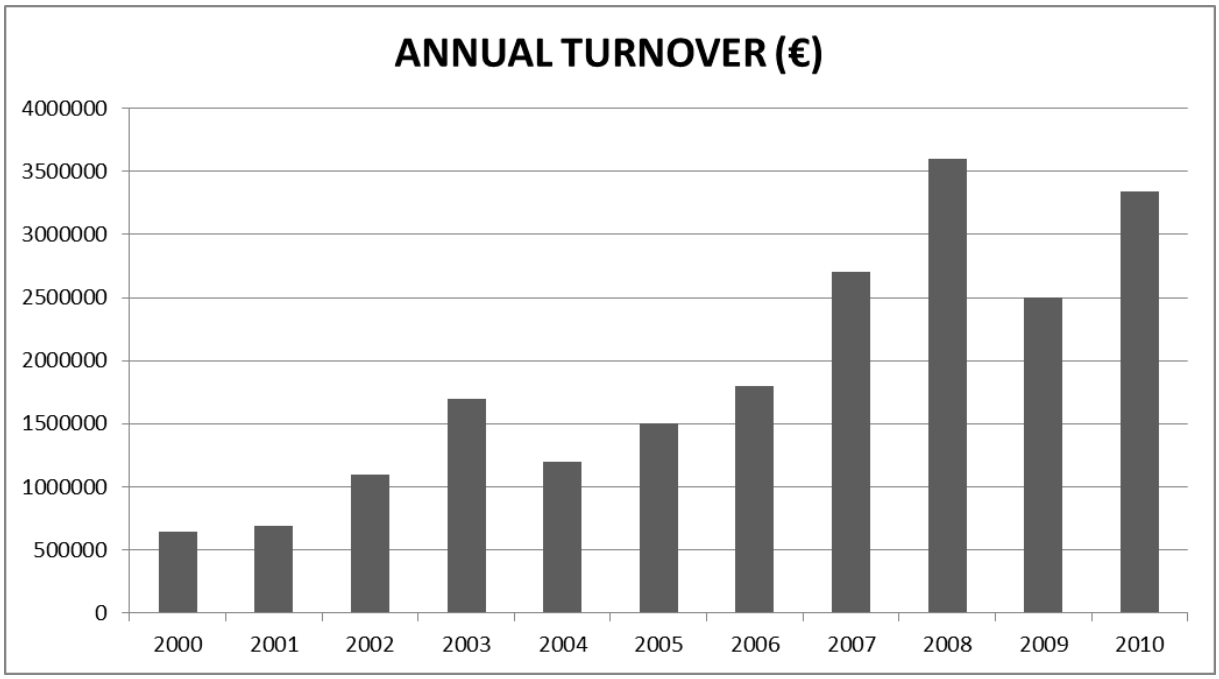

Fig. 2. The development of turnover between years 2000-2010

The following chapters present a case study on the invoicing process of the commissioner company. The study was performed by Matti Honkala from Oulu University of Applied Sciences. The study is presented in detail in his BBA thesis. [2]

2 Research Methods – The Workflow Modeling

The main methodology utilized conducting this Business Process Improving -project is based on a book of *Workflow Modeling - Tools for Process Improvement and Application Development* by Alec Sharp and Patrick McDermott. The main methodology can be understood as a certain type of variation of Business Process Management –approach. Although the authors states that it is more practical and concise to this type of modeling project, when comparing to other Business Process Management -methods. [4]

When the Six Sigma –project's most popular Process Improvement methodology consists of five phases of improvement (Define - Measure - Analyze - Improve - Control) [3] the methodology applied with this certain approach is called the *three-phase project-oriented methodology*. These three improvement phases are as follows:

1) Establish process context, process scope and the goals of the process

2) Understand the as-is-process-workflow and other enablers, and

3) Define to-be process characteristics and requirements

The goal of the phase number one is to conduct an *Overall Process Map* of the process under improvement project. Sharp & McDermott describe the Overall Business Map as "a simple graphical depiction of a set of related processes (sub processes), usually amount of five to seven". The Overall Process Map is being conducted for recognizing the series of Business Processes in the particular process area and also comprehending their relationships and linked connections to each other.

When the Overall Process Map is being conducted, it is then possible to come up with a complete, thorough understanding of the boundaries of the whole Business Process Improving -project. What of these processes are being taken into deeper consideration, and what of the processes are completely out of the context? Sharp & McDermott also states that: “the value of the Overall Process Map is that it also clarifies what is out of scope as well as what is in”.

When the Overall Process Map is being conducted and the scope for the project is clarified, the As-Is-Process can be modeled. In this phase of the project, the actual visual modeling of the processes takes place and the *swimlane diagrams* are being developed.

2.1 Swimlane diagrams

The swimlane diagrams are a certain type of Process Flow Diagrams which are used for showing the entire Business Process under investigation, from its beginning to an end. It is also common to say that the workflow model depicts the three R's; *1) Roles, 2) Rules and 3) Routes* of the Business Process. In this context, these swimlane diagrams are being applied for visualizing the As-Is- Process workflow as well as the To-Be-Process workflow.

Because of their ease of use, the swimlane diagrams are being widely used with different Business Process improvement methods; for example Business Process Modeling Notation (BPMN) by Business Process Management Initiative (BPMI) and also with the Unified Modeling Language (UML) as the Activity Diagrams. [4]

The swimlane diagrams are also applicable with this particular context because the diagrams seem to be relatively simple and concise to conduct and also simple to understand. In a nutshell - the swimlane diagrams simply just show 1) *what* is done, 2) by *whom*, 3) and in *what sequence*. The main elements which will constitute the swimlane diagrams are: 1) the actors involved, 2) the steps they accomplish in the process, and 3) the flow of work between them. [4]

The actors of the swimlane diagrams can be understood as “swimmers” (hence the name swimlane) who does the work within the process on each of the swimlane. Therefore, with the horizontal swimlane diagrams, the actors of the process are being listed on the left side of the diagram. Each of the actors will have their own designated swimlane assigned which extends from left to right, across the diagram, therefore there should be no overlapping or whatsoever when the work is being "floated" through the entire process.

The transition, when the work flows from one actor to another, is called *a handoff;* which can actually happen in real life when one actor of the process physically hands out e.g. a printed document to another actor of the process to use. The line, which separates the swimlanes of two actors, indicates that the completion of the preceding step can be understood as a precondition for the initiation of the following step. Furthermore, the swimlane diagram shows the previous steps - which have to be fully completed - before the next step of the swimlane diagram can begin.

In figure number 3 we can see an example of a simple horizontal swimlane diagram from school’s semester enrollment process. Each of the individual process actors are placed on their designated swimlanes; also the handoffs and the process’ boundaries can be seen very clearly on this diagram example.

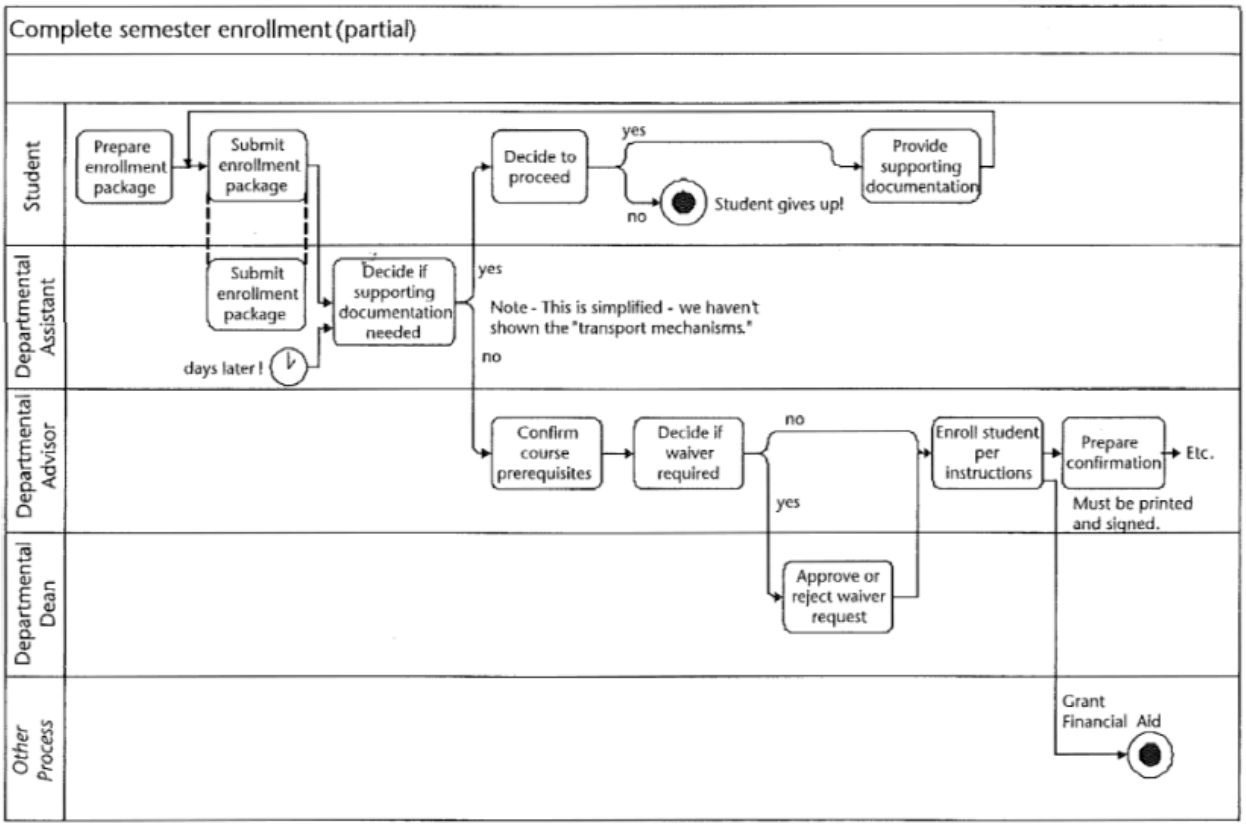

Fig. 3. A simple swimlane diagram (Sharp & McDermott 2009, 204) [4]

3 Studying the current invoicing process

The invoicing process in the commissioner company has been almost similar since year 1998 after the currently used MS Access –based timesheet software has been taken into use. The biggest differences with the invoicing process at the time were that the Chief Executive Officer of the company handled the invoicing of the customer only by himself. The working hours were collected by using the same MS Access –timesheet database and by the working hour data from the monthly timesheets the invoices were able to be compiled by using the Nova financial administration-system. The commissioner company still uses the Nova financial administration-system although it had been through several version upgrades since year 1998.

At the time, when the invoicing process of the commissioner company was managed by the previous Chief Executive Officer, the size of the organization made it possible to manage the invoicing process as a part-time-basis, but later on when the organization expanded, it became apparent that the workload had to be balanced in order to successfully managing the invoicing of the customer. Therefore the Financial Manager was being hired to the commissioner company.

When the invoicing process of the commissioner company was being managed by the previous Chief Executive Officer, the financial management software was being applied only with compiling and printing the invoices, therefore it was not fully integrated within the

invoicing process. The customer payments were verified by manually examining the bank statements - and if needed, the reminders were sent to the customers. The manual verification of the customer payments later on revealed to be somewhat time-consuming process and when the automated payment verification was taken into use, it was possible to perform the invoicing faster and effectively. [1] Shortly after the current Financial Manager was being hired to the commissioner company, the financial management software was fully integrated into the invoicing process, and the verification of the customer payments became smoother; since the financial management software can be integrated with the banking systems, the bank statements can be automatically downloaded to the financial management software and the verification of the payments went as it is supposed to go by using a financial management software.

The Financial Manager was fully responsible for the invoicing process until year 2004 when a part-time assistant was being assigned for correcting the monthly timesheets and sending the final invoices to the customers. At the time, the size of the commissioner company's organization made it possible to perform the invoicing process with part-time assistant, but when the organization expanded even more, nowadays the commissioner company has hired Financial Management Assistant to work with the invoicing processes full-time.

The studying of the current invoicing process was conducted by gathering the information about the process by interviewing the functional area representatives. The process under study is the as-is invoicing process of the commissioner company, and the process itself involves a number of personnel; the Surveyor, the Financial Management Assistant, the Financial Manager, commissioner company’s contact person in Tornio Office and also the Chief Executive Officer of the commissioner company. The functional area representative - or representatives - of this particular process are the Financial Manager and the Financial Management Assistant so they are being interviewed for gathering the needed information of the process. The interviewing of the functional area representatives should have taken place on each of the three main steps throughout the project - if the three-phase project oriented methodology was being followed perfectly, that is. This particular project is being conducted under the time restrictions of Bachelor's Thesis, therefore the interviewing of the functional area representative(s) is being conducted during the first step of the project only (*establish process context, scope and goals)* for uncovering the necessary information about the process for conducting the swimlane diagrams. By interviewing the functional area representatives it is possible to uncover 1) the scope of the process, 2) set of related Business Processes and 3) also the activities of the connected processes. The scope of the process under study can be established by using the framework of the process boundaries and contents by Sharp & McDermott [4]. The process boundaries should reveal the *what, who and how* of the process:

What - triggering event, result for the customer
Who - actors and organizations participating in the process
How - systems and mechanisms supporting the process

The developing-phase of the swimlane diagrams will be conducted after the As Is Process and the goals of the process are clarified and understood. Due to the author's long working history with the client company, the interviews were held rather informally therefore there will be no specific interview framework applied with the interviews. Also the Overall Business Process map will be conducted by cooperation with the functional area representatives.

4 Modeling the invoicing process

The modeling of the invoicing process was done by using the aforementioned service-level swimlane diagrams which can be created for modeling the whole process with one and simple diagram. Swimlane diagrams can also be used when the subprocesses of the invoicing process are being modeled; therefore it is most suitable modeling technique for this kind of Business Process improvement project. The modeling of the invoicing process should cover the whole process from beginning to an end, the phases (subprocesses) and also the actors who perform the activities with the process under study.

The process in the appendix number one was being modeled by creating the service-level workflow diagram of the invoicing process as it was in year 1998, before the current Financial Manager was responsible for invoicing the customers of the company. The process in the appendix two depicts the invoicing process as it was in year 2000 when the Financial Manager was being hired to the commissioner company. The current invoicing process was modeled by creating similar service-level diagram than in appendix one and two.

During the interview sessions it was possible to come up with the invoicing process phases of the current invoicing process. The phases were categorized by using the three-phase project oriented methodology as processes with connected subprocesses, and the redundant process phases were integrated with the subprocesses.

3 Results and conclusions

When the stakeholders of each of the sub-processes of the Invoicing Process were interviewed, it became obvious that the biggest problems and delays with the current Invoicing Process happen with the current timesheet collecting process; and due to the fact that by using the current timesheet database the employee of the commissioner company who is willing to add the working hours to the database have to be physically situated inside either one of the commissioner company's offices, inside the head office in Oulu or the branch office in Tornio. And also the current timesheet-database software cannot be modified so that it could be used remotely via Internet-connection. Therefore the transformation of the timesheet-database is justified.

As the transformation of the timesheet –database goes as planned, each of the employees of the commissioner company has the possibility to add their working hours to the timesheet database remotely, and also to remotely use the project database of the timesheet system. The project database is located inside the timesheet software and it consists of almost every customer of the commissioner company with their contact information, therefore it makes it possible to find the information about customers and the previous projects by using the same database system.

The outcome of this study can be seen with the swimlane diagrams and with the complexity of the overall invoicing process. The process itself will be extensively improved after the planned internet-version of the timesheet database will be released.

By applying the current invoicing process it takes usually around two weeks to gather the monthly timesheets from every employee of the commissioner company, which from the financial management point-of-view can be somewhat frustrating to wait this long until the invoicing actually can begin. With the internet-version of the timesheet-database, that time for gathering the timesheets can be significantly shorter. That is, due to the fact that each of the employees will have the opportunity to add their working hours into the database by only using the internet-connection and the employee does not have to be physically situated in commissioner company's premises when using the timesheet-database.

Although the improvement of the timesheet-database does not rule out the fact that the employees of the commissioner company are still the ones who are responsible for adding the working hours to the database, and if they are not willing to take the internet-version of the timesheet database extensively into use (and therefore continue sending their working hours via email) the usefulness of the improved invoicing process can be futile.

Also the usability of the timesheet-database should be on that level in which the employee does not feel the using of the software too challenging or time consuming thus the employees of the commissioner company doesn't necessarily need any training for successfully using the upgraded timesheet database system. The usability-issues were being handled by using somewhat similar user interface as with the previous timesheet-database software by using the basic functionalities of the previous timesheet system as a template for the functionalities with the improved timesheet system, thus the similarity should encourage the employees to easily migrate using the improved version of the timesheet-database.

The invoicing process has been mostly identical when comparing the process characteristics with years 2000 and 2010. The company growth has occurred quite rapidly, and the invoicing process has expanded to involve total number of 7 persons at the most. When comparing to year 2000 the invoicing process involved only 3 persons (the Surveyor, the Chief Executive Officer and the Customer). On assumption, the invoicing process would be a bit simplified in a way, e.g. the role of the Chief Executive Officer with the invoicing process can be taken into consideration since he is largely involved on both, correcting the timesheets and approving the final invoices. And when the Chief Executive Officer is not situated at the company premises, the process of invoicing stays in "idle state", thus the process is not moving forward as it is supposed to.

The methods of reducing the role of the Chief Executive Officer with the invoicing process can be e.g. dividing the projects due to their characteristics as the ones which can be approved by the Financial Manager and the ones which will need the Chief Executive Officers "stamp of approval". Therefore the Chief Executive Officer does not have to use the time for going through every invoice of the invoicing period. This method only needs some arrangements in the beginning of the project and mostly with the invoicing terms so that later on the final invoices does not necessary need the Chief Executive Officer's approval.

Also the process when the Chief Executive Officer approves the invoices could be smoother as there seems to occur some redundant printing of the *drafts* of the final invoices which could be replaced by using the electric documents which can be sent via email and

therefore the Chief Executive Officer does not necessarily have to be situated inside company premises for making his corrections to the invoices. These electronic documents are possible to print out from the invoicing software quite easily, thus it seems as a natural step of improvement with the invoicing process.

Literature

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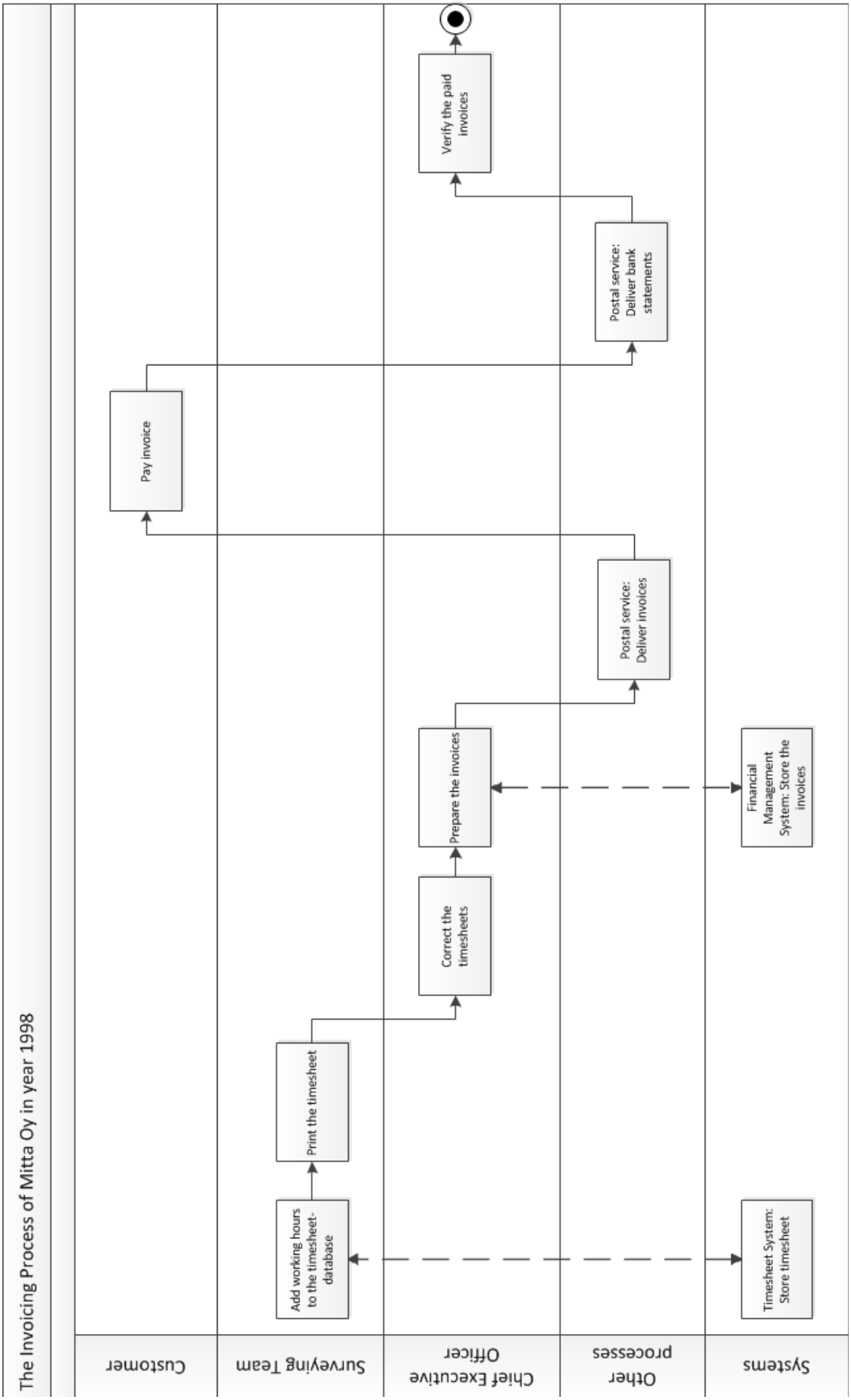
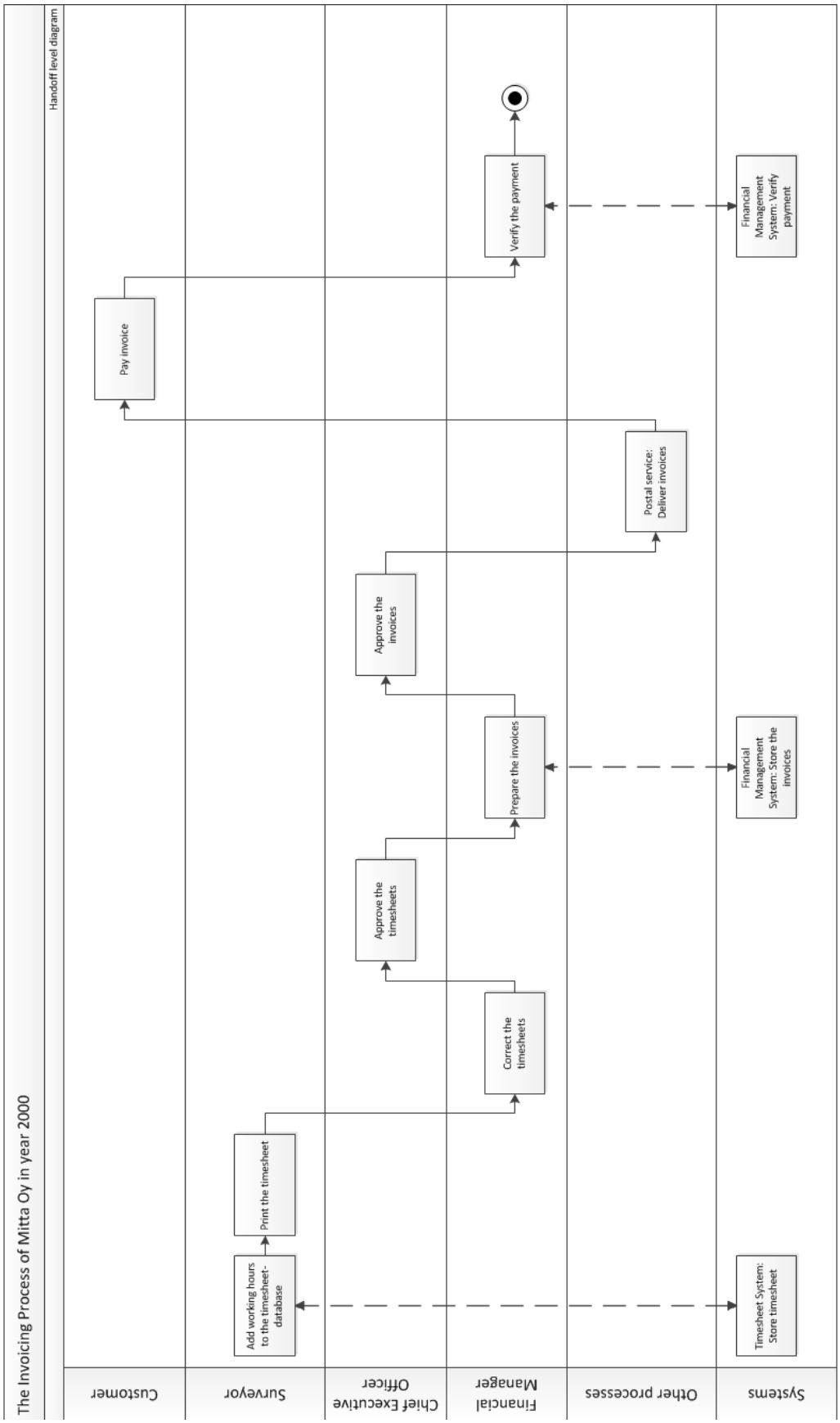
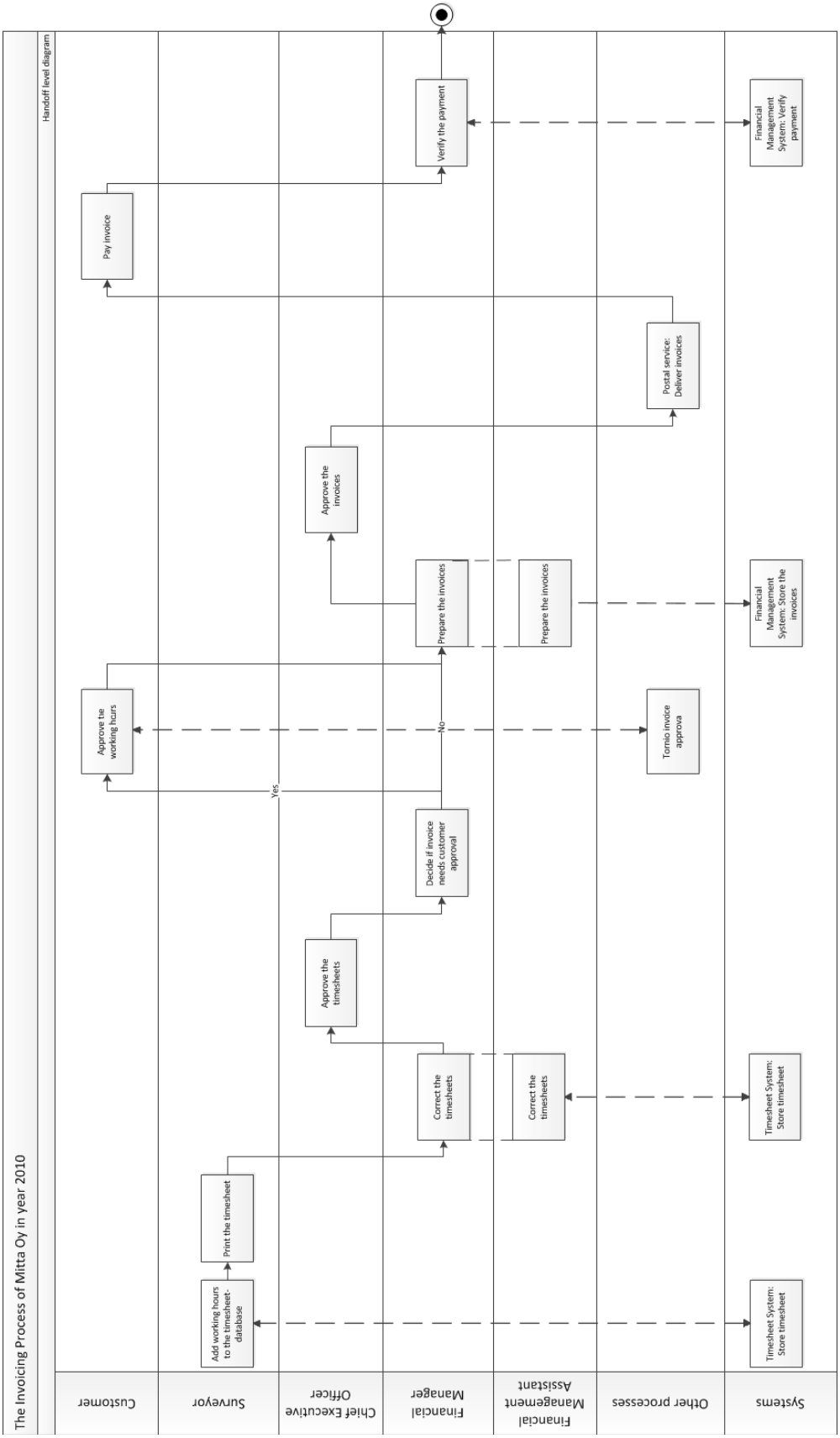
APPENDIX 1


The Invoicing Process of Mitta Oy in year 1998
Customer
Surveying Team
Chief Executive Officer
Other processes
Systems
Add working hours to the timesheet-database
Print the timesheet
Correct the timesheets
Prepare the invoices
Verify the paid invoices
Timesheet System: Store timesheet
Financial Management System: Store the invoices
Postal service: Deliver invoices
Postal service: Deliver bank statements
Pay invoice

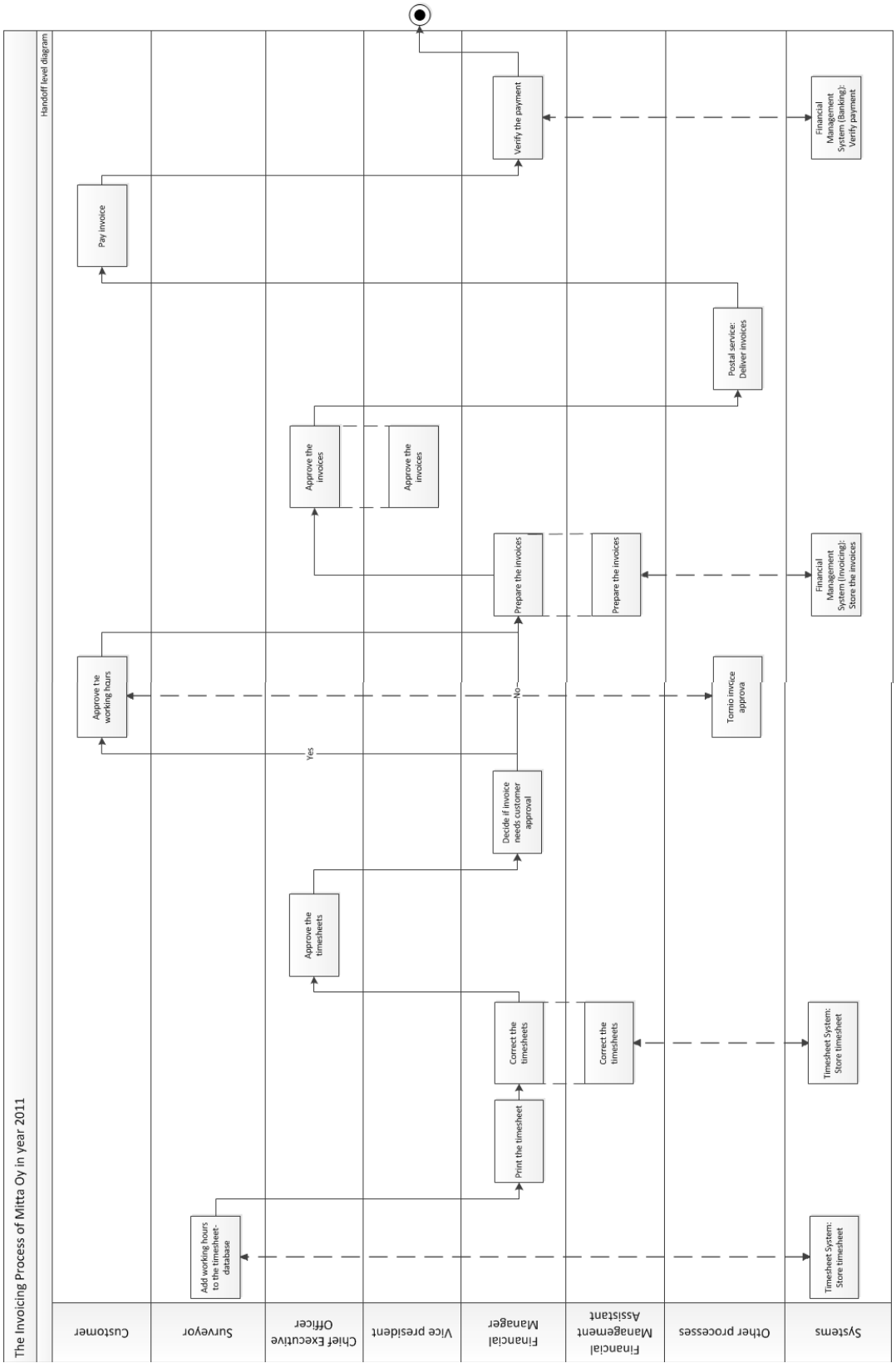
APPENDIX 2


The Invoicing Process of Mitta Oy in year 2000
Handoff level diagram
Customer
Surveyor
Chief Executive Officer
Financial Manager
Other processes
Systems
Add working hours to the timesheet-database
Print the timesheet
Correct the timesheets
Approve the timesheets
Prepare the invoices
Approve the invoices
Postal service: Deliver invoices
Pay invoice
Verify the payment
Timesheet System: Store timesheet
Financial Management System: Store the invoices
Financial Management System: Verify payment

APPENDIX 3


The Invoicing Process of Mitta Oy in year 2010
Handoff level diagram
Customer
Surveyor
Chief Executive Officer
Financial Manager
Financial Management Assistant
Other processes
Systems
Add working hours to the timesheet-database
Print the timesheet
Timesheet System: Store timesheet
Correct the timesheets
Correct the timesheets
Timesheet System: Store timesheet
Approve the timesheets
Decide if invoice needs customer approval
Yes
No
Approve the working hours
Tornio invoice approva
Prepare the invoices
Prepare the invoices
Financial Management System: Store the invoices
Approve the invoices
Postal service: Deliver invoices
Pay invoice
Verify the payment
Financial Management System: Verify payment

APPENDIX 4


The Invoicing Process of Mitta Oy in year 2011
Handoff level diagram
Customer
Surveyor
Chief Executive Officer
Vice president
Financial Manager
Financial Management Assistant
Other processes
Systems
Add working hours to the timesheet-database
Timesheet System: Store timesheet
Print the timesheet
Correct the timesheets
Correct the timesheets
Timesheet System: Store timesheet
Approve the timesheets
Decide if invoice needs customer approval
Approve the working hours
Yes
No
Tomio invoice approva
Prepare the invoices
Prepare the invoices
Financial Management System (Invoicing): Store the invoices
Approve the invoices
Approve the invoices
Postal service: Deliver invoices
Pay invoice
Verify the payment
Financial Management System (Banking): Verify payment