HAAGA-HELIA
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Requirements Engineering Process for Sales Management System
Case study: Tin Phong Trading Co., Ltd.

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Abstract

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The starting point of this thesis project was to analyse the system and software requirements for the Sales Management System to help Tin Phong Trading Co., Ltd. as a final assignment for the student to get a Bachelor's Degree in Business Information Technology.

Tin Phong Trading Co., Ltd. is trading company in Ho Chi Minh city, Vietnam. The main business of the company is to trade motorcycle spare-parts in wholesale or retail within the local market. The sales management is still using the traditional method to record the customers' information, payments and purchases on paper or through MS Excel. It takes time to search the correct information when it is necessary.

In order to solve their current sales management problems, a Sales Management System should be created. From this point of view, requirements analysis for Sales Management System should be carried out before creating a complete system in use. The first inevitable step in the requirements engineering process was to analyse the company all business cases in sales management by a feasibility study, which was the bases to go to two main parts of this project. First one was to analyse the system requirements for the Sales Management System of Tin Phong Trading Co., Ltd., and the second was to analyse the software requirements, which only includes three sub systems: Record product, Record potential customer, and Handle contract sale in the Sales Management System.

The Sales Management System of Tin Phong Trading Co., Ltd. was analysed by using the Object-Oriented methods, Business Process Modelling, and UML in system process.
After the assurance quality test of this project has been accepted by a steering group, the result of this project will handle to a developer for designing database and implementing software application in use. The database design and implementation phase will be carried out during spring of 2009 and completed in summer of 2009 according to the plan and decision of the steering group.

However, this project is mortal part of the software system. It decides whether it could help the company to solve the sales management problems or not. Hopefully, after the Contract sale sub system applies in use at the Sales Department of the company in summer 2009, this project will be realized how important and helpful to the sales management process of Tin Phong Trading Co., Ltd.

Key words
Requirement engineering, handle contract sale, wholesale, retail, spare-parts.

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1. Introduction

This thesis is set up for showing the aptitude of applying knowledge and skills of a student accumulated at Haaga-Helia University of Applied Science during the study period. This is considered as a final assignment for the student to get a Bachelor's Degree in Business Information Technology.

1.1. Purpose

The purpose of the project for the thesis is to analyse the system and software requirements for the Sales Management System to help Tin Phong Trading Co., Ltd. to solve their sales management problems.

1.2. Background information

Tin Phong Trading Co., Ltd. is trading company in Ho Chi Minh city, Vietnam. The main business of the company is to trade motorcycle spare parts in wholesale or retail within the local market.

The Director of Tin Phong Trading Co., Ltd., who was my co-operator, and I had run a business of trading motorcycle spare-parts for more than two years when I was in Vietnam. In that period, we only followed our customers' purchase and payment through MS Excel or on papers. It took time to get the sales records and necessary information. Sometimes we even got incorrect information.

After I moved to Finland, my previous co-operator has also run the same business. He has asked me to design software which can carry out the customers' payment and purchase in order to save time and get the correct information. The reasons are that I ran this kind of business before, and now I am studying business information technology. This is a good opportunity for me to design software for him to solve his current problems.

1.3. Objectives and delimitation

The objectives of this thesis project are to have complete requirements analysis documentation for the Sales Management System of Tin Phong Trading Co., Ltd. The following three main documents are produced for the Requirements Engineering Process for Sales Management System:

- Feasibility study.
- System requirements analysis for Sales Management System.
- Software requirements analysis for Sales Management System.

In this project, the Sales Management System is designed to be a standalone system. There is no integration with the existing Accounting System and the future Warehouse System.

During the process of this project, the most important thing is that the following main learning objectives can be achieved:

- Clear understanding of the requirements analysis process of software system.
- Improved skills in using of Object-Oriented methods, Business Process Modelling, and UML in system process.
- Applying in real life from the earlier learned skills such as Information Systems and Object Oriented Approach, Information System Requirement Engineering, Developing Information System, Software Project B.
- Getting positive experience of analysing a system.

1.4. Research method

Applied method was chosen in this thesis project. If the requirements analysis has done in good results, the database design, and the implementation phase will be developed easier. In the beginning, the database design and the implementation were planned to be developed in Vietnam based on this project. After gaining the agreement from the Director of the company, Simeon Mushimiyimana is now designing the database and implementing the system based on this project results as his thesis topic at Haaga-Helia University of Applied Science.

Once Simeon Mushimiyimana finishes the software system, the company can apply it in use at the Sales Department of the company. At that time, this project will be realized how important and helpful to the sales management process of Tin Phong Trading Co., Ltd.

1.5. Critics

A sufficient complete communication with the Director of the company is very important to this project. Even though I ran this kind of business before, everyone has his own management and requirement in business. Once the requirement analysis is incorrect or inaccurate, it is hard for the developers to develop complete software in use. In case that the developers only follow the requirements analysis to develop software, the product is not good in usability for the company. Hence, a good requirements analysis would reduce the unnecessary works and time spending during development. Later on, when complete software based on this project is done, it helps the company solve the current sales management problems mentioned above.

2. Company business ideas and goals

Tin Phong Trading Ltd., Co. has an office and two warehouses. The office includes Accounting Department and Sales Department. Two warehouses are considered as Warehouse Department.

The business idea of the company is to supply different kinds of motorcycle spare parts imported from abroad or from the manufacturers in Vietnam to the middle man, motorcycle workshop or the motorcycle spare-part stores in retail, wholesale, or contract sale.

The sources of these products are unstable because of many reasons. That is why every retailer could be a wholesaler for one or more specific products in a certain period. That means a customer can have monopolization for one or more specific products in a certain period. In some cases, the customer has to sign a contract with the company to have monopolization for the products. Usually in these contracts, the payment terms and delivery terms show nothing but deadline. After signing the contract, the customer can get the product without any advance payment or vice versa. These cases have happened to the contract sale customers, the wholesalers, or even retailers. Sometimes the customers only pay the debt without any buy or order product.

The only difference between the contract sale and wholesale or retail is that the company has to follow the payment and delivery deadline of the contract products for the customers, and the customers are guaranteed to get the products in time and sufficient quantity.

In order to encourage the customers to buy more, the company also offers two prices on some specific products to all customers. That means if the customers buy over a certain quantity, they will get discount, which can not apply the percentage for discount because of the custom. The company just marks them as wholesale prices. It is the difference between wholesale and retail.

All the main sales activities happen in the Sales Department. The Customers can come over to see the product samples or the salesmen promote the products the Customers through the Sales Department.

3. Project approach

(http://myy.haaga-helia.fi/~jalki/sys8tf060 by Kirsti Jalasoja 2009)

The purpose of this thesis project is to analyse the requirements for the systems and software of the Sales Management System of Tin Phong Trading Co., Ltd using Object-Oriented methods, Business Process Modelling, and UML in system process. In order to be clear what was going to do for this thesis project, we should have a look and understand three main parts of the thesis project hereunder: feasibility study, system requirements analysis, and software requirements analysis.

3.1. Feasibility study

This phase can not be inevitable before going to the systems and software requirements analysis, especially the Sponsor is not in Finland. This phase is to make a preliminary study of the present state of the business activity of the company, the business objectives, and the goals of using information system in business. Based on the preliminary business study, **elicit bases for the development** that means to identify the priority needs and requirements of the Sales Management System, and make a preliminary state model for the Sales Management System solution. In other words, **design a vision of system architecture**.

Once the feasibility study is done, the system and software requirements analysis will describe the target state of the Sales Management System.

3.2. System requirements analysis

The main goal in this phase is to find out the data, business and data process tasks in the Sales Management System. The following steps can help you discover the data and its process from business to information required in the system.

- **Analyse business environment**: This is the first step to analyse the requirements for the Sales Management System. In this step, we specify the boundary between the application system domain and its environment by using the Entity-Structure diagram method. This step is the most important step in the requirements analysis process which decides what data is going to be used and what is going to be left out in the services. This step also shows the trigger of the services, and the data, material flows concerned to the services.

- **Re-engineer the business process**: The second step is to re-engineer the business activities with data and material flows according to the business requirements and the environment of the Sales Management System by using the Business process modelling – Top-down and Event-Driven method. This step describes what and how the application services should be use in each business activity and what kinds of data will be processing in the business activity. This step also shows the response of the business activities to the application environment.

- **Analyse business entities**: The third is to analyse and specify the manually and automated storable data which is necessary to the company's business process and the Sales Management System. With the specified data, a class model with UML is designed for the Sales Management System which shows the inter-relationships between the classes and every class's attributes. The lifecycle of the key business entities should be designed in this step for showing the changing stage from the beginning to ending of the key data during the business process. The lifecycle is described by state diagram technique and UML.

- **Specify preliminary use case**: Next step is to analyse and specify the data processing tasks in the business processes, which part of data processing tasks is performed in manually and which one is done by the application software described in the preliminary use cases. Data processing rules of the data should be described as detail as the best for knowing all the functional business rules at the preliminary use case. In this project, the **architecture requirements** is analysed in this step for specifying technical and other non-functional requirements for the Sales Management System such as human computer interface, distribution, and data communication requirements.

- **Specify security requirements**: After then, we have to elicit and analysis the objectives and requirements for safety and security to the Sales Management System. In this step, we have to figure out how to manage the business and data process and how to recover the data once the system fails, and what kind of secure is necessary to the business, data, and data processing tasks during the system operation.

- **Validate the system requirements**: Last but not least in the system requirements analysis is to validate all tasks in the system requirements document in order to verify whether the functionality in business, the services and data of the Sales Management System are valid or not in this document. The document is revised in this step in case that some parts of the document are invalid or inconsistent.

All data, business and data process tasks in the Sales Management System have been analysed and specified after going through all steps mentioned-above. A complete system requirements document is ready for the next phase, software requirements analysis.

3.3. Software requirements analysis

This phase is based on the result of the system requirements document to analyse the functionality of the software including user activities such as use cases, user interface, security requirements, and business entity elements of the software using classes and business component. A complete software requirements analysis in detail is described in the following steps.

- **Specify boundaries of software item**: The first step in the software requirements analysis is to give overall picture of the software or software item (also known as sub system) such as background, organization, business domain, and frequency of use.

- **Specify use case, sub use case model**: The second step is to make a use case, and sub use case model in detail and step by step about the software functionality from the user point of view by using use case map, use case diagram, sub use case, and their descriptions. This step is based on the result of the preliminary use cases in the system requirements document.

- **Analyse details of class model**: The third step is to complete the business class model from business view based on the third step in the system requirements analysis. That means that the responsibility and operation in every entity is specified according to the business services. The lifecycle of the key business entities here shows the necessary actions in each transition. In the other words, it shows the business activities where the software is used and what the actions are required on the operations in the business classes. In this step, all parameters and codes not concerning to any business class or use

case, but necessary in the business are described for referring sometimes in the business descriptions or user interface description in next step.

- **Design user interface**: After then, a user interface model is created for showing the data structure on the screen, printouts, and templates of the software application.

- **Data access**: This step is to make the Sequence diagram for each main use case. However, it is not created in this project. The reason will be mentioned in part 6.3.

- **Validate the software requirements**: Last but not least, validation for all tasks in this software requirements document is also inevitable to verify whether the functionality of the Sales Management software are cover all requirements for business service or not. The document is revised in this step in case that some parts of the document are invalid or inconsistent.

Once the functionality and business entity elements of the software described in the software requirements document fulfil the required business services, the whole documentation is ready for the developer to continue the design and implementation phase.

4. Project process and progress

This thesis project has been done based on the concept mentioned in the previous chapter. Now, we continue to see how this whole project processes to achieve its objectives. Firstly, we shall have a look how the project plan figured out in this project, and then we can consider how the whole project had progressed according to the project plan.

4.1. Project plan

The topic "Requirements Analysis for Sales Management System" for my thesis came up in my mind after finishing my Requirement Engineering course by Kirsti Jalasoja in spring 2008, in addition to my business background and my co-operator's requirements. I decided to start my project plan for my thesis with the mentioned topic on 19.09.2008. Finally, my project plan was completed on 11.10.2008.

There was one re-plan after the system requirements analyse phase according to the original plan. Later on, my project schedule was changed two more times under the permission of the steering group. Finally, there were totally three re-plans in this thesis project. Therefore, only the final stage of my project is shown hereunder in the figure 1.1. The detail of this thesis project stage is described in appendix 5.

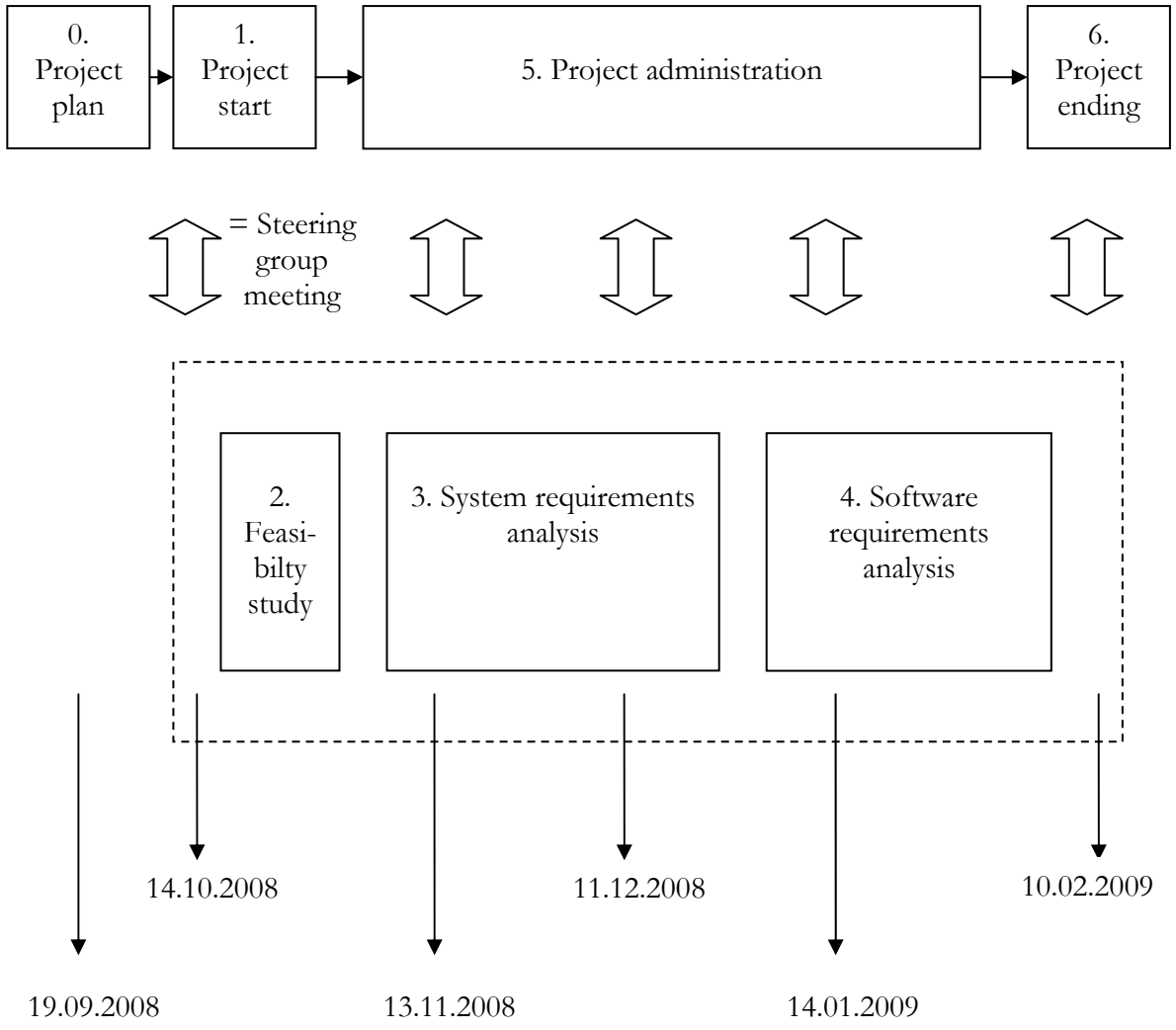

Figure 4.1: Project stage

The thesis project officially started on 14.10.2008 and ended on 10.02.2009. During the thesis project processing, there were three steering group meetings excluding the first and the final steering group meetings for going through the project progress and re-planning the project schedule as planned in the beginning of this thesis project.

The whole project was divided in six main parts: project start, feasibility study, system requirements analysis, software requirements analysis, project administration, and project ending. There are thirty six tasks inside those six main parts. In the project administration part, there were three progress reports and three minutes of meeting for three steering group meetings. The name of each task is described in the following table:

Table: 4.1 Project task name

No.	TASK NAME
1.	**Project start**
1.1.	Project start steering group meeting 1
1.2.	Minutes of meeting 1
2.	**Feasibility study**
2.1.	Elicit bases for the development
2.2.	Design a vision of system architecture
3.	**System requirements analysis**
3.1.	Analyse business environment
3.2.	Re-engineer the business process
3.3.	Analyse business entities
3.4.	Specify preliminary use case
3.5.	Specify security requirments
3.6.	Validate the system requirements
3.7.	Review 1, 2, 3
4.	**Software requirements analysis**
4.1.	Re-plan software requirements analysis phase
4.2.	Specify boundaries of software item
4.3.	Specify use case, sub use case model
4.4.	Analyse details of class model
4.5.	Design user interface
4.6.	Data access
4.7.	Validate the software requirements
4.8.	Review 4

Table: 1.1 Project task name (continue)

No.	TASK NAME
5.	**Project administration**
5.1.	Progress report 1, 2, 3
5.2.	Steering group meeting 2, 3, 4
5.3.	Minutes of meeting 2, 3, 4
6.	**Project ending**
6.1.	Final validation
6.2.	Final report
6.2.	Thesis report
6.4.	Final steering group meeting 5
6.5.	Minutes of meeting 5
6.6.	Deliverable

4.2. Project start

On 09.10.2008, I informed the sponsor about the first steering group meeting by phone. Unfortunately, the sponsor apologized for his absence.

The First steering group meeting was held on 14.10.2008 for going through my project plan. Because of the absence of the sponsor, I did not get my Thesis agreement at that moment, which was being on the way from Vietnam to Finland by mail. I promised to give it to my Thesis Supervisor after receiving it. My project plan was accepted by the steering group after making some small correction. My project was started doing the Feasibility study.

4.3. Feasibility study

As I have mentioned in 1.1. Background information, I ran this business before when I was in Vietnam. I know clearly how the business processing in this field. The solution for this part was not a problem. I only had to contact with the company's Assistant to get the accurate requirements for the Sales Management System. It was the first time to make this feasibility study, I could not figure out the accurate time consumption for this part. Finally the actual work hour was three and half times more than my plan hour.

4.4. System requirements analysis

According to my planned schedule, I would finish all my tasks in this first phase on 12.11.2008, but at that moment, I had only finished until Analyse business entities step, and started specifying the preliminary use case task. The reason leaded to the undone tasks was the big load of work under the tight schedule. Under this situation, my Thesis Supervisor suggested me to extend the dead line of the first phase to 11.12.2008, and also the dead line of the whole project 22.01.2009. Hence, I had to re-plan project schedule before I continue my undone tasks. The original planned hour 406 hours was changed into 458 hours for the whole project.

My work for this thesis project was going on with the re-planned schedule. Finally, I had completed all tasks in time. My schedule in this period (13.11.2008 – 10.12.2008) had been processed more smoothly than before under good advice of my Thesis Supervisor Kirsti Jalasoja in the second steering meeting on 13.11.2008. Of course, there was a small change in work hours for some tasks. Some were required more working hours than my plan; some were required less. However, the total work hours in my plan was the same as my actual work hours. The most important thing was that I could finish all my tasks described in system requirements analysis of the Sales Management System for Tin Phong Trading Ltd., Co. on 10.12.2008. The outcomes are described in the next chapter.

According to my original plan, there were two reviews in this system requirements analysis phase in order to assure the quality of this project. One was on 06.11.2008 right after the step "Analysis business entities" to review the class model whether it matched the requirements before going further analysis. The second review was on 13.11.2008 to review the whole tasks at this phase. Actually, the first review was after the step "Re-engineer the business process", and the second one was after the step "Analysis business entities", because of the big load of work as I mentioned above. Under that situation, one more steering group meeting and review held on 11.12.2008 are needed for assuring the quality of the whole tasks of the system requirements analysis. Therefore, there were totally three reviews in this system requirements analysis.

At that moment, my classmate, Simeon Mushimiyimana, would like to continue my project by designing database, and implementing the software application as his thesis. He planned to start in January 2009. After contacting with the sponsor and my Thesis Supervisor, his idea was agreed.

4.5. Software requirements analysis

According to the original plan of my project, this software requirements analysis phase should start in week 46, but it started in week 50 due to the hard work load of the system requirements analysis phase. In addition, I was busy in weeks 48 and 49. If we follow the calendar week, it was four weeks later than the original plan. In reality, it was only two weeks later, because the week 48 and 49 were not considered as a thesis project work weeks. However, I had to re-plan my schedule for this phase as my plan.

The actual work hour was much bigger than my plan that made me not complete all cases in the project even though I utilized the whole Christmas holiday to handle this project. Only three sub systems: Record product, Record potential customer, and Handle contract sale in the software requirements analysis were completely done. The remnant sub systems: Handle retail, Handle wholesale, Handle returned product, Record feedback, and Browse report would be analysed later.

The actual work hour for this project till 13.01.2009 was 450 hours already. I noticed the project situation during the Christmas holiday. That was why I tried to split the Browse report case in simpler ways to other cases such as List customer in Record potential customer, List stock status in Record product, and so on for Simeon Mushimiyimana to implement the application in use. If the software application without those simple "List" functions instead of the "Browse" functions, it seems useless.

According to my re-plan, there was only one review in this software requirements analysis phase on 14.01.2009. Because of the project quality assurance, after completing the required tasks in this phase, I had to validate the whole system and software requirements analysis documents even my re-planned hour was run out soon. The final validation will be described in 4.7.Project ending.

4.6. Project administration

The purpose of this project administration was to follow the project process and report the project progress to the steering group. For instance, the project process could not follow the project plan or there were some exception cases during the project process, the project group had to report all situations to the steering group in the steering group meeting through the progress report. The steering group had to take responsibility for solving those exception cases and steering the project group to a suitable solution. All the changes of the thesis project and decisions by the steering group for the project were recorded in the minutes of meeting. In this project, the sponsor could not be present in the meetings. I was responsible for reporting all situations of the project to the sponsor by phone and email.

The organization of this thesis project had steering group and project group. All communications and events happened in this thesis project between the steering group and project group was responsible by a steering group Secretary. In the steering group, there were a sponsor (also known as Director of the company), and a Thesis Supervisor. In the project group, there were a project Manager, a project team member, and a project group Secretary. Because this is a thesis, one person had to be responsible for all roles in the project group in order to get used to how the thesis was. The figure 4.6 Project organization will show who was in which role in this thesis project.

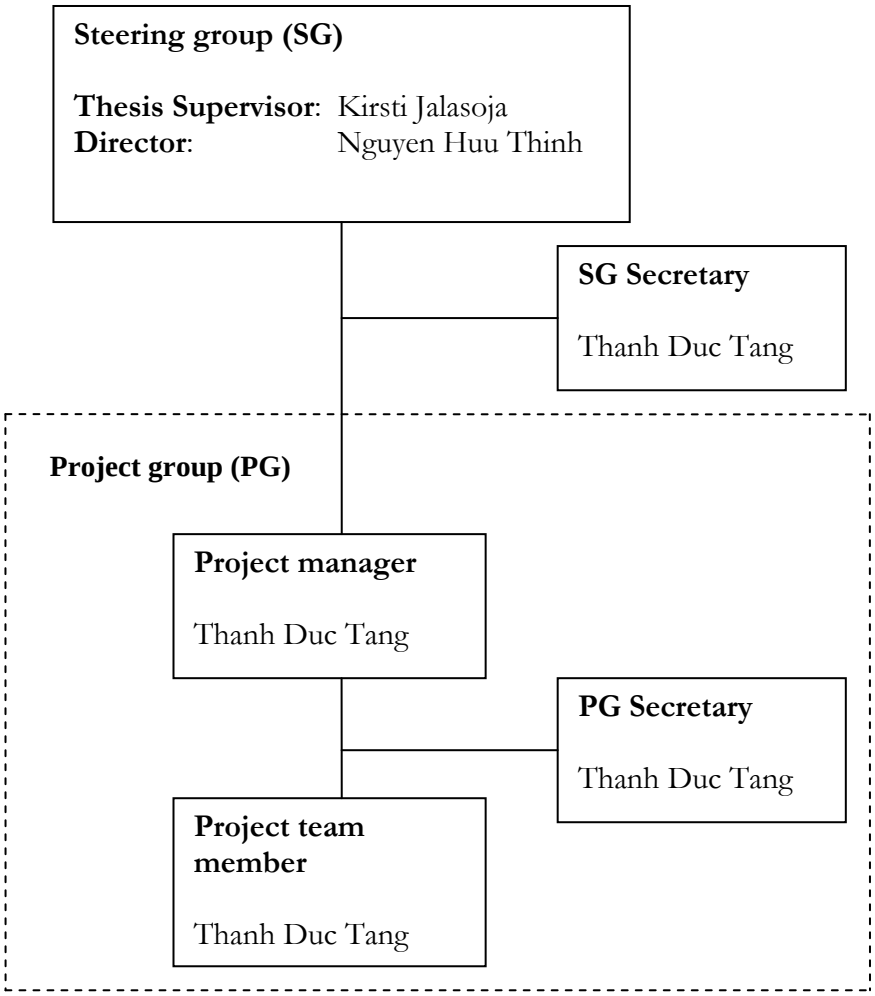

Figure 4.6: Project organization

4.7. Project ending

In order to assure the quality of the project, I had to validate the whole system and software requirements analysis documentation of the Sales Management System before giving to the developer Simeon Mushimiyimana. I was planned only 33 hours for this task, but my actual work hour excluding this task was 450 hours already on 13.01.2009. Finally, the steering group in the fourth steering meeting decided to give 60 hours extension for this task and 40 hours for this thesis report and final report. Finally, I have completed the validation for the system and software requirements documents on 31.01.2009 in 96 hours, not in 60 hours as the steering group decision. The reason was the same that the work load was so big. It really took time to validate to have a good quality. Anyway, the whole system requirements document and three sub-system software requirements document have completed for Tin Phong Co., Ltd. The outcomes are described in the next chapter.

Before the final steering group meeting, I had to make a final report for reporting the results of this project, the project process, the usage of resources, learning experience from this project, and the further suggestion for this project.

The final steering group meeting was held on 10.02.2009 for going through the system requirements document (appendix 2), the software requirements document (appendix 3), and the final report (appendix 4). After two documents and the final report were accepted and the whole project result was accepted too, this project ended at that moment. The final minutes of meeting would be delivered to all members in this project. The necessary deliverables were sent to my Thesis Supervisor, the Director of Tin Phong Trading Co. Ltd., Haaga-Helia Pasila Library, and the developer Simeon Mushimiyimana.

5. Results achieved

This chapter is describe the concrete result of this project achieved based on the requirements of the company. The result of this project is a documentation including feasibility study (appendix 1), system requirements document (appendix 2), and software requirements document (appendix 3).

5.1. Feasibility study

The feasibility study was completely done based on the requirements of the company and my previous business experience in this field, with the result hereunder:

- Background and requirements of the Sales Management System
- A vision of the Sales Management System architecture.

5.2. System requirements document

The result of the system requirements analysis is a complete system requirements document which covers all requirements analysis of the Sales Management System. During my analysis in this phase, I had always checked whether what I was doing was matched with the previous task and the requirements of the company or not.

Sometimes, some mistakes were found during analysis, it really took time for those unexpected correction. However, I could finally finish the system requirements analysis as company's requirements to the document with the result hereunder:

- Overview of the Sales Management System (*Context diagram, external agent description*)
- State business model of the Sales Management Process (*A business process model: business process diagram and descriptions*)
- Data model (*State diagrams of business entities*)
- The state of the application software (*Preliminary use cases and business classes of the application software. Data processing business rules. Use of data and traceability matrix. Architecture requirements. Security requirements for business*)
- Validation (*Test plan and test cases*)

5.3. Software requirements document

The result of the software requirements analysis is the software requirements document which only covers the analysis for three sub systems: Record product, Record potential customer, and Handle contract sale. The main reason of the uncompleted all sub systems in the Sales Management System was the time limit for this project. However, the most complicated case Handle contract sale, and two other cases: Record product and Record potential customer, to support the Handle contract sale case were done in this project. The final result of the software requirements document of Contract sale sub system of the Sales Management System is listed hereunder:

- Overview of the Sales Management System
- Use case model of the Contract Sale Sub System of the Sales Management System (*Top level use case model: use case map, actors and descriptions. Use case diagrams and descriptions. Data processing business rules*)
- Business class model (*with entities, attributes, relationships, and operations. Final state diagrams: states, transitions, events and actions*)
- User interface model (*Preliminary user interface model: screen and screen structure*)
- Validation (*Test plan and test cases*)

In general, the feasibility study is done in 100%, system requirements analysis in 100%, and software requirements analysis in 40%. So, the concrete result of the whole project totally achieves about 80%, but the time consumption for it was much more than in my plan. Totally I had spent 608 hours in 19 weeks on this thesis project that means 150% comparing with my original plan (406 hours), and 133% comparing with my re-plan (458 hours) (appendix 5). However, this result was accepted by the steering group, because the time was limited and the project was free of charge.

All documents format of this thesis project were followed the Requirements Engineering course by Kristi Jalasoja under the agreement of the steering group. The following three main parts mentioned-above as the appendices in this Thesis report has been done:

- Feasibility study (14 pages)
- System requirements document (139 pages)
- System requirements document (191 pages)

Besides, all processes and documentation of this thesis were followed to Haaga-Helia Bachelor's Thesis process guideline. The administration folder including the following details has been done:

- Project plan (21 pages)
- Final report (6 pages)
- The agendas and minutes of the steering group meetings (5 pages)
- Progress reports (14 pages)
- Minutes of the project meetings (15 pages)
- Follow-up work hours and Project schedule (3 page)
- Correspondence (1 pages)

The administration folder and this thesis report were sent to my Thesis Supervisor and Haaga-Helia Pasila Library. The feasibility study, system requirements document and software requirements document were sent to the Director of Tin Phong Trading Co. Ltd., and the developer Simeon Mushimiyimana.

6. Steering group decision

6.1. Project objectives and results

This thesis project has achieved all main objectives as plan even it has completed about 80% according to the requirements of the company. The remnant cases are the same as the complete one. It needs more time to finish all cases.

The results of this thesis project are shown in documentation type in the appendices 1, 2, 3, the other final report at the appendix 4. The steering group has accepted the all results of this project. Tin Phong Trading Co., Ltd. hopes that it is ideal if I could continue completing the remnant use cases in the software requirements analysis after I have done my thesis.

6.2. System requirements analysis

The step of "technical architecture requirements" was suggested to leave out in the second steering group meeting on 13.11.2008, because the technical architecture requirements were not required at that moment according to the business case, only the architecture requirements should be analyzed.

6.3. Software requirements analysis

According to the decision of steering group in the third steering group meeting on 11.12.2008, the Record product, Record potential customer, and Handle contract sale use cases should be analysed first. If time was allowed, I could continue the Handle wholesale, Handle retail, Handle returned product, Record feedback, and Browse report. Otherwise, the rest of the project would be continued by myself after this thesis report. Further more, the step "Data transfer requirements to external system" should be changed into "Data access for Handle contract sale". That means a sequence diagram for Handle contract sale should be the outcome of this step, but later this step was left out by the decision of the steering group in the fourth steering meeting on 14.01.2009 because of time limit.

On the other hand, the steering group also decided in fourth steering group meeting that this project should not be continued or enlarged the work load. It should be concluded at the present state with three sub systems: Record Product, Record Potential Customer, and Handle Contract Sale.

7. Conclusion

The main and most difficult part Handle contract sale in software requirements analysis has been done. Only the Handle wholesale, Handle retail, Handle returned product, Record feedback, Browse report are uncompleted in this project. It sounds very much, but the Handle wholesale, Handle retail, and Handle returned product parts are simpler than Handle contract sale according the requirements of the company, and the logic of those parts is nearly the same. The Record feedback is the simplest part according the business requirements and system analysis case. So, only the Browse report part may take time. In my opinion, it is good if the requirements analysis for those parts can be completed later for a developer to complete the whole software as Tin Phong Trading Co., Ltd. required. I am sure I will complete them when I could, because the requirements analysis need to do the real work for learning.

Later, the developer, Simeon Mushimiyimana, will base on the result of this project to design database and implement the application software. After his work is done, I think it is good to test for checking whether the software application matches the requirements analysis, also the company requirements or not. Otherwise, it just wastes the time to implement.

However, "Requirements analysis" is the foundation of the software system as same as the foundation of the building. If this foundation has not been built well enough, it will create a bad quality software system. Once we would like to make change of the software system, it costs very big resources. Therefore, this project is mortal part of the software system. It decides whether it could help the company to solve the sales management problems or not. Hopefully, after the Contract sale sub system applies in use at the Sales Department of the company in summer 2009, this project will be realized how important and helpful to the sales management process of Tin Phong Trading Co., Ltd. It will turn a new chapter for the company to have more effective work process in sales management as well as in the company's business.

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Sales Management System
Case study: Tin Phong Trading Co., Ltd.

Thanh Duc Tang

Feasibility report

Business Information Technology

13.11.2008

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1 Background and requirements of the Sales Management System

1.1 The company

Tin Phong Trading Co., Ltd. is a motorcycle spare-part trading company located in Ho Chi Minh city, Vietnam.

1.2 Business ideas and goals

The business idea of the company is to supply different kinds of motorcycle spare parts imported from abroad or from the manufacturers in Vietnam to the middle man, motorcycle workshop or the motorcycle spare-part stores in retail or wholesale scale.

The requirements of the market have been changed quite often because of many reasons, such as the unstable resources of products, the out-of-date model of the motorcycle, and so on. That makes the selection of products change quite often as well. However, there are about 2.000 products in selection usually. The most popular product groups are brake shoes, bolt, spring, head light cover, rear light cover, signal light cover, bearing, piston, gas filter, kick starter arm, corn, relay, IC, cushion.

1.3 Office and organization

Tin Phong Trading Ltd., Co. has an office and two warehouses. The office includes Accounting Department and Sales Department. Two warehouses are considered as Warehouse Department.

All the main sales activities happen in the Sales Department. The Customers can come over to see the product samples or the salesmen promote the products the Customers through the Sales Department.

1.4 The present state of business process and data process task and the present state information

1.4.1 The main actor

Sales Department is place where all the sales activity of the company takes place, such as Customer orders product, signs contract, picks up quotation list, makes payment, gives feedback, returns product, and so on.

There are Sales Assistant and salesmen in this department. The Sales Assistant is the main person who deals with the sales process in this department. Because of the scale of the company, the director and the Accountant also takes part of this sales management process.

1.4.2 The main external agents

Accounting Department is a place where keeps, inspects, and audits financial record of the company.

Accounting Department is the external agent of the sales management process and internal agent of the company.

Customer may be a person, a workshop or a store that buys products at the company.

Customer is an external agent of Tin Phong Trading Ltd., Co.

A warehouse is a place where storages the company's products. Each ware house has its own stock. There is one Warehouse Keeper in each warehouse.

The warehouse is external agent of the sales management process and internal agent of the company.

A supplier is a manufacturer or an exporter who supplies products to the company.

The supplier is an external agent of the company.

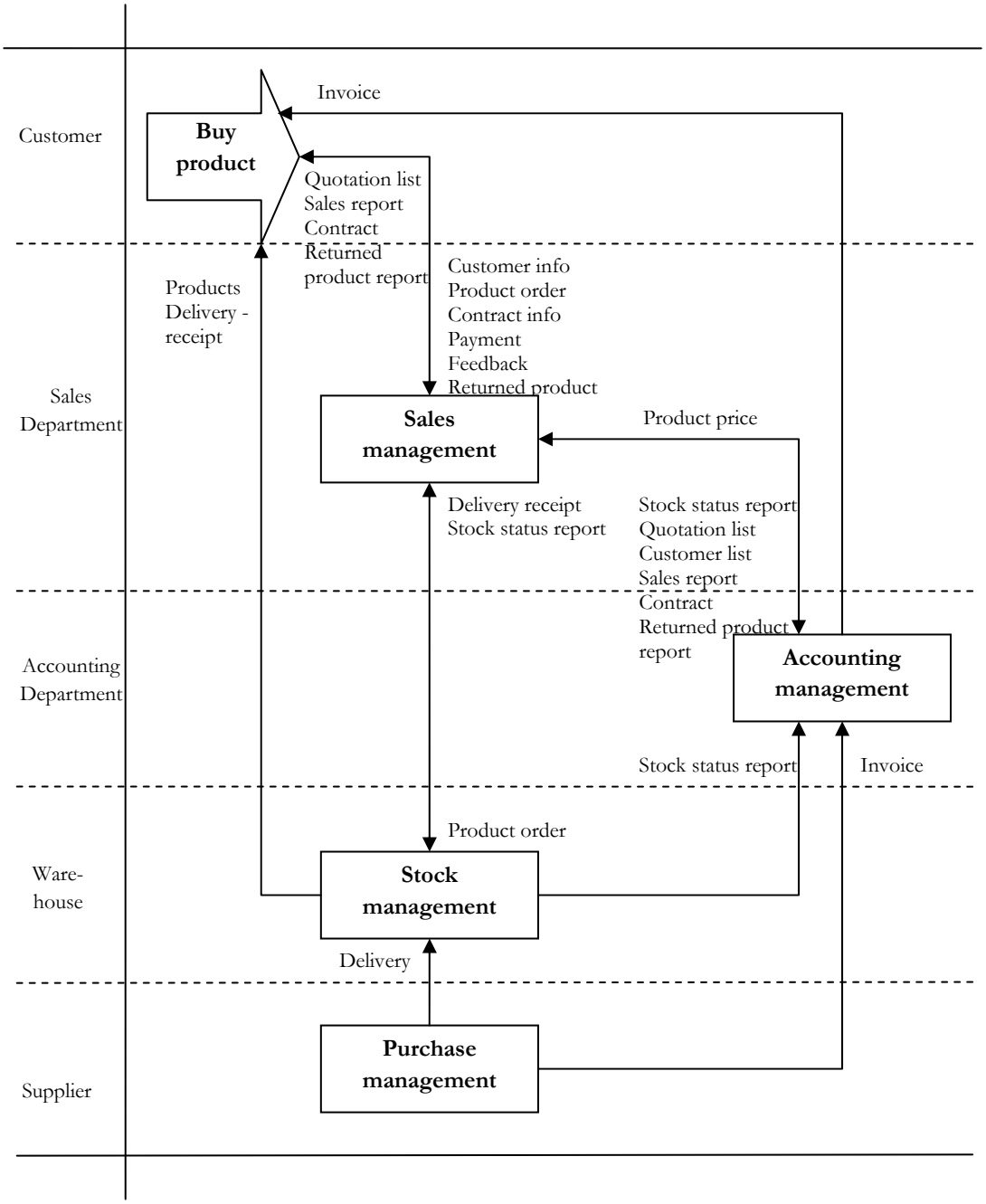

Figure 1.4: Sales management progress diagram

1.4.3 The sales management process description

In the sales management process, a Sale Assistant or Salesmen

- Records potential customer information.
- Manages a product order from the Customer
- Records contract information from Customer
- Receives payment from Customer.
- Receive feedback from the Customer.
- Handles the returned product from Customer.
- Gives stock status report to Accounting Department.
- Gives quotation list to Customer and Accounting Department.
- Gives Customer list to Accounting Department.
- Gives sales reports to Customer and Accounting Department.
- Gives contract to Customer and Accounting Department.
- Gives returned product report the Customer and Accounting Department.
- Receives stock status report from warehouse.
- Gets delivery receipt from Warehouse Keeper.
- Orders products to warehouse.
- Receives product price from Accounting Department.

Records potential customer information

When the Salesmen promote the products to the Customers, they will send some samples or quotation list to the Customers. The new Customers also come over to the company to buy products sometimes. At that moment, the Salesman in the Sales Department will write down the potential Customer information to the Sale Assistant follow the business.

Manages a product order from the Customer

When a Customer wants to buy products at the company, s/he makes an order by phone or comes directly to the Sales Department of the company. The Salesmen also come over to the Customer's place to get a buy order from the Customers. That means the Salesmen also makes a product order through the phone from the Customers' place to the Sale Assistant.

Records contract information from Customer

When the Customer would like to buy big amount quantities of products from the company or to monopolize a certain product, the Customer will negotiate the product price, payment, delivery, and other terms and conditions with the company to have final contract information. The Sales Assistant will base on the negotiated contract information to make a contract. The benefits of signing a contract are that the Customer can get a monopolized product in the market with special price; the company can receive payment from the Customer and deliver the contract quantity to him/her within a certain period.

Receives payment from Customer

The Customer seldom pays the total amount in his/her total buy amount. S/he only pays part of the total amount. The Salesman has to follow the Customer's payment from retail, wholesale, to contract sale. Sometimes the Customer just pays the debt without any buy. With the long-term Customer, s/he even buys product without any payment. S/he only signs on the delivery receipt as debt evidence after receiving products.

The terms of payment are discussed between the Salesman and the Customer. With the Customers located in Ho Chi Minh City, they pay every week. With the one located far from Ho Chi Minh City, they pay once a month. In general, the Customers will pay all their debt at the end of Chinese New Year except the buy with contract.

Receive feedback from the Customer

The Customer may contact the Salesman by phone or directly. The feedback of the Customer is handled either in the office or in Customer's place.

There is a note book to keep the feedback of the Customers.

Handles the returned product from Customer

The Customer may return the product with bad quality. The time limit for the return product depends on different situations, such as the returned product still exists in the market but may not exist at the company. The Customer usually would like use the returned product sum to cover his/her current debt than to get a new product.

Gives stock status report to Accounting Department

The Accountant needs a stock status report for checking whether the input and output are matched between the Sales Department, Warehouse, and his/her account record.

Gives quotation list to Customer and Accounting Department

Every time the new products have been imported to the company, the Salesmen will promote products information as a quotation list of product to the Customer at the company or to Customer's place. This quotation list usually is printed out in retail price for the Customer but also in wholesale price for the Salesmen. In case the Customer asks for the wholesale price, the Salesmen can follow the quotation list to quote to the Customer.

In order to follow the price easily, the Accountant in Accounting Department also needs a quotation list from the Sales Department.

Gives customer list to Accounting Department

After the customer information has been recorded, give it to the Accounting Department.

Gives sales reports to Customer and Accounting Department

The Salesmen have to send the daily sales reports, which show the daily delivery and payment of the Customers, to the Accounting Department. Sometimes the Customers also require having these sales reports in the certain period to check by him or herself whether they are correct or not.

There are three kinds of sales as following:

Retail: When a Customer buys a small quantity of a certain product.

Wholesale: When Customer buys a big quantity of a certain product. This wholesale quantity is usually defined by the company, or sometimes the Customer also gives suggestion. On the other hand, the product delivery time is in a very short period usually less than one week.

Contract sale: When a Customer buys a big quantity of a certain product in monopolization. The terms of delivery and payment for the product are signed in the contract. The contract price is the lowest price compared with retail and wholesale price. The delivery time is in long period usually more than one week.

Gives contract to Customer and Accounting Department

After the contract has been made, three copies will be made: first for Customer, second for Accounting Department and third for Sales Department itself.

Gives returned product report the Customer and Accounting Department

The returned product reflects the quality of the product and influent to the long-term business relationship. On the other hands, the value of the returned product is considered as payment and the debt of the customer will be reduced. The Account needs the returned product report to follow the payment in the account. The customer sometimes requires the returned product report as well.

Receives stock status from warehouse

The Warehouse Keepers have to send a stock status report to the Sales Department and the Accounting Department when the products are inputted into warehouse. The purpose of this process is to let the Salesmen and the Accountant know whether the imported quantity in reality is matched the one on paper. The exact quantity is very important to the Salesmen when they promote the product to the wholesale or contract sale Customers.

Gets a delivery receipt from Warehouse Keeper

The Customer will sign on the delivery receipt after receiving the products. The Salesman will get the signed delivery receipt from Warehouse Keepers after the product has been delivered.

The delivery receipt is made in three copies: first for Customer, second for Salesman, third for Warehouse Keeper him-/herself.

Orders products to warehouse

When a Salesman or sales assistant has got an order from the Customer, the Salesman calls to the Warehouse Keeper to prepare the required products to deliver to the Customer with a delivery receipt. The Salesman or Sale Assistant should know which product is located in which warehouse.

Receives product price from Accounting Department

After calculating the all costs of the product, the Accountant will provide a product price list to the Sale Assistant. If there is any change of prices, the Direct will inform the Accountant first. After then, the Accountant will inform to the Sales Department.

1.4.4 The accounting management process description

The accounting management process is the procedure for inspecting the delivery, payment and stock status, and managing invoice from supplier to Customer by an Accountant, who also takes care of giving the product price to the Sales Department.

The Accountant in Accounting Department will get the customer list, and sales report from the Sales Department. The invoice will be sent to the Customer after delivering the products. Besides, the Accountant can check the delivery in the sales report whether it matched the output record in the stock status report provided by the Warehouse Keeper.

The Accountant gets the stock status report from the Warehouse Keeper also to check whether the quantity on the invoice sent by the suppliers is matched the quantity imported in reality.

The Accountant also needs other reports and lists from the Sales Assistant to help the Accountant work process easier.

1.4.5 The stock management process description

The stock management process takes care of the product order from Salesman or Sale Assistant, product preparation and delivery with delivery receipt, product storing, and stock status.

After receiving the product order from the Salesman or Sale Assistant in the Sales Department, the Warehouse Keeper prepares the ordered product and three delivery receipts to the let the Customer sign on it, one for Customer, one for Sales Assistant, and one for the Warehouse Keeper him-/herself.

The delivery may be a Salesman or a delivery worker in the warehouse. However, the Salesman will get the signed delivery receipt after delivering the products to the Customer.

Every time the products have been inputted into the warehouse, the Warehouse Keepers will make three stock status reports, one for Sales Department, one for to Accounting Department, and one for Warehouse Keeper him-/herself. Besides, the Warehouse Keeper also has to send a stock status report to the Accounting Department once a week to check if the stock status in warehouse is matched the one in accounting system.

1.4.6 The purchasing management process description

The purchasing management process takes care of purchase product delivery to warehouse and sending invoice to the Accounting Department. This procedure takes care by a Supplier which does not concern to this project at the moment.

1.5 Present state IT-solutions

At the moment, only the Accounting System of the company exists to manage book keeping, balance sheet and so on of the company. The Accounting System is not described in detail in this feasibility report because of the inconvenience of the distant communication.

1.6 Problems and development needs

It takes time to search the sales information, such as which price in which sales for which Customer. Sometimes, the company has even got incorrect information of the sales from papers or the MS excel file. It is very hard to follow the buy sum, payment and debt of a Customer at a certain period.

Accounting System of the company has already existed, but it does not need to integrate with this Sales Management System at the moment because of the working procedure of the company. However, the result of this Sales Management System is still required for inputting

manually the Customer's payment status and the delivered quantity of product to the Accounting System.

Because of the time limit, the Warehouse System and Purchasing System are not included in this project. They would be developed after this system in use.

1.7 Business and IT objectives for changes and security objectives

1.7.1 Business objectives

Information about all Customers is collected and maintained using a new Sales Management System. Based on this information, the Director can easily contact with the Customer directly.

Information about all delivery products with sell price is collected. Based on this information, the Director can see which product is more popular, which product has good profit, and which product should import continuously. Besides, the Director also can check the buy of the Customers to decide the gift in every festival.

Information about the returned products and feedback is collected for checking the product quality of the manufacturers.

Information about delivery and payment are needed for accounting system. Based on this information, the Accountant can inspect or audit the company's financial record. On the other hand, the director can check how big the debt of the Customer is or how often the Customer receives the delivery or makes payment.

Information about the contract is needed for the Director to let the Salesman to follow the delivery and the payment of the Customer.

1.7.2 Data processing needs

Creation:

- Add a new product and the product retail price, wholesale-price with wholesale quantity, contract price.
- Add product input quantity to warehouse.
- Add a new potential customer.

- Add delivery and payment detail. Unit price depends on the quantity. Unit price can only be changed by the Sale Assistant. Pre-payment is inputted by Sales Assistant. It is possible to add payment only without any delivery to the system and show the previous debt.
- Add contract sale to follow delivery of every item and the payment for the contract.

Report:

- A report of product list with stock status.
- A report of product list with retail price.
- A report of product list with wholesale price and wholesale quantity.
- A report of customer list in detail information.
- A report of customer list sorted by district.
- A report of delivery list in detail information in a certain period for one customer.
- A report of payment list in detail information in a certain period for one customer.
- A report of customer list with buy sum, payment sum and current debt in a certain period.
- A report of one sold product with different customers' names and prices.
- A report of returned product list with customers' name and returned product price.

1.7.3 Automation objectives

The new sales management system must be easy to search and check the information that the user need. The user interface should be professional and easy to understand for the user.

1.7.4 Security objectives

Only the Director, Accountant or Sale Assistant can change the prices in the system.

For the report, the Salesman only can read and print the list of product price and customer list only.

The sales activity must be able to be collected during the system failure, and able to be entered into the system later.

2 A vision of the Sales Management System architecture

Description

Accounting Department

The Accountant records to the accounting system about the customer information based on the customer list, the sales information based on the sales reports given by the Sales Assistant, and the returned product information based on the returned product report for inspecting or auditing the financial record. S/he needs the quotation list and contract to check the product price whether they are correct or not.

The Accountant checks the stock status report sent by the Warehouse Keeper whether the stock in warehouse is matched the one from the Sale Assistant and the accounting system.

The Accountant takes care of sending invoice to the Customer. The invoice information is based on the sales report given by the Sales Assistant or Salesmen.

The Accountant provides the product price to the Sales Assistant to record or update.

Customer

Usually provides his/her personal information to the company. S/he orders products by phone or coming directly to the company. If the Customer would like to monopolize a certain product or buys in a big quantity, s/he has to sign a contract with the company represented by a Salesman or Director. Sometimes the Customer only makes a payment without any product order. The Customer also gives feedback, returns product (See detail 1.4.3 mentioned above).

The Customer will get the quotation list, sales report, returned product report, and contract from the Salesman through the Sales Assistant.

Sales management system

Receives stock status, product price, customer information, contract sale, wholesale, retail, delivery, payment, feedback, and returned product data from the Sales Assistant workstation.

Sales Management System sends information about customer list, quotation list, stock status, sales report (including contract sale, wholesale, and retail), contract, and returned product reports from the Sales Assistant workstation to the Accountant, and to the Customer only quotation list, sales report, contract, and returned product report.

Sales Assistant

The Sales Assistant Records stock status, product price, customer information, contract information, contract sale, wholesale, retail, delivery, payment, feedback, and returned product data to the Sales Management System through the workstation. The Sales Assistant browses and views all lists and report provided by the sales management system through the work station. When the Salesman has got the product order from the Customer, he usually writes down and calls directly to the Warehouse Keeper to prepare the product.

Warehouse Keeper

The Warehouse keeper prepares the products to the Customer according the product order from the Sales Assistant by phone. The Warehouse Keeper makes delivery receipt to Customer and Sales Assistant, and also does the stock status report in reality to the Accountant and Sales Assistant.

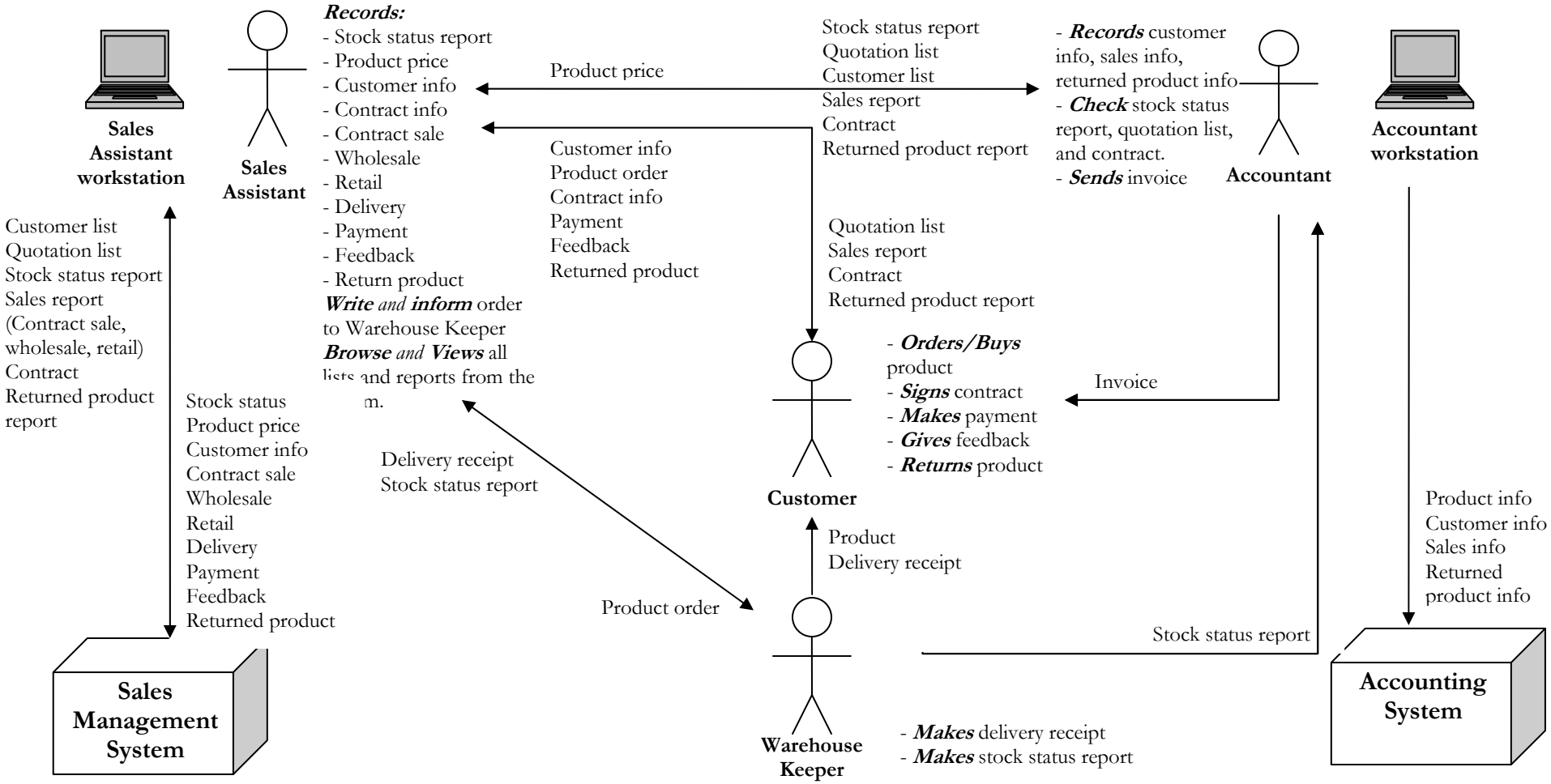

Figure 2: The state of the Sales Management System architecture

Sales Management System
Case study: Tin Phong Trading Co., Ltd.
System Requirements Document

Thanh Duc Tang
Haaga-Helia
Business Information Technology

Version	1.0	
Created by	Thanh Duc Tang	05.02.2009
Review by	Steering group meeting	10.02.2009
Approved by	Steering group meeting	10.02.2009

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1.2.2. Description of the external agent: Customer

1.2.3. Description of the external agent: Warehouse Keeper

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1. Overview of the Sales Management System

1.1 Model of the Sales Management System

Environment of the Sales Management System

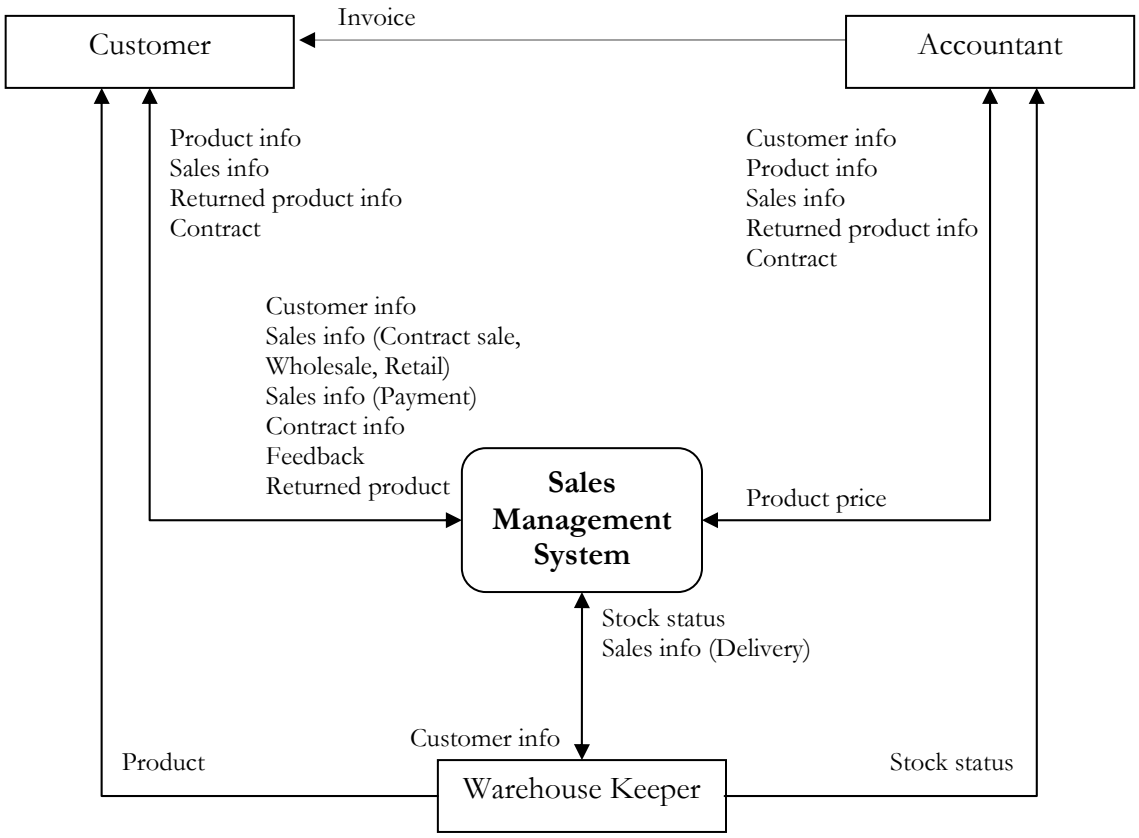


Figure 1.1: The state context diagram of the Sales Management System

Description of the model of Sales Management System

The product information includes the stock status and product prices. The stock status is recorded into the Sales Management System through the reports provided by the Warehouse Keeper after the products are inputted to the company's warehouse (also known as stock). The Warehouse Keeper also has to provide one copy of stock status report to the Accountant to check whether the stock status record is matched the record given from the Sales Management System later on. The product prices are recorded into the Sales Management System through the price lists provided by the Accountant. After then, the product information including stock status and product prices should provide to the Accountant as a check list and only to the Customer as a quotation list in which there is no stock status.

Before the customer makes his or her first buy from the company, the personal information given by a potential customer (also known as customer information) is recorded into the Sales Management System. After then, this customer information should provide to the Accountant and Warehouse Keeper to update the information to their record.

Sales information, which is divided in three types of sales: retail, wholesale, and contract sale, should be recorded into the Sales Management System when the customer buys the products at the company. For every type of sales, there are delivery and payment records. The payment made by the Customer is also recorded into the Sales Management System. The delivery is recorded into the Sales Management System through the delivery receipts provided by the Warehouse Keeper after the product is delivered from warehouse to customer's place.

For contract sale, when the customer is interested in buying a certain product in large quantity or wants to monopolize the product, s/he has to sign a contract with the company by providing the negotiated terms and conditions of the contract (contract information) to the Sales Assistant to record into the Sales Management System and make a contract. After the contract has been made, the Sales Assistant will print the contract from the Sales Management System to the Customer and Accountant.

The Accountant needs the sales information from the Sales Management System to inspect the financial record of the company and create an invoice to the customer. The Customer also needs the sales information to check his/her payment and delivery list sometimes.

The feedback and returned product given by the Customer are also recorded into the Sales Management System. The sum of the returned product will cover the current debt of the Customer. Exchanging the returned product is excluded in this solution. The Accountant needs the returned product information to inspect the financial record. The Customer sometimes also requires the returned product information.

The product is sent directly to the Customer from Warehouse Keeper.

1.2 Description of the external agents

1.2.1 Description of external agent: Accountant

Table 1.2.1: The description of external agent: Accountant

External agent	Description	
Accountant	Accountant is a person who keeps, inspects, and audits the financial record of the company.	
Events and responses	**Data flows into the system**	**Data flows out of the system**
Ac01 When the Accountant gives product price which includes retail price, wholesale price and wholesale quantity, and contract price to Sales Assistant to record into the Sales Management System manually.	product price	
Ac02 In case that the product has already existed in the system, the Sales Assistant updates the prices based on the existed product in the system	product price	product info
Ac03 After the contract sale has been signed, the contract sale is in progress. The Accountant needs a copy of contract sale to follow the progress.		contract
Ac04 When the Accountant needs a quotation list to check whether the record in the system is correct or not.		product info

Table 1.2.1: The description of external agent: Accountant (continue)

Events and responses	Data flows into the system	Data flows out of the system
Ac05 The Accountant needs the stock status report to check whether the record in the system is matched the Warehouse Keeper's stock status report.		product info
Ac06 When the company has a new customer, the Accountant needs the customer information		customer info
Ac07 When the Accountant needs a sales report to follow the payment record in the system whether it matches the account record.		sales info
Ac08 The Account needs the returned product report to follow the payment in the account.		returned product

1.2.2 Description of external agent: Customer

Table 1.2.2: The description of external agent: Customer

External agent	Description	
Customer	Customer is a person, or a workshop, or a store that buys the products of the company.	
Events and responses	**Data flows into the system**	**Data flows out of the system**
Cu01 When the salesmen offer the products to a new customer, they will send some product samples and quotation list to the customer, or a customer comes over to the company to get information about the products, the information of the potential customer may be recorded	customer info	
Cu02 When the customer would like to buy big amount quantities of products from the company, the customer will negotiate the product price, payment, delivery, and other terms and conditions with the company to have final contract information.	contract sale	product info customer info
Cu03 The customer will get and sign a contract sale with the company		contract

Table 1.2.2: The description of external agent: Customer (continue1)

Events and responses	Data flows into the system	Data flows out of the system
Cu04 When the customer makes payment for contract sale.	payment	contract sale info customer info
Cu05 When the customer would like to buy a product over the minimum wholesale quantity assigned by the company, the customer will get the product at wholesale price from the company.	wholesale	product info customer info
Cu06 When the customer makes payment for wholesale	payment	wholesale info customer info
Cu07 When the customer would like to buy a product in small quantity or less than the minimum wholesale quantity assigned by the company, the customer will get the product at retail price from the company.	retail	product info customer info
Cu08 When the customer makes payment for retail	payment	retail info customer info

Table 1.2.2: The description of external agent: Customer (continue2)

Events and responses	Data flows into the system	Data flows out of the system
Cu09 When customer returns a product to the company either from contract sale, wholesale, or retail, the quantity of the returned product will be recorded into the Sales Management System, at the same time the value of the returned product is considered as a payment from the Customer.	returned product payment	customer info product info sales info
Cu10 When customer gives feedback to the company about the product.	feedback	customer info
Cu011 When the customer requires a product information as a quotation list; Or the salesmen promote the products to the customer.		product info
Cu12 When the customer requires his/her buy detail in a certain period.		sales info
Cu13 The customer sometimes requires the returned product report		returned product

1.2.3 Description of external agent: Warehouse Keeper

Table 1.2.3: The description of external agent: Warehouse Keeper

External agent	Description	
Warehouse Keeper	Warehouse Keeper is a person who prepares and keeps record of the input or output of the stock in the warehouse of the company.	
Events and responses	**Data flows into the system**	**Data flows out of the system**
Wa01 When the company imports the products from the suppliers, the Warehouse Keeper re-checks the quantity and makes a stock status report.	stock status	
Wa02 When the product has already existed in the system, the Sales Assistant updates the quantity based on the existed product in the system	stock status	product info
Wa03 After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for contract sale	delivery	contract info product info customer info

Table 1.2.3: The description of external agent: Warehouse Keeper (continue 1)

Events and responses	Data flows into the system	Data flows out of the system
Wa04 After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for wholesale	delivery	wholesale info product info customer info
Wa05 After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for retail	delivery	retail info product info customer info

2. State business models of the Sales Management Process

The purpose of the business model of the Sales Management Process is to describe the state of the main business process.

From each process, there are descriptions of activities, data and material flows between activities, the data processing tasks and use of the target Sales Management System.

The main processes in the Sales Management are:

1. Record product
2. Record potential customer
3. Handle contract sale
4. Handle wholesale
5. Handle retail
6. Record returned product
7. Record feedback
8. Browse report

The state business model of the application domain of the Sales Management System is described using business process diagram.

The business process diagrams and descriptions are hereunder:

2.1. Sales Management process

The following diagram shows the state model of the Sales Management process, but only the main context:

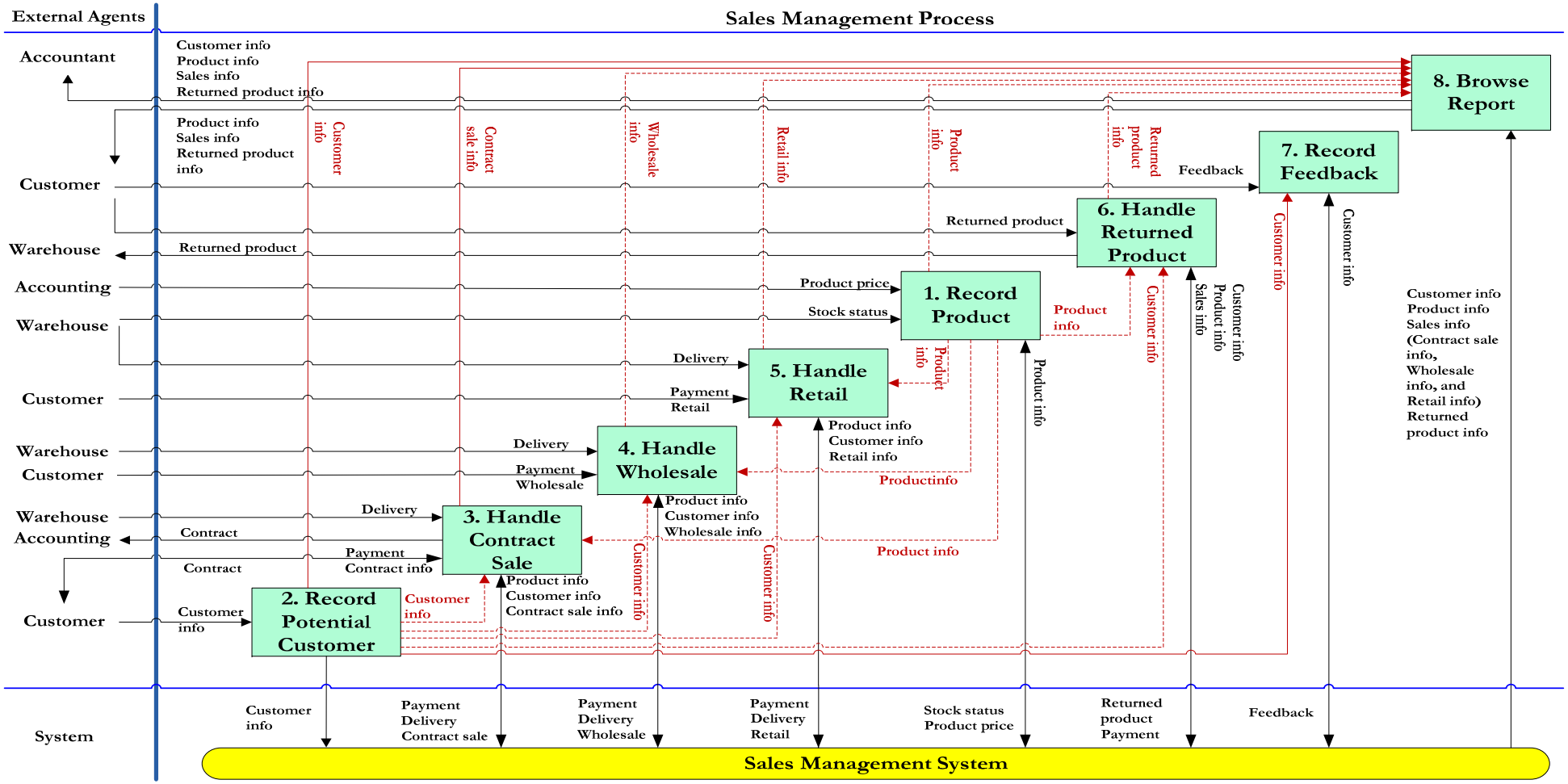


Figure 2.1: The state of the Sales Management Process

The process description of Sales Management Process is as follows:

Table 2.1: The state process description of the Sales Management Process

Process name
Sales Management

Activators
1. Record product 2. Record potential customer 3. Handle contract sale 4. Handle wholesale 5. Handle retail 6. Record returned product 7. Record feedback 8. Browse report

Outcomes
Customer info, product info, sales info, returned product, contract

Process/Activities
1. Record product When the company imports the products from the suppliers, the Warehouse Keeper re-checks the quantity, makes a stock status report (Wa01) and gives it to the Sales Assistant to record the correct quantity into the Sales Management System. When the product has already existed in the system, the Sales Assistant updates the quantity based on the existed product in the system (Wa02). When the Accountant gives product price which includes retail price, wholesale price and wholesale quantity, and contract price to Sales Assistant to record into the Sales Management System manually (Ac01).

Table 2.1: The state process description of the Sales Management Process (continue 1)

Process/Activities
Usually, the contract price is recorded when a contract is going to be signed. The contract price is negotiated between the Customer and the Salesman or Director of the company. The result of price negotiation will be noticed to the Accountant. **2. Record potential customer** When the salesmen offer the products to a new customer, they will send some product samples and quotation list to the customer, or a customer comes over to the company to get information about the products, the information of the potential customer may be recorded (Cu01) into the Sales Management System. **3. Handle contract sale** When the customer would like to buy big amount quantities of products from the company, the customer will negotiate the product price, payment, delivery, and other terms and conditions with the company to have final contract information (Cu02) which will be stored in the Sales Management System. The customer will get and sign a contract sale with the company (Cu03). After the contract sale has been signed, the contract sale is in progress. The Accountant needs a copy of contract sale to follow the progress as well (Ac03). When the Warehouse Keeper outputs the products from warehouse to the customer, the Warehouse Keeper will make three copies of delivery receipts: the first one is saved by him-/herself, the second one for the Customer, the third one for the Sales Assistant. After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for contract sale (Wa03).

Table 2.1: The state process description of the Sales Management Process (continue 2)

Process/Activities
When the customer makes payment for contract sale (Cu04), the payment will be recorded into the Sales Management System. **4. Handle wholesale** When the customer would like to buy a product over the minimum wholesale quantity assigned by the company, the customer will get the product at wholesale price from the company (Cu05). The wholesale of the customer will be recorded into the Sales Management System. The delivery and the payment of the wholesale may be divided in many times. When the Warehouse Keeper outputs the products from warehouse to the customer, the Warehouse Keeper will make three copies of delivery receipts: the first one is saved by him-/herself, the second one for the Customer, the third one for the Sales Assistant. After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for wholesale (Wa04). When the customer makes payment for wholesale (Cu06), the payment will be recorded into the Sales Management System. **5. Handle retail** When the customer would like to buy a product in small quantity or less than the minimum wholesale quantity assigned by the company, the customer will get the product at retail price from the company (Cu07). The retail of the customer will be recorded into the Sales Management System.

Table 2.1: The state process description of the Sales Management Process (continue 3)

Process/Activities
The delivery usually happens in one time, but the payment of the retail may be divided in many times. When the Warehouse Keeper outputs the products from warehouse to the customer, the Warehouse Keeper will make three copies of delivery receipts: the first one is saved by him-/herself, the second one for the Customer, the third one for the Sales Assistant. After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for retail (Wa05). When the customer makes payment for retail (Cu08), the payment will be recorded into the Sales Management System. **6. Handle returned product** When a customer returns a product to the company either from contract sale, wholesale, or retail, the quantity of the returned product will be recorded into the Sales Management System, at the same time the value of the returned product is considered as a payment from the Customer (Cu09). The returned product price is based on the current retail, wholesale, or contract price based on the negotiation between the Salesman and the Customer. Sometimes, the contract sale is terminated, but the company still has to accept the returned product from the Customer.

Table 2.1: The state process description of the Sales Management Process (continue 4)

Process/Activities
7. Record feedback When customer gives feedback to the company about the products (Cu10), the feedback will be recorded into the Sales Management System based on the customer information. **8. Browsing report** When the customer requires product information as a quotation list; Or the salesmen promote the products to the customer (Cu11). The Accountant needs a quotation list to check whether the record in the system is correct or not (Ac04). The Accountant needs the stock status report to check whether the record in the system is matched the Warehouse Keeper's stock status report (Ac05). When the company has a new customer, the Accountant needs the customer information (Ac06) to update to her record. When the Accountant needs a sales report to follow the payment record in the system whether it matches the account record (Ac07). When the customer requires his/her buy detail in a certain period (Cu12). The returned product report is necessary in business, because the value of the returned product is considered as payment and the debt of the customer will be reduced. The Account needs the returned product report to follow the payment in the account (Ac08). The customer sometimes requires the returned product report (Cu13).

2.2. Record product process

The following diagram shows the state model of the 1. Record Product process:

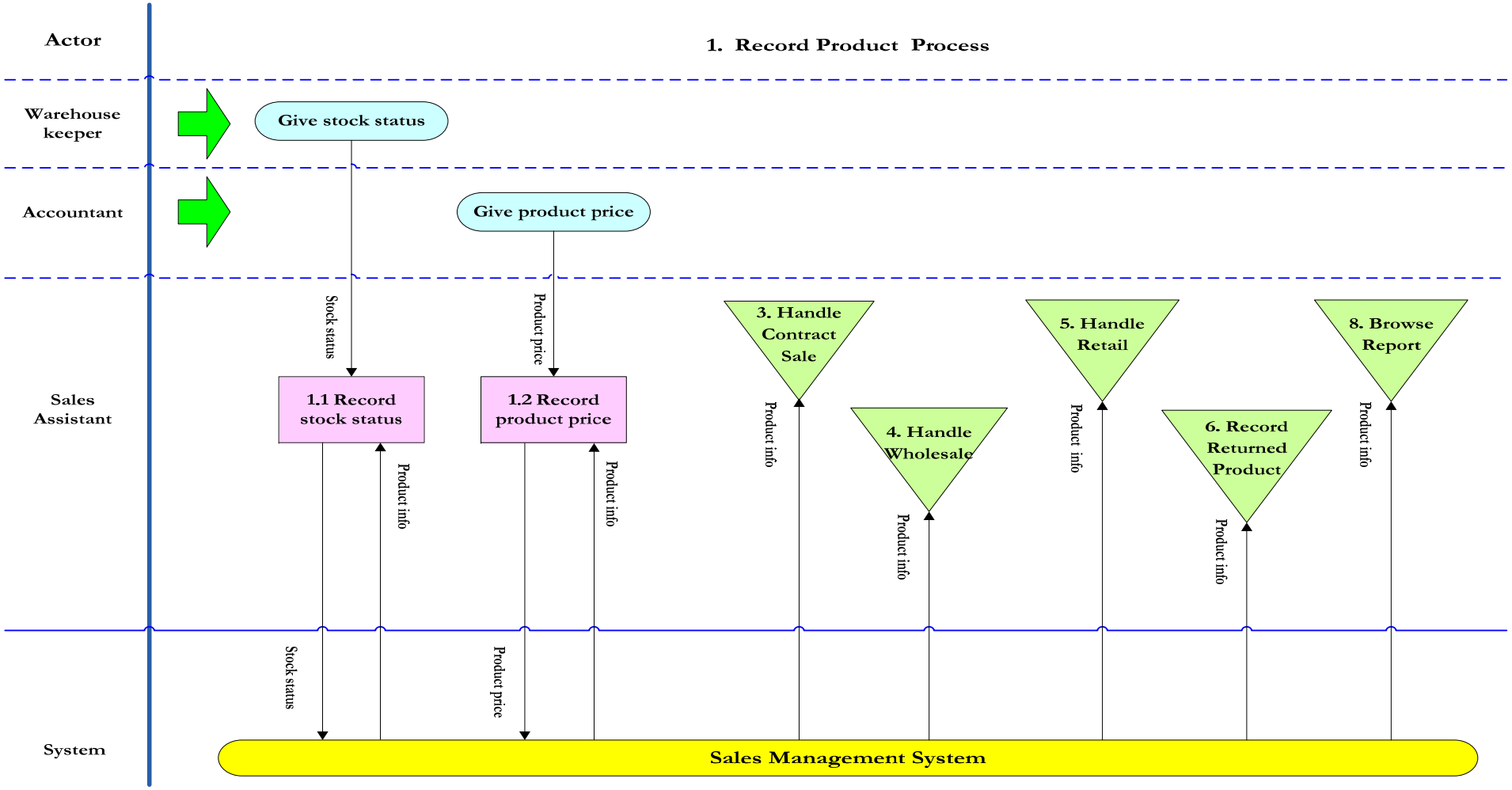


Figure 2.2: The state of the Record Product Process

The process description of the Record Product Process is as follows:

Table 2.2: The state process description of the Record Product Process

Process name
Record Product

Owner of the process
Sales Assistant

Activators
- The Warehouse Keeper gives the stock status report. - The Accountant gives the product prices.

Outcomes
- Product information as price list (quotation list). - Product information as a stock status report.

Process/Activities
1.1. Record stock status ***Give stock status*** When the company imports the products from the suppliers, the Warehouse Keeper re-checks the quantity, makes a stock status report (Wa01) and gives it to the Sales Assistant to record the correct quantity into the Sales Management System. When the product has already existed in the system, the Sales Assistant updates the quantity based on the existed product in the system (Wa02). Sales Assistant's data processing task: Record product stock status.

Table 2.2: The state process description of the Recording Product Process (continue)

Process/Activities
1.2. Record product price ***Give product price*** When the Accountant gives product price which includes retail price, wholesale price and wholesale quantity, and contract price to Sales Assistant to record into the Sales Management System manually (Ac01). In case that the product has already existed in the system, the Sales Assistant updates the prices based on the existed product in the system (Ac02). Sales Assistant's data processing task: Record product price including the retail, wholesale price, wholesale quantity, and contract price if any.

2.3. Record potential customer process

The following diagram shows the state model of the 2. Record Potential Customer process:

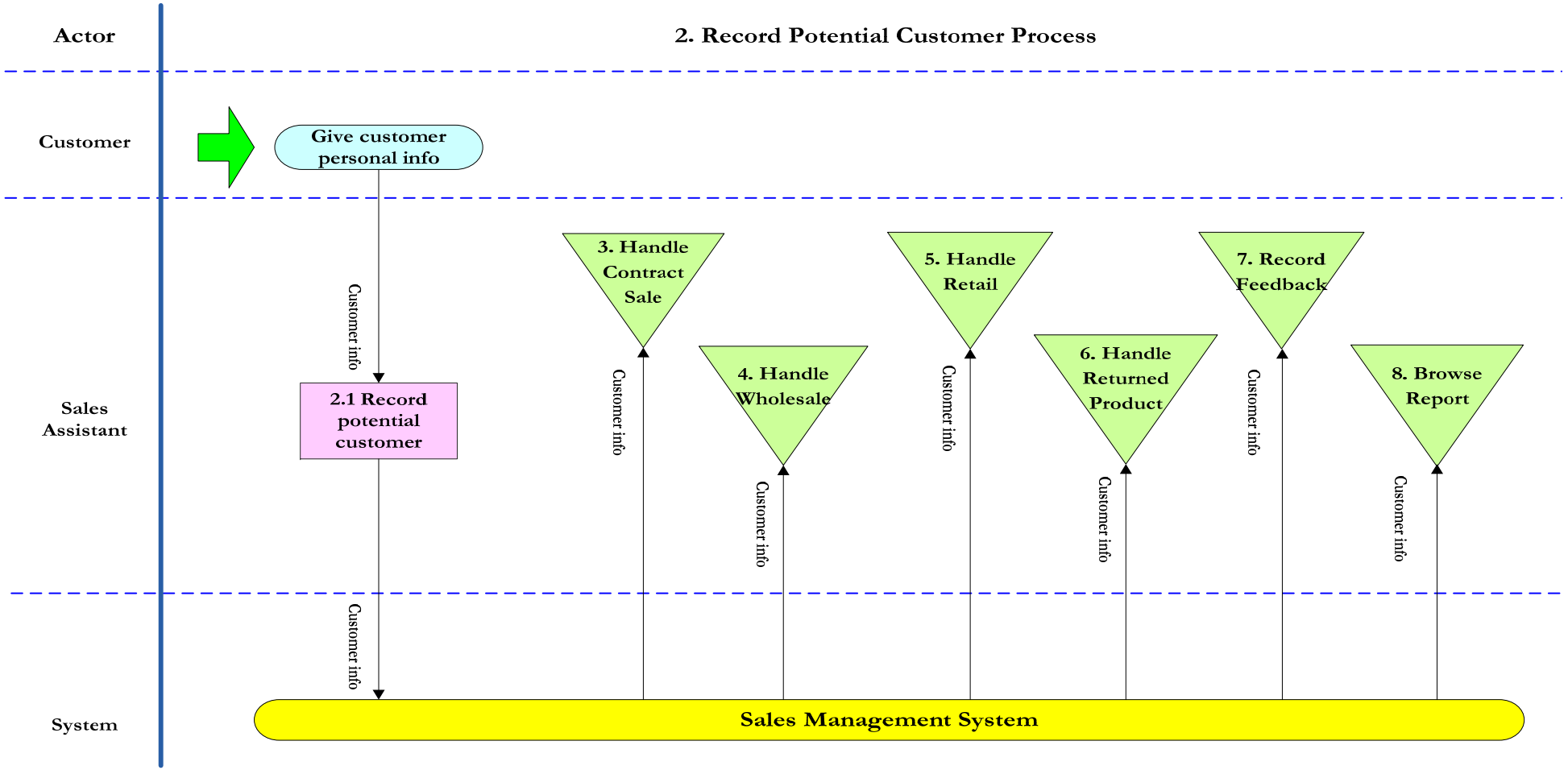


Figure 2.3: The state of the Record Potential Customer Process

The process description of the Record Potential Customer Process is as follows:

Table 2.3: The state process description of the Record Potential Customer Process

Process name
Record Potential Customer

Owner of the process
Sales Assistant

Activators
- The customer gives the customer personal information.

Outcomes
- Customer information.

Process/Activities
2.1. Record potential customer ***Give customer personal information*** When the salesmen offer the products to a new customer, they will send some product samples and quotation list to the customer, or a customer comes over to the company to get information about the products, the information of the potential customer may be recorded (Cu01) into the Sales Management System. Customer data can also be updated if the customer has already existed in the Sale Management System. Sales Assistant's data processing task: Record potential customer information.

2.4. Handle contract sale process

The following diagram shows the state model of the 3. Handle Contract Sale process:

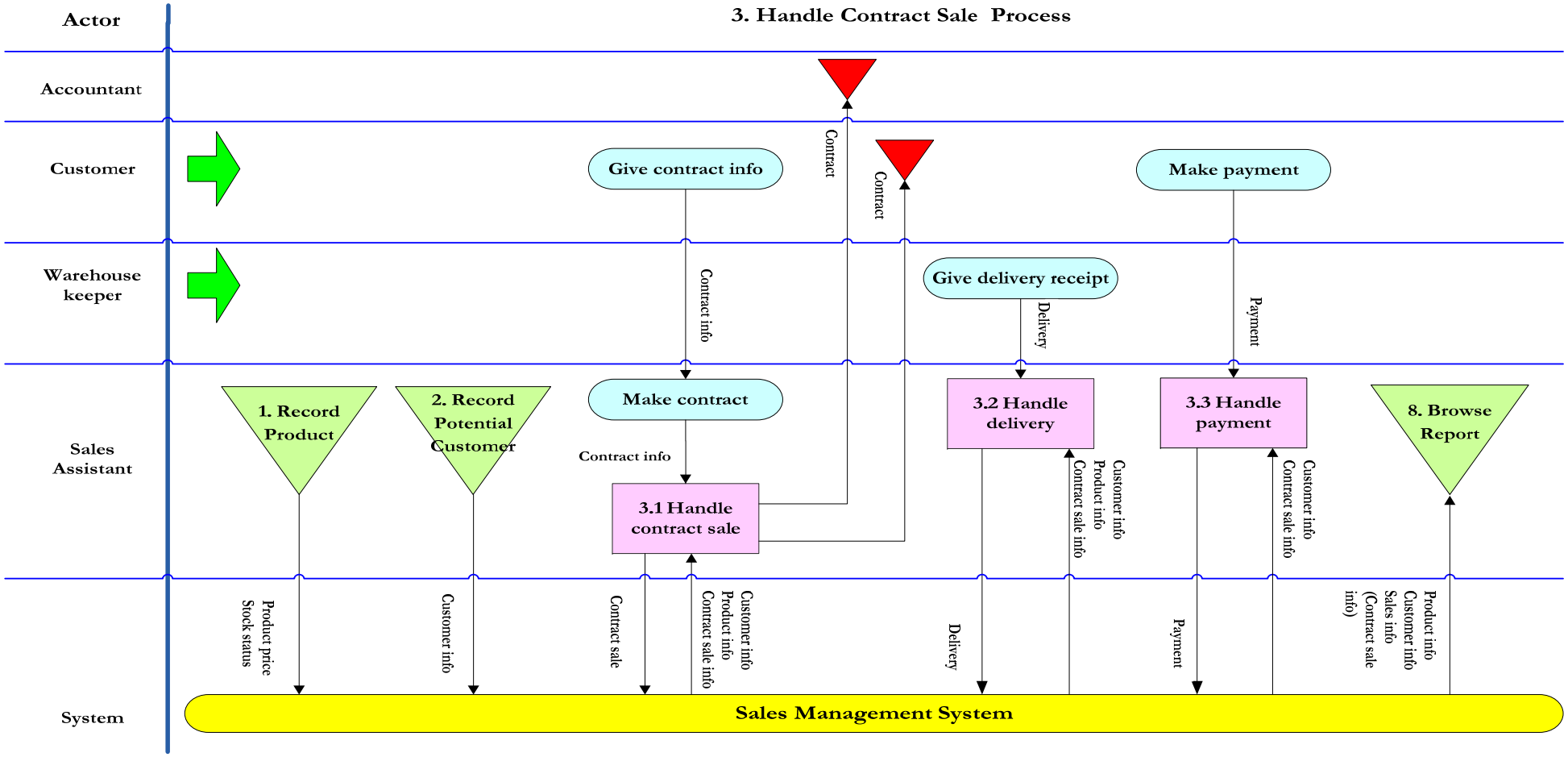


Figure 2.4: The state of Handle Contract Sale Process

The process description of Handle Contract Sale Process is as follows:

Table 2.4: The state process description of the Handle Contract Sale Process

Process name
Handle Contract Sale

Owner of the process
Sales Assistant

Activators
- The customer gives contract information to the company. - The customer makes payment. - A delivery receipt is given by the Warehouse Keeper.

Outcomes
- The Customer and Accountant get the contract. - The contract sale information (sales information) including delivery and payment details..

Process/Activities
3.1. Handle contract sale ***Give contract info*** When the customer would like to buy big amount quantities of products from the company, the customer will negotiate the product price, payment, delivery, and other terms and conditions with the company to have final contract information.

Table 2.4: The state process description of the Handle Contract Sale Process (continue 1)

Process/Activities
Make contract The Sales Assistant will base on the negotiated contract information to record them into the Sales Management System. (Cu02) After then, three copies of contract should be printed out for signing: First is for the customer (Cu03), second is for the Accountant to follow the contract sale progress (Ac03), and third is for saving in the Sales Department. The contract sale can be updated if it has not been carried out yet. That means the delivery and payment have not been handled for the contract sale. Otherwise, it can not be updated. Sales Assistant's data processing task: Handle contract sale to the Sales Management System based on signed contract sale information. **3.2. Handle delivery** ***Give delivery receipt*** When the Warehouse Keeper outputs the products from warehouse to the customer, the Warehouse Keeper will make three copies of delivery receipts: the first one is saved by him-/herself, the second one for the Customer, the third one for the Sales Assistant. After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for contract sale (Wa03).

Table 2.4: The state process description of the Handle Contract Sale Process (continue 2)

Process/Activities
Sales Assistant's data processing task: Handle delivery to the Sales Management System based on signed contract sale information. **3.3. Handle payment** ***Make payment*** When the customer makes payment for contract sale (Cu04), the Sales Assistant will record the payment based on the signed contract sale information. Sales Assistant's data processing task: Handle payment to the Sales Management System based on signed contract sale information.

2.5. Handle wholesale process

The following diagram shows the state model of the 4. Handle Wholesale process:

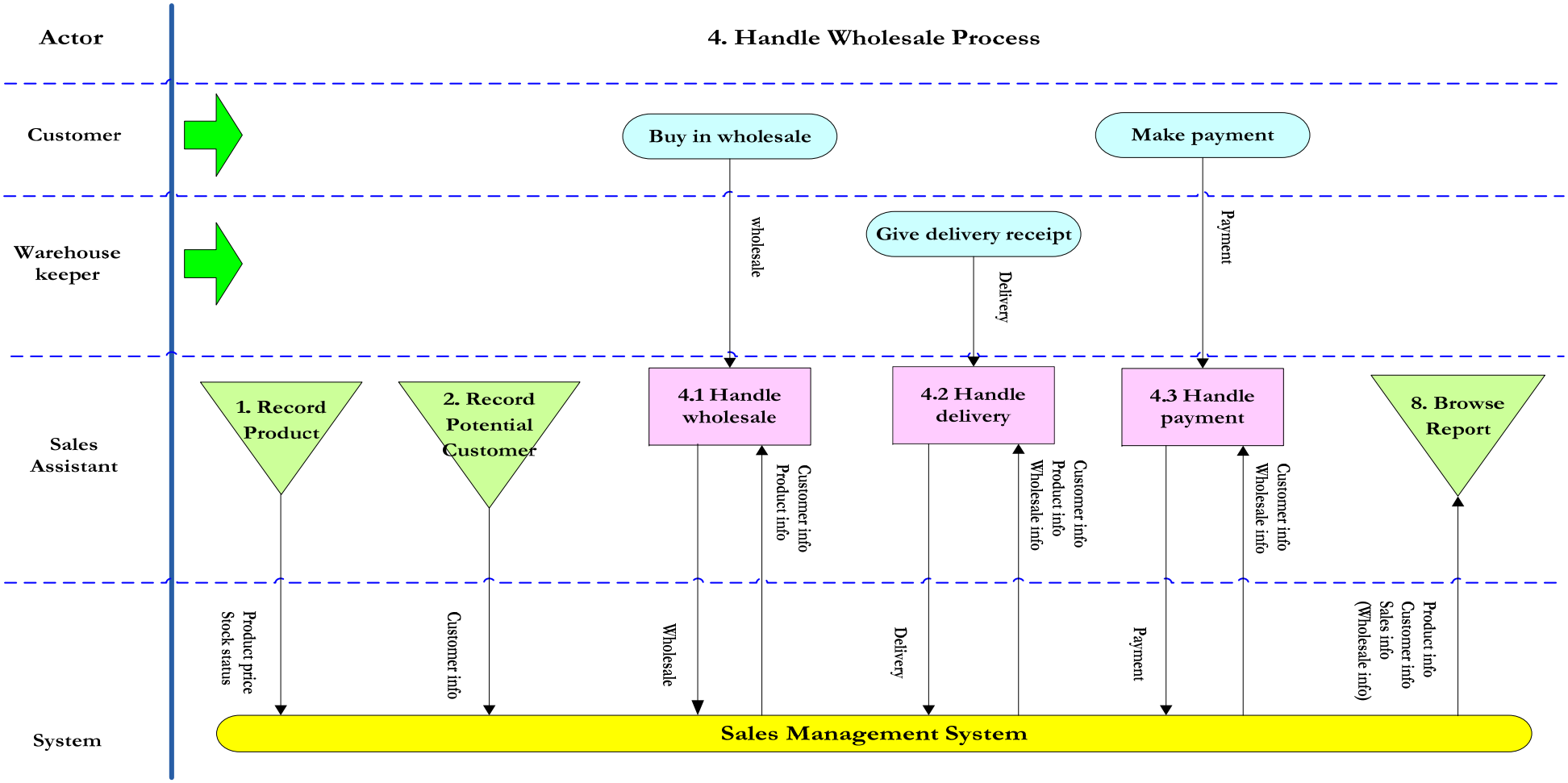


Figure 2.5: The state of Handle Wholesale Process

The process description of Handle Wholesale Process is as follows:

Table 2.5: The state process description of the Handle Wholesale Process

Process name
Handle Wholesale

Owner of the process
Sales Assistant

Activators
- The customer buys wholesale. - The customer makes payment. - A delivery receipt is given by the Warehouse Keeper.

Outcomes
- The wholesale information (sales information) including delivery and payment details.

Process/Activities
4.1. Handle wholesale ***Buy in wholesale*** When the customer would like to buy a product over the minimum wholesale quantity assigned by the company, the customer will get the product at wholesale price from the company (Cu05). The wholesale of the customer will be recorded into the Sales Management System. The delivery and the payment of the wholesale may be divided in many times. Sales Assistant's data processing task: Handle wholesale to the Sales Management System based on the product information and customer information.

Table 2.5: The state process description of the Handle Wholesale Process (continue)

Process/Activities
4.2. Handle delivery ***Give delivery receipt*** When the Warehouse Keeper outputs the products from warehouse to the customer, the Warehouse Keeper will make three copies of delivery receipts: the first one is saved by him-/herself, the second one for the Customer, the third one for the Sales Assistant. After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for wholesale (Wa04). Sales Assistant's data processing task: Handle delivery to the Sales Management System based on the wholesale information. **4.3. Handle payment** ***Make payment*** When the customer makes payment for wholesale (Cu06), the payment will be recorded into the Sales Management System. Sales Assistant's data processing task: Record payment to the Sales Management System based on the wholesale information.

2.6. Handle retail process

The following diagram shows the state model of the 5. Handle retail process:

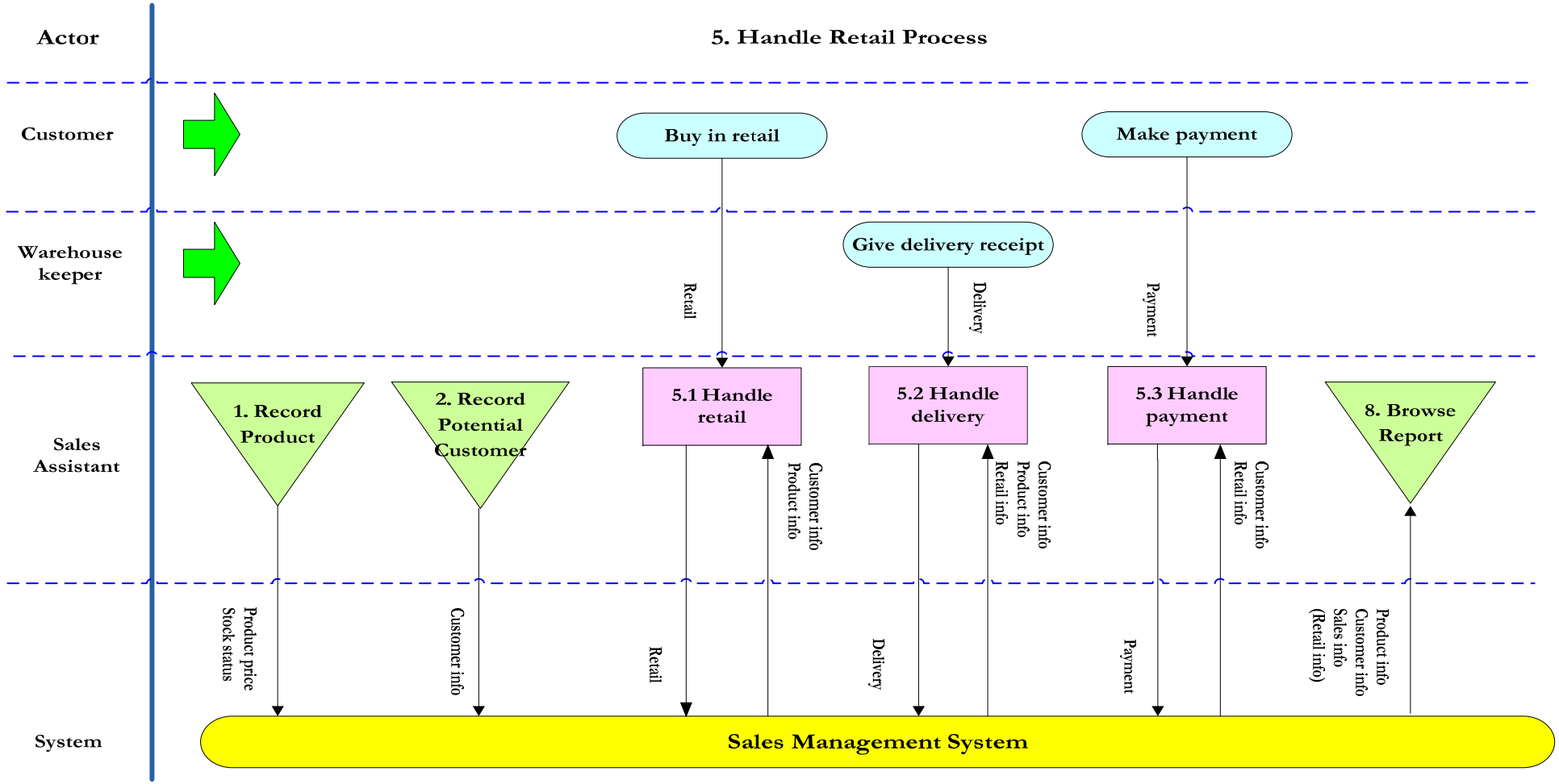


Figure 2.6: The state of Handle Retail Process

The process description of Handle Retail Process is as follows:

Table 2.6: The state process description of the Handle Retail Process

Process name
Handle Retail

Owner of the process
Sales Assistant

Activators
- The customer buys retail. - The customer makes payment. - A delivery receipt is given by the Warehouse Keeper.

Outcomes
- The retail information (sales information) including delivery and payment details.

Process/Activities
5.1. Handle retail ***Buy in retail*** When the customer would like to buy a product in small quantity or less than the minimum wholesale quantity assigned by the company, the customer will get the product at retail price from the company (Cu07). The retail of the customer will be recorded into the Sales Management System. The delivery usually happens in one time, but the payment of the retail may be divided in many times. Sales Assistant's data processing task: Handle retail to the Sales Management System based on the product information and customer information.

Table 2.6: The state process description of the Handle Retail Process (continue)

Process/Activities
5.2. Handle delivery ***Give delivery receipt*** When the Warehouse Keeper outputs the products from warehouse to the customer, the Warehouse Keeper will make three copies of delivery receipts: the first one is saved by him-/herself, the second one for the Customer, the third one for the Sales Assistant. After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for retail (Wa05). Sales Assistant's data processing task: Handle delivery to the Sales Management System based on the retail information. **5.3. Handle payment** ***Make payment*** When the customer makes payment for retail (Cu08), the payment will be recorded into the Sales Management System. Sales Assistant's data processing task: Record payment to the Sales Management System based on the retail information.

2.7. Handle returned product process

The following diagram shows the state model of the 6. Handle returned product process:

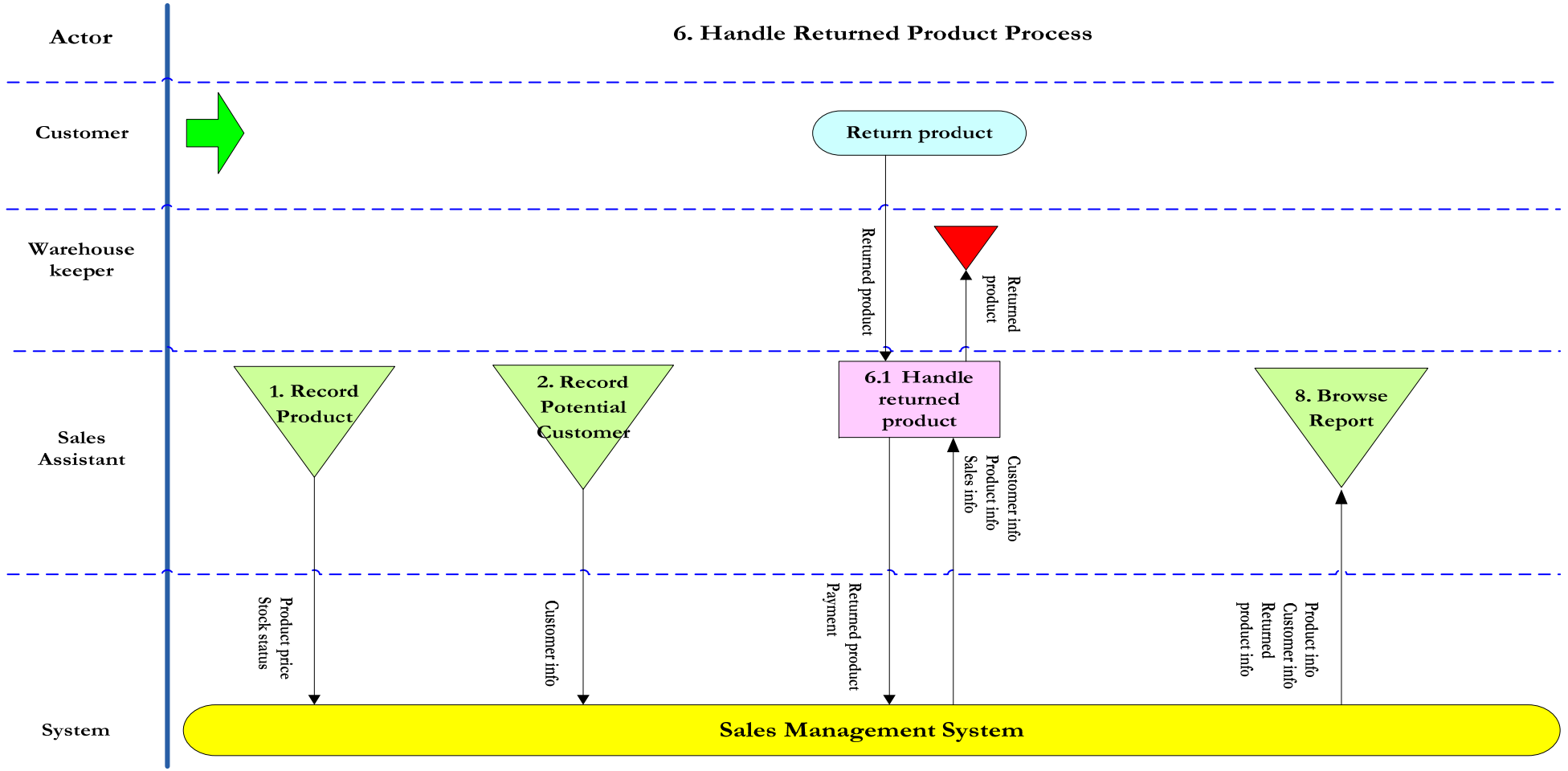


Figure 2.7: The state of the Handle Returned Product Process

The process description of Handle Returned Product is as follows:

Table 2.7: The state process description of the Handle Returned Product Process

Process name
Handle Returned Product

Owner of the process
Sales Assistant

Activators
- The customer returns product.

Outcomes
- The returned product information including returned product and debt reduction.

Process/Activities
6.1. Handle returned product ***Return product*** When a customer returns a product to the company either from contract sale, wholesale, or retail, the quantity of the returned product will be recorded into the Sales Management System. At the same time the value of the returned product is considered as a payment from the Customer (Cu09). The returned product price is based on the current retail, wholesale, or contract price based on the negotiation between the Salesman and the Customer. Sometimes, the contract sale is terminated, but the company still has to accept the returned product from the Customer. Sales Assistant's data processing task: Handle returned product to the Sales Management System based on the sales information, product information and customer information.

2.8. Record feedback process

The following diagram shows the state model of the 7. Record feedback process:

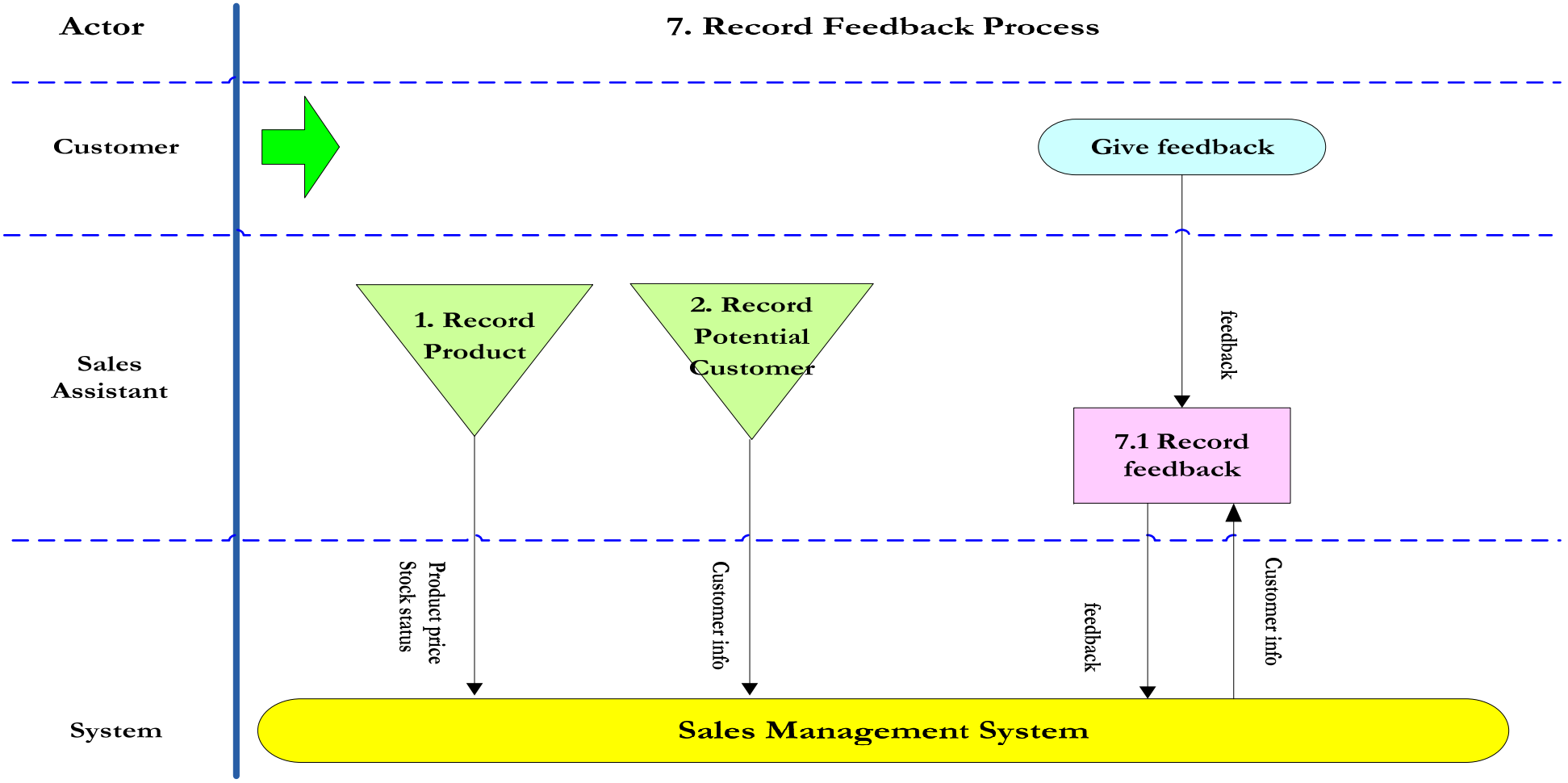


Figure 2.8. The state of the Record Feedback Process

The process description of Record Feedback Process is as follows:

Table 2.8: The state process description of the Record Feedback Process

Process name
Record Feedback

Owner of the process
Sales Assistant

Activators
- The customer gives feedback.

Outcomes
- Feedback

Process/Activities
7.1. Record feedback ***Give feedback*** When customer gives feedback to the company about the products (Cu10), the feedback will be recorded into the Sales Management System based on the customer information. Sales Assistant's data processing task: Record feedback given by the Customer to the Sales Management System based on the customer information.

2.9. Browse report process

The following diagram shows the state model of the 8. Browse report process:

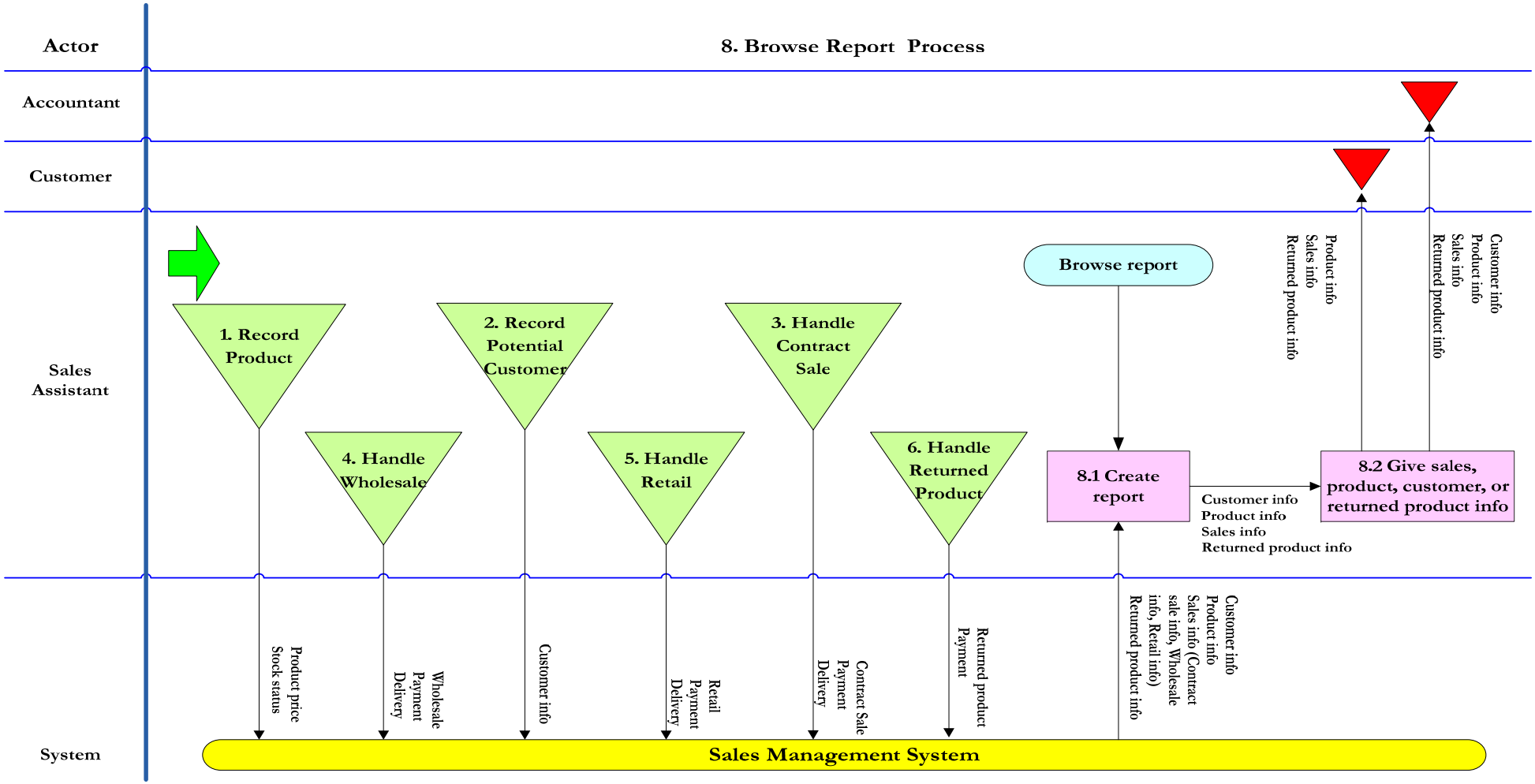


Figure 2.9: The state of the Browse Report Process

The process description of Browse Report Process is as follows:

Table 2.9: The state process description of the Browse Report Process

Process name
Browse Report

Owner of the process
Sales Assistant

Activators
- Browse report to give the Customer Accountant.

Outcomes
- A report of product list with stock status. - A report of product list with retail price. - A report of product list with wholesale price and wholesale quantity. - A report of customer list in detail information. - A report of customer list sorted by district. - A report of delivery list in detail information in a certain period for one customer. - A report of payment list in detail information in a certain period for one customer. - A report of customer list with buy sum, payment sum and current debt in a certain period. - A report of one sold product with different customers' names and prices. - A report of returned product list with customers' name and returned product price. **8.1. Create report** ***Browse product information*** When the customer requires product information as a quotation list; Or the salesmen promote the products to the customer (Cu11).

Table 2.9: The state process description of the Browse Report Process (continue 1)

Process/Activities
The Accountant needs a quotation list to check whether the record in the system is correct or not (Ac04). The Accountant needs the stock status report to check whether the record in the system is matched the Warehouse Keeper's stock status report (Ac05). Sales Assistant's data processing task: Make and browse report about product information with product names and retail price, or wholesale price and wholesale quantity (as quotation list), or stock status. ***Browse customer information*** When the company has a new customer, the Accountant needs the customer information (Ac06) to update to her record; Or a customer list is required for another purpose. Sales Assistant's data processing task: Make and browse report about customer information in detail or with customer names sorted by area (customer list) ***Browse sales information*** When the Accountant needs a sales report to follow the payment record in the system whether it matches the account record (Ac07). When the customer requires his/her buy detail in a certain period (Cu12) or When the Sales Assistant wants to check the sales detail.

Table 2.9: The state process description of the Browse Report Process (continue 2)

Process/Activities
Sales Assistant's data processing task: Make and browse report about: - A report of delivery list in detail information in a certain period for one customer. - A report of payment list in detail information in a certain period for one customer. - A report of customer list with buy sum, payment sum and current debt in a certain period. - A report of one sold product with different customers' names and prices. ***Browse returned product information*** The returned product report is necessary in business, because the value of the returned product is considered as payment and the debt of the customer will be reduced. The Account needs the returned product report to follow the payment in the account (Ac08). The customer sometimes requires the returned product report (Cu13). Sales Assistant's data processing task: Make and browse report about returned product list with customers' name and returned product price. **8.2. Give sales, product, customer, or returned product information** ***Give sales information*** When the Accountant needs a sales report to follow the payment record in the system whether it matches the account record (Ac07). When the customer requires his/her buy detail in a certain period (Cu12).

Table 2.9: The state process description of the Browse Report Process (continue 3)

Process/Activities
Give product information When the customer requires product information as a quotation list; Or the salesmen promote the products to the customer (Cu11). The Accountant needs a quotation list to check whether the record in the system is correct or not (Ac04). The Accountant needs the stock status report to check whether the record in the system is matched the Warehouse Keeper's stock status report (Ac05). ***Give customer information*** When the company has a new customer, the Accountant needs the customer information (Ac06) to update to her record. ***Give returned product information*** The returned product report is necessary in business, because the value of the returned product is considered as payment and the debt of the customer will be reduced. The Account needs the returned product report to follow the payment in the account (Ac08). The customer sometimes requires the returned product report (Cu13).

3. Data model

The purpose of this model is to show the main entities of the sales management process.

Class diagram of the Sales Management Process

The detailed class diagrams of the sales management process are described in the following descriptions.

Class diagram of the Sales Management Process

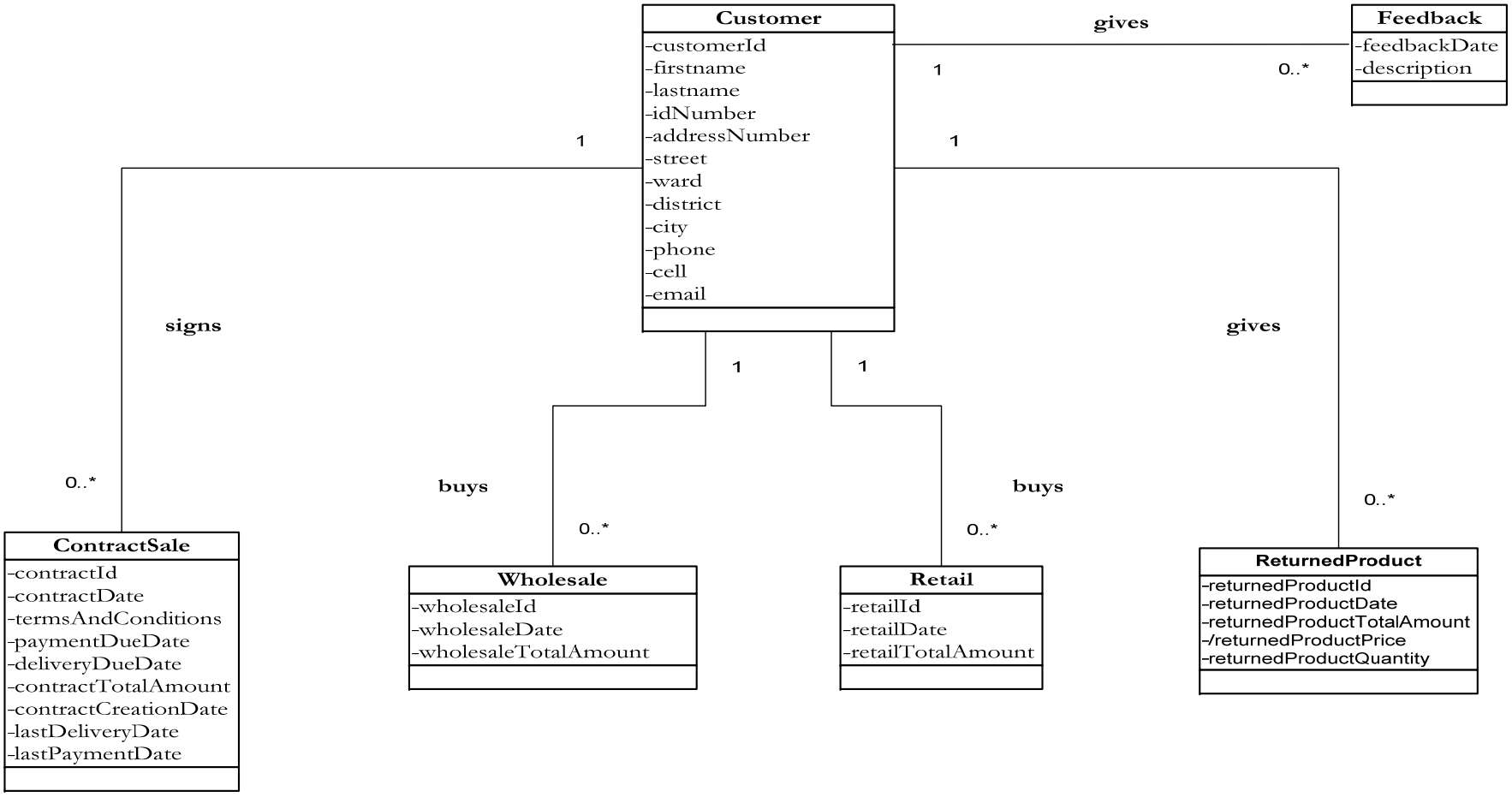


Figure 3.1.1: Class diagram of the Sales Management Process

Description of the Figure 3.1.1: Class diagram of the Sales Management Process

A Customer may sign many Contract Sales with the company or not at all. Each Contract Sale is signed by only one Customer.

A Customer may buy many Wholesales from the company or not at all. Each wholesale is bought by only one Customer.

A Customer may buy many Retails from the company or not at all. One Retail is bought by only one Customer.

A Customer may give many Returned products to the company or not at all. Each Returned product is given by only one Customer.

A Customer may give many Feedbacks to the company or not at all. Each Feedback is given by only one Customer.

Class diagram of the Sales Management Process (Payment)

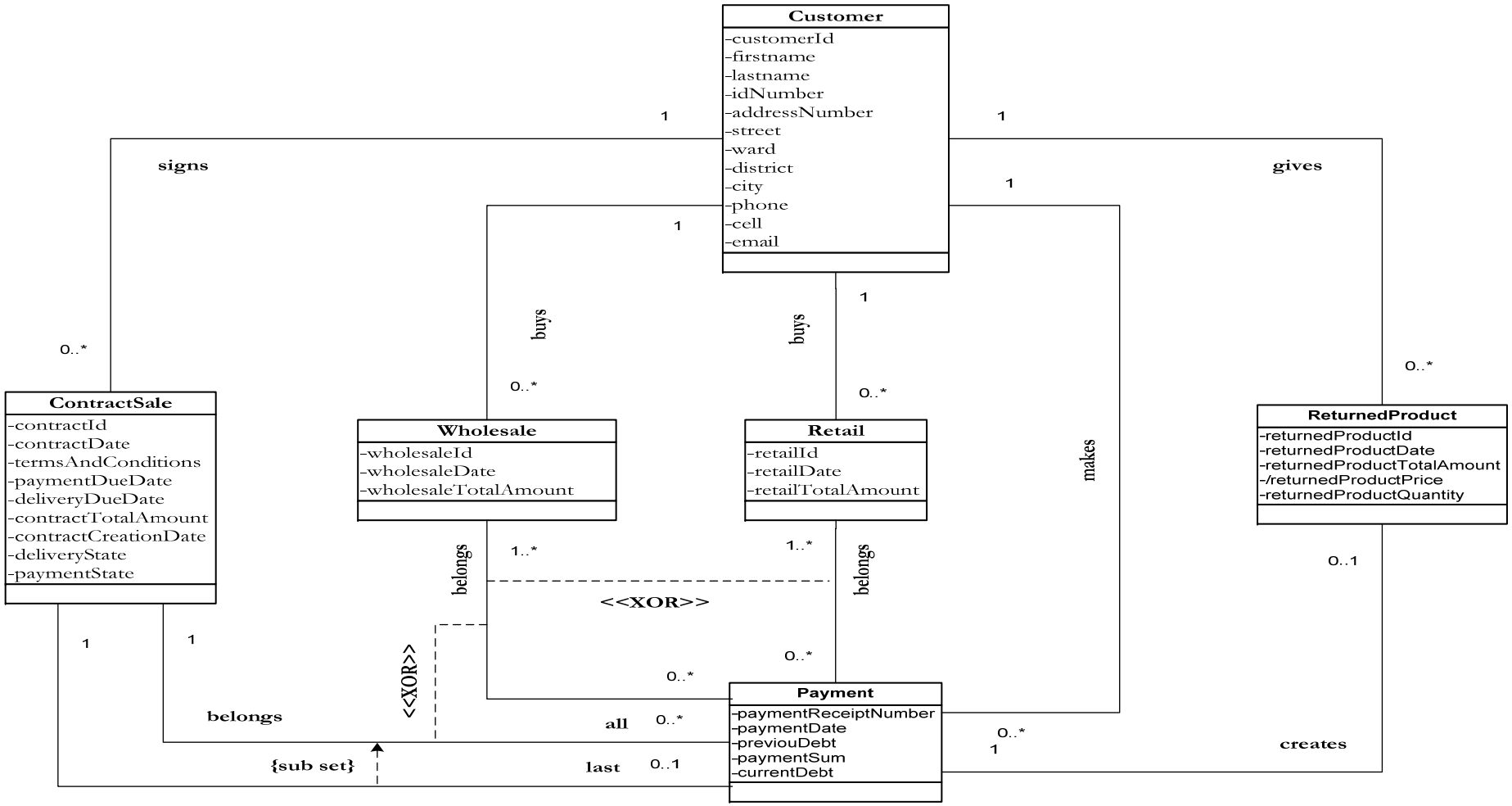


Figure 3.1.2: Class diagram of the Sales Management Process (Payment)

Description of the Figure 3.1.2: Class diagram of the Sales Management Process (Payment)

The description between Customer and Contract Sale, Wholesale, Retail, Returned Product is described in Figure 3.1.1.

When a Customer makes a Payment to the company, the Payment may belong to Contract Sale, Wholesale, or Retail. One Customer can make many Payments, but one Payment only belongs to one Customer.

For the Contract Sale case, the Customer may pay many times in one Contract Sale. In this case the last Payment should be notified to end the Contract Sale. After the Contract Sale is made, the Customer does not have to pay right away.

For the Wholesale case, the Customer may pay many times for one Wholesale. Sometimes, the Customer does not pay at all after buying Wholesale.

The Retail case is the same as Wholesale. The Customer may pay many times for one Retail. Sometimes, the Customer does not pay at all after buying Retail.

When a Customer gives Returned product to the company, one Payment is created for only one Returned Product. How many Returned Products happen means how many Payments are created.

Class diagram of the Sales Management Process (Contract Sale)

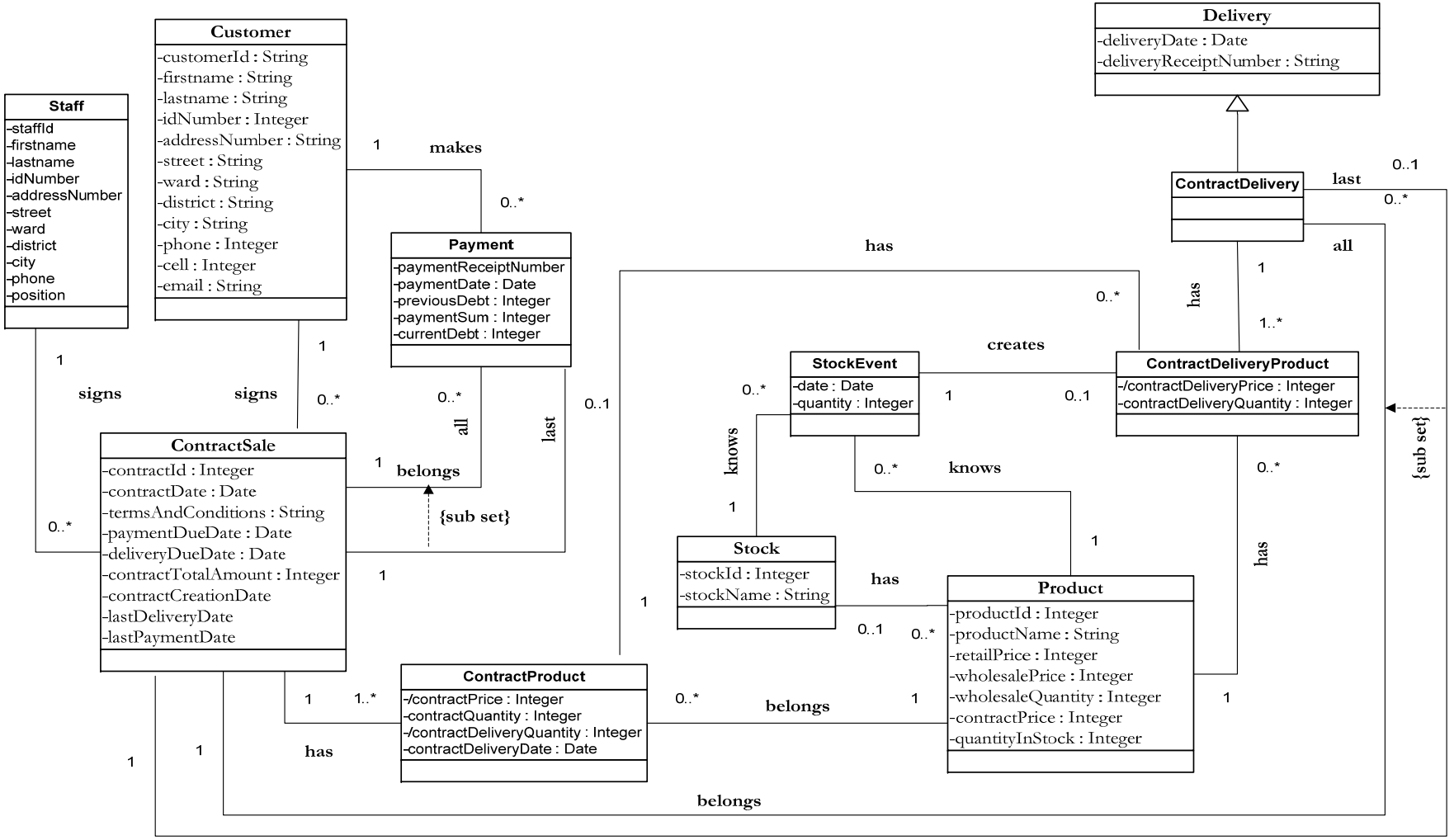


Figure 3.1.3: Class diagram of the Sales Management Process (Contract Sale)

Description of the Figure 3.1.3: Class diagram of the Sales Management Process (Contract Sale)

The description of signing a Contract Sale with a Customer is described in Figure 3.1.1.

The description of a Customer's Payment for a Contract Sale is described in Figure 3.1.2.

The description of a Delivery to a Customer for Contract Sale is described in Figure 3.1.6.

A Staff represents the company to sign a Contract Sale with the Customer. Not every Staff in the company has privilege to sign a Contract Sale, only the Salesmen and the Director in the company. Sometimes one Staff may sign many Contract Sales.

Every Contract Sale has at least one Contract Product picked up from only one Product for each time. Every Contract Product belongs to only one Contract sale, but it can be delivered in many times. That also means every Contract Sale may have many Contract Deliveries. In this case the last Contract Delivery should be notified to end the Contract Sale. Every Contract Delivery is for only one Contract Sale. Contract Delivery Product knows how many Contract Products has been delivered for each time.

Each product may belong to many Contract Products in different Contract Sales or not at all if no Contract Sale is signed for it.

Class diagram of the Sales Management Process (Wholesale)

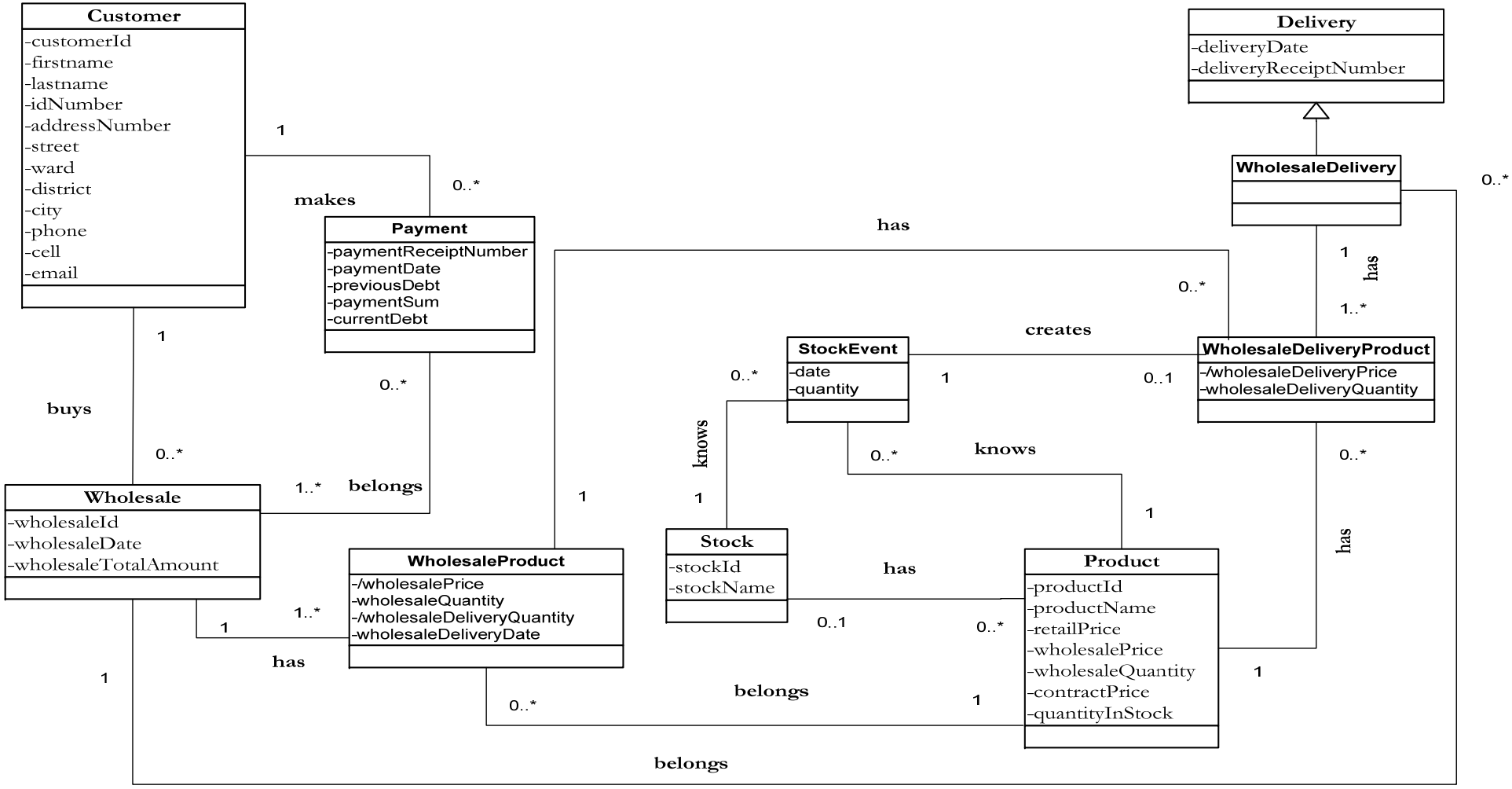


Figure 3.1.4: Class diagram of the Sales Management Process (Wholesale)

Description of the Figure 3.1.4: Class diagram of the Sales Management Process (Wholesale)

The description of buying Wholesale by a Customer is described in Figure 3.1.1.

The description of a Customer's Payment for Wholesale is described in Figure 3.1.2.

The description of a Delivery to a Customer for Wholesale is described in Figure 3.1.6.

Every Wholesale has at least one Wholesale Product picked up from only one Product for each time. Every Wholesale Product belongs to only one Wholesale, but it can be delivered in many times. That also means every Wholesale may have many Wholesale Deliveries. Every Wholesale Delivery is for only one Wholesale. Wholesale Delivery Product knows how many Wholesale Products has been delivered for each time.

Each product may belong to many Wholesale Products in different Wholesales or not at all if no Customer buys Wholesale.

Class diagram of the Sales Management Process (Retail)

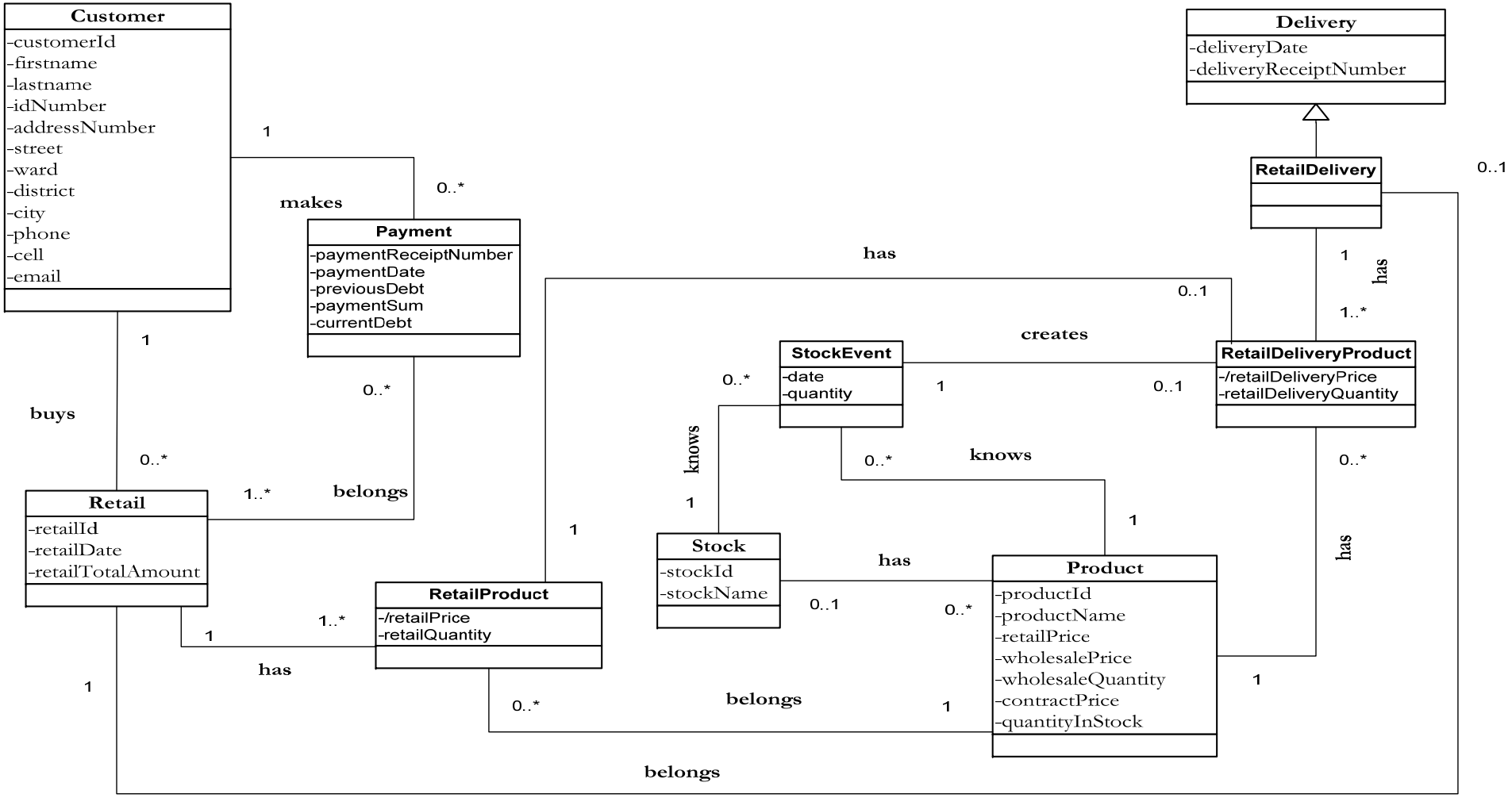


Figure 3.1.5: Class diagram of the Sales Management Process (Retail)

Description of the Figure 3.1.5: Class diagram of the Sales Management Process (Retail)

The description of buying Retail by a Customer is described in Figure 3.1.1.

The description of a Customer's Payment for Retail is described in Figure 3.1.2.

The description of a Delivery to a Customer for Retail is described in Figure 3.1.6.

One Retail has at least one Retail Product picked up from only one Product for each time. One Retail Product belongs to only one Retail and it is delivered in only one time. That also means one Retail have only one Retail Delivery. *)

Each product may belong to many Retail Products in different Retails or not at all if no Customer buys Retail.

*) *This diagram is designed for the later development case of Retail that can also be delivered in many times.*

Class diagram of the Sales Management Process (Delivery)

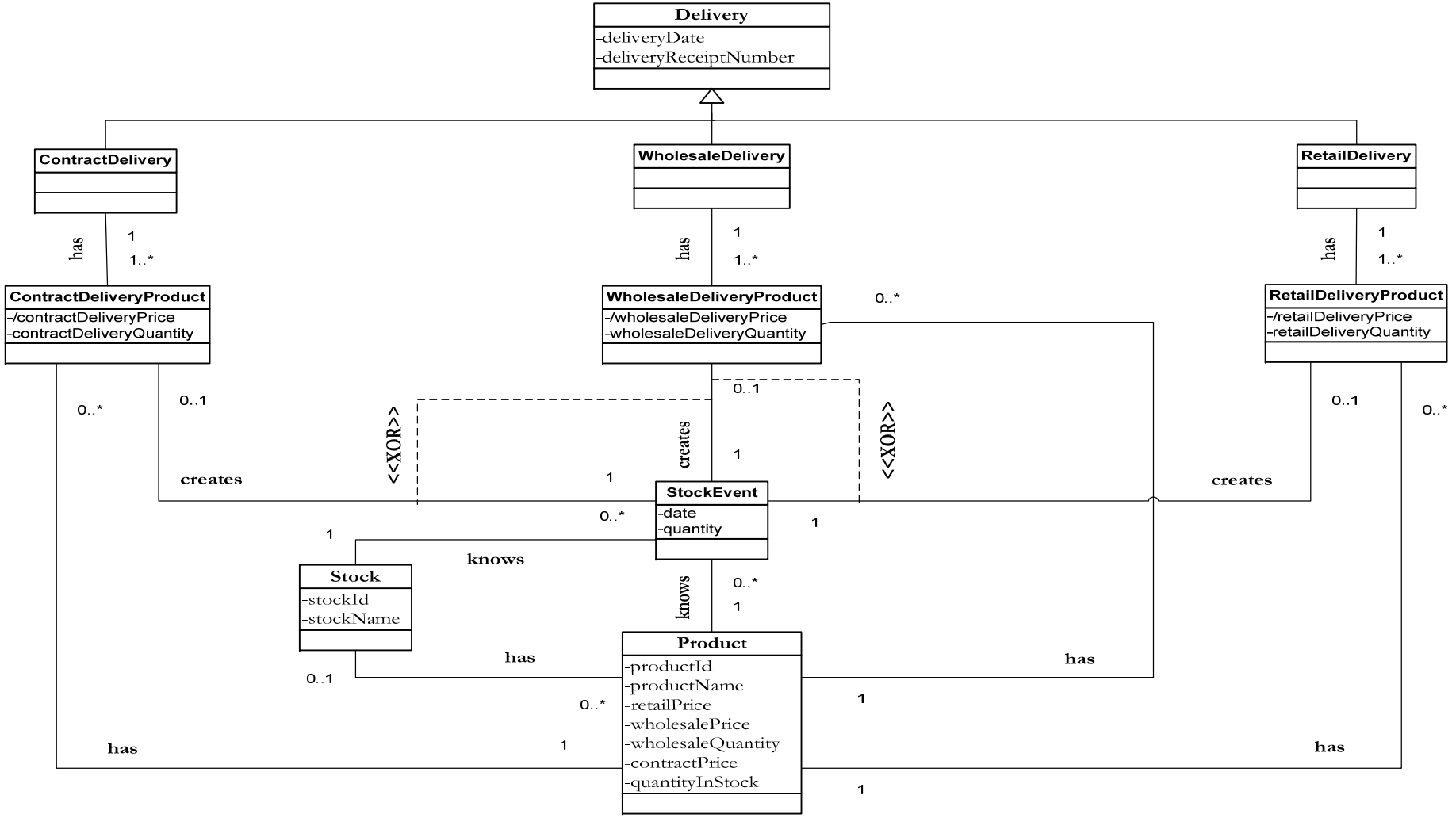


Figure 3.1.6: Class diagram of the Sales Management Process (Delivery)

Description of the Figure 3.1.6: Class diagram of the Sales Management Process (Delivery)

There are three types of Deliveries: Contract Delivery, Wholesale Delivery, or Retail Delivery. When Delivery happens, only one of three types mentioned-above will be carried out.

For Contract Delivery, every Contract Delivery has at least one Contract Delivery Product which picks up only one Product for each time. Every Contract Delivery Product belongs to only one Contract Delivery and creates only one Stock Event from one Stock (*).

For Wholesale Delivery, every Wholesale Delivery has at least one Wholesale Delivery Product which picks up only one Product for each time. Every Wholesale Delivery Product belongs to only one Wholesale Delivery and creates only one Stock Event from one Stock.

Retail Delivery is as same as Contract Delivery and Wholesale Delivery. Every Retail Delivery has at least one Retail Delivery Product which picks up only one Product for each time. Every Retail Delivery Product belongs to only one Retail Delivery and creates only one Stock Event from one Stock.

Every Stock Event may be created by one Contract Delivery Product, or one Wholesale Delivery Product, or one Retail Delivery Product, and has the same Product as the one created the Stock Event for each time.

Every Product may be stored in one Stock. When a Product is sold out or the company has a new Stock, there is no Product at all in the Stock at that time. Each Product may have many Stock Events. If there is no Delivery (also known as output product quantity from the Stock) or no input product quantity to the Stock, the Stock Event does not happen at all. Each product is stored in the same one Stock. However, there are many Products in one Stock in which happen many Stock Events.

(*) Stock here means warehouse.

Class diagram of the Sales Management Process (Returned product)

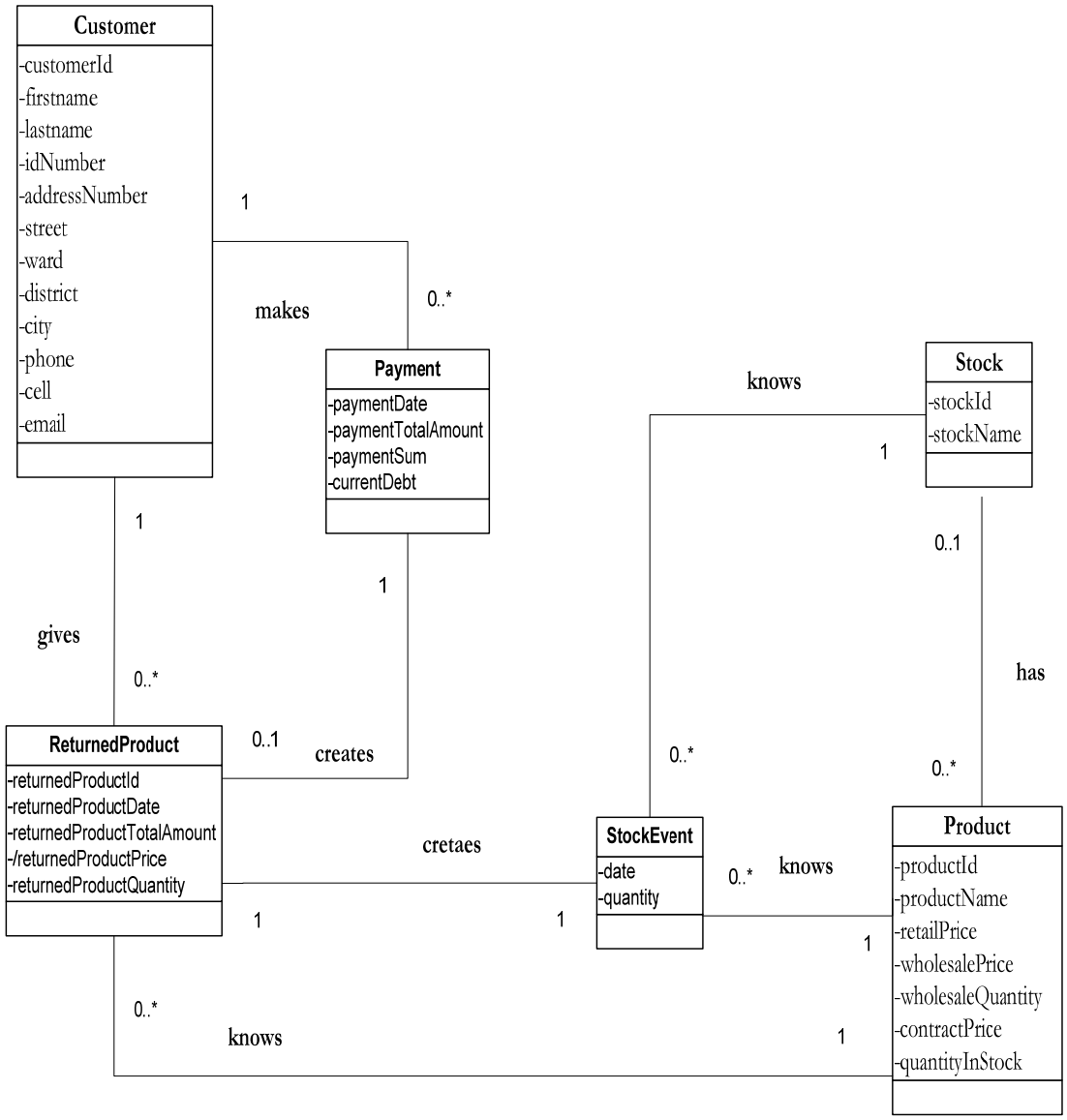


Figure 3.1.7.: Class diagram of the Sales Management Process (Returned product)

Description of the Figure 3.1.7: Class diagram of the Sales Management Process (Returned product)

The description of giving a Returned Product by a Customer is described in Figure 3.1.1.

The description of creating a Payment for a Returned Product is described in Figure 3.1.2.

The Returned Product Price is usually compromised between the Customer and the company. That is the reason that one Returned Product only includes one Product and creates only one Stock Event form a Stock. Every product in a Stock may have many Returned Product Stock Events or not at all if no Customer gives Returned Product.

Standalone classes of Counter, Company and Staff

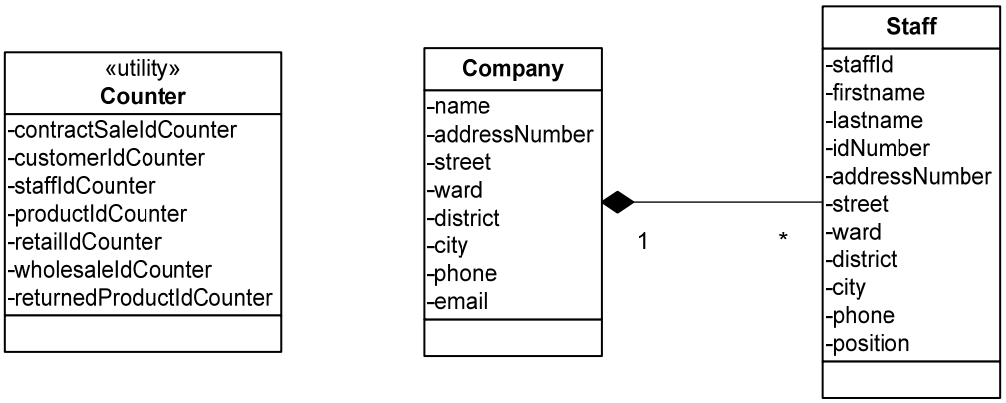


Figure 3.1.8: Standalone classes of Counter, Company and Staff

Description of the Figure 3.1.8: Standalone classes of Counter, Company and Staff

Counter is for giving unique identification number to each new customer, each new product, each new contract sale, each new staff, each new retail, each new wholesale, or each new returned product.

One Company is composed by many Staffs.

3.1. Class description of the Sales Management Process

3.1.1. The description of Company

Class name	Company
Specification	Company is a business enterprise trading motorcycle spare-parts.
Superclass	-

Attributes		
	name	Company's name
	addressNumber	Address number where the company is located
	street	Street name where the company is located
	ward	Ward number/name where the company is located
	district	District number/name where the company is located
	city	City where company is located
	phone	Company's line phone number
	email	Company's email address

Associations	One Company is composed by many Staffs

Volumes	1

3.1.2. The description of ContractDelivery

Class name	ContractDelivery
Specification	ContractDelivery tells that the delivery type belongs to contract. It also tells which contract delivery belongs to which contract sale.
Superclass	Delivery

Attributes	-	

Associations	The association to ContractSale class Each ContractDelivery has one ContractSale. The association to ContractDeliveryProduct class Each ContractDelivery has at least one ContractDeliveryProduct.

Volumes	-

3.1.3. The description of ContractDeliveryProduct

Class name	ContractDeliveryProduct
Specification	ContractDeliveryProduct is holding information about the amount of money calculated according to contract delivery quantity and contract price of a product for every contract delivery that tells which contract delivery product belongs to which contract delivery that also means that how many contract delivery products include in one contract delivery.
Superclass	-

Attributes	/contractDeliveryPrice	Calculate price of per contract delivery product for every delivery of a contract sale
	contractDeliveryQuantity	Quantity per product for every delivery in a contract sale

Associations	The association to ContractDelivery class Each ContractDeliveryProduct belongs to only one ContractDelivery. The association to ContractProduct class Each ContractDeliveryProduct belongs to one ContractProduct. The association to Product class Each ContractDeliveryProduct holds information about one Product. The association to StockEvent class Each ContractDeliveryProduct belongs to one StockEvent.

Volumes	300 000 times

3.1.4. The description of ContractProduct

Class name	ContractProduct
Specification	ContractProduct is holding information about the amount of money calculated according to a contract quantity and contract price of a product in a contract sale that tells which contract product belongs to which contract sale. It holds information about the delivered quantity and date of each product in the contract sale. It also knows whether the total delivery quantity of the contract is delivered or not to notice the contract sale last delivery.
Superclass	-

Attributes	/contractPrice	Calculate price of a contract product for the contract sale
	contractQuantity	Quantity per product in the contract sale
	/contractDelivery Quantity	Calculate quantity of a delivered contract product for the contract sale
	contractDeliveryDate	Date of a delivered contract product to Customer

Associations	The association to ContractSale class Each ContractProduct belongs to only one ContractSale. The association to ContractDeliveryProduct class Each ContractProduct may have many ContractDeliveryProducts or not at all. The association to Product class Each ContractProduct belongs to only one Product.

Volumes	4 000 contract products

3.1.5. The description of ContractSale

Class name	ContractSale
Specification	ContractSale is an agreement sale on certain products based on a contract between the customer and the company.
Superclass	-

Attributes		
	contractId	Unique identification number of a contract
	contractDate	Signing date of a contract
	contractCreationDate	System date making a contract
	termsAndConditions	Terms and conditions of the contract
	paymentDueDate	Due date for the last payment for the contract
	deliveryDueDate	Due date for the last delivery of the product
	contractTotalAmount	Total contract value
	lastDeliveryDate	The last date of the last delivery for contract
	lastPaymentDate	The last date of the last payment for contract

Associations	
	The association to ContractDelivery class Each ContractSale may have many ContractDeliverys or not at all. Each ContractSale may have one last ContractDelivery or not at all. The association to ContractProduct class Each ContractSale has at least one ContractProduct. The association to Customer class Each ContractSale is signed by only one Customer. The association to Payment class Each ContractSale may have many Payments or not at all. Each ContractSale has its last Payment.

The description of ContractSale (continue)

Associations	The association to Staff class Each ContractSale is signed by only one Staff.

Volumes	500 contracts.

3.1.6. The description of Counter<<utility>>

Class name	Counter <<utility>>
Specification	Counter is a utility class for giving a unique identification number to each new contract, or to each new customer, or to each new product.
Superclass	-

Attributes	contractIdCounter	Unique identification number of new contract
	customerIdCounter	Unique identification number of new customer
	staffIdCounter	Unique identification number of new staff
	productIdCounter	Unique identification number of new product
	retailIdCounter	Unique identification number of new retail
	wholesaleIdCounter	Unique identification number of new wholesale
	returnedProductIdCounter	Unique identification number of a returned product

Associations	-

Volumes	increasing

3.1.7. The description of Customer

Class name	Customer
Specification	Customer is a person, workshop or store that buys the company's products.
Superclass	-

Attributes	customerId	Unique identification number of a customer
	firstname	First and middle name of a customer
	lastname	Last name of a customer
	idNumber	Identity card number of a customer
	addressNumber	Address number where the customer resides
	street	Street name where the customer resides
	ward	Ward number/name where the customer resides
	district	District number/name where the customer resides
	city	City where the customer resides
	phone	Customer's line phone number
	cell	Customer's mobile phone number
	email	Customer's email address

Associations	The association to ContractSale class Each Customer may sign many ContractSales or not at all. The association to Payment class Each Customer may make many Payments or not at all The association to Feedback class Each Customer may give many Feedbacks or not at all The association to Retail class Each Customer may buy many Retails or not at all

The description of Customer (continue)

Associations	The association to ReturnedProduct class Each Customer may give many ReturnedProduct s or not at all The association to Wholesale class Each Customer may buy many Wholesales or not at all.

Volumes	max 2 000 customers

3.1.8. The description of Delivery

Class name	Delivery
Specification	Delivery is a distribution of product from the company to the customers.
Superclass	-

Attributes	deliveryDate	Date of delivered product to customer
	deliveryReceiptNumber	Receipt number of the delivery

Associations	Superclass of ContractDelivery,WholesaleDelivery, and RetailDelivery

Volumes	600 000 times

3.1.9. The description of Feedback

Class name	Feedback
Specification	Feedback is the returned information, opinion or idea from the customers about a specific product to the company.
Superclass	-

Attributes	feedbackDate	Date of given feedback
	description	Information in details about product

Associations	The association to Customer class Each Feedback is given by only one Customer

Volumes	200 feedbacks

3.1.10. The description of Payment

Class name	Payment
Specification	Payment is sum of money paid by the customers to the company. It is also a sum created by a returned product.
Superclass	-

Attributes	paymentReceiptNumber	Receipt number of the payment
	paymentDate	Date when a customer pays
	paymentDebt	The debt that the customer owes the company at last time (previousDebt = the last currentDebt)
	paymentSum	Sum of money that customer pays to the company or sum of value of returned product
	currentDebt	The latest debt of the customer after buying products or making payment (currentDebt = previousDebt – paymentSum)

Associations	The association to Customer class Each Payment is made by only one Customer. The association to ContractSale class Each Payment may belong to only one ContractSale. The association to Retail class Each Payment may belong to at least one Retail sale. The association to Wholesale class Each Payment may belong to at least one Wholesale. The association to ReturnedProduct class Each Payment may belong to one ReturnedProduct or not at all.

The description of Payment (continue)

Volumes	100 000 payments

3.1.11. The description of Product

Class name	Product
Specification	Product is a merchandise that is sold by the company to the customers
Superclass	-

Attributes	productId	Unique identification number of a product
	productName	Name of a product
	retailPrice	Price of the product per unit for retail
	wholesalePrice	Price of the product per unit for wholesale
	wholesaleQuantity	Minimum quantity defined for wholesale
	contractPrice	Price of the product per unit for contract sales
	quantityInStock	Quantity in stock (warehouse)

Associations	The association to ContractProduct class Each Product may belong to many ContractProducts or not at all. The association to ContractDeliveryProduct class Each Product may belong to many ContractDeliverieProducts or not at all. The association to WholesaleProduct class Each Product may belong to many WholesaleProducts or not at all. The association to WholesaleDeliveryProduct class Each Product may belong to many WholesaleDeliverieProducts or not at all. The association to RetailProduct class Each Product may belong to many RetailProducts or not at all.

The description of Product (continue)

Associations	The association to RetailDeliveryProduct class Each Product may belong to many RetailDelivereieProducts or not at all. The association to ReturnedProduct class Each Product may belong to many ReturnedProducts or not at all. The association to Stock class Each Product may have in one Stock or not at all. The association to StockEvent class Each Product may has many input or output StockEvents or not at all.

Volumes	5 000 products

3.1.12. The description of Retail

Class name	Retail
Specification	Retail is a sale of products to customer usually in small quantities.
Superclass	-

Attributes	retailId	Unique identification number of retail
	retailDate	Date of retail
	retailTotalAmount	Total amount of retail

Associations	The association to RetailDelivery class Each Retail has one RetailDelivery or not at all. The association to RetailProduct class Each Retail has at least one RetailProduct. The association to Customer class Each Retail is bought by only one Customer. The association to Payment class Each Retail may have many Payments or not at all.

Volumes	2 500 000 retails.

3.1.13. The description of RetailDelivery

Class name	RetailDelivery
Specification	RetailDelivery tells that the delivery type belongs to retail. It also tells which retail delivery belongs to which retail.
Superclass	Delivery

Attributes	-	

Associations	The association to Retail class Each RetailDelivery has one Retail. The association to RetailDeliveryProduct class Each RetailDelivery has at least one RetailDeliveryProduct.

Volumes	1 000 000 times

3.1.14. The description of RetailDeliveryProduct

Class name	RetailDeliveryProduct
Specification	RetailDeliveryProduct is holding information about the amount of money calculated according to retail delivery quantity and retail price of a product for every retail delivery that tells which retail delivery product belongs to which retail delivery.
Superclass	Delivery

Attributes	/retailDeliveryPrice	Calculate price of per retail delivery product for every delivery of retail
	retailDeliveryQuantity	Quantity per product for every delivery in retail

Associations	The association to RetailDelivery class Each RetailDeliveryProduct belongs to only one RetailDelivery. The association to RetailProduct class Each RetailDeliveryProduct belongs to only one RetailDelivery. The association to Product class Each RetailDeliveryProduct holds information about one Product. The association to StockEvent class Each RetailDeliveryProduct belongs to one StockEvent.

Volumes	3 000 000 times

3.1.15. The description of RetailProduct

Class name	RetailProduct
Specification	RetailProduct is holding information about the amount of money calculated according to retail quantity and retail price of a retail product in retail that tells which retail product belongs to which retail.
Superclass	-

Attributes	/retailPrice	Calculate price of a retail product for retail
	retailQuantity	Quantity per product in retail

Associations	The association to Retail class Each RetailProduct belongs to one Retail. The association to RetailDelivery class Each RetailProduct may have one RetailDelivery or not at all. The association to Product class Each RetailProduct belongs to only one Product.

Volumes	25 000 000 retail products

3.1.16. The description of ReturnedProduct

Class name	ReturnedProduct
Specification	ReturnedProduct is a product that is returned by a customer, and also tells which customer returns the product.
Superclass	-

Attributes	returnedProductId	Unique identification number of a returned product
	returnedProductDate	Date of returned product
	returnedProductTotalAmount	Total amount of returned product
	/returnedProductPrice	Calculate price of the returned product
	returnedProductQuantity	Quantity of the returned product

Associations	The association to Customert class Each ReturnedProduct belongs to one Customer. The association to Payment class Each ReturnedProduct creates one Payment. The association to Product class Each ReturnedProduct holds information about one Product. The association to StockEvent class Each ReturnedProduct belongs to one StockEvent.

Volumes	80 000 returned products

3.1.17. The description of Staff

Class name	Staff
Specification	Staff is a person who works for the company.
Superclass	-

Attributes	staffId	Unique identification number of a staff
	firstname	First and middle name of a staff
	lastname	Last name of a staff
	idNumber	Identity card number of a staff
	addressNumber	Address number where the staff resides
	street	Street name where the staff resides
	ward	Ward number/name where the staff resides
	district	District number/name where the staff resides
	city	City where the staff resides
	phone	Staff's phone number
	position	Staff's position

Associations	Staff class is a composition class of Company class. The association to ContractSale class Each Staff may have many Contractsales or not at all.

Volumes	30 staffs

3.1.18. The description of Stock

Class name	Stock
Specification	Stock is a place for storing the product, also known as warehouse.
Superclass	-

Attributes	stockId	Unique identification number of the warehouse
	stockName	Name of the warehouse

Associations	The association to Product class Each Stock may have many Products or not at all. The association to StockEvent class Each Stock may have many Stock Events or not at all.

Volumes	10 stocks

3.1.19. The description of StockEvent

Class name	StockEvent
Specification	StockEvent is holding the input or output information about the quantity of product in warehouse.
Superclass	-

Attributes	date	Date showing the input or output of the quantity in stock
	quantity	Quantity inputted and outputted in stock at warehouse

Associations	The association to ContractDeliveryProduct class Each StockEvent may have only one ContractDeliveryProduct or not at all. The association to Product class Each StockEvent belongs to only one Product. The association to RetailDeliveryProduct class Each StockEvent may have only one RetailDeliveryProduct or not at all. The association to Stock class Each StockEvent belongs to only one Stock. The association to WholesaleDeliveryProduct class Each StockEvent may have only one WholesaleDeliveryProduct or not at all.

Volumes	75 000 000 events

3.1.20. The description of Wholesale

Class name	Wholesale
Specification	Wholesale is a sale of products to customer usually in big certain quantities defined by the company.
Superclass	-

Attributes	wholesaleId	Unique identification number of wholesale
	wholesaleDate	Date of wholesale
	wholesaleTotalAmount	Total amount of wholesale

Associations	The association to WholesaleDelivery class Each Wholesale may have many WholesaleDeliverys or not at all. The association to WholesaleProduct class Each Wholesale has at least one WholesaleProduct. The association to Customer class Each Wholesale is bought by only one Customer. The association to Payment class Each Wholesale may have many Payments or not at all.

Volumes	5 000 wholesales.

3.1.21. The description of WholesaleDelivery

Class name	WholesaleDelivery
Specification	WholesaleDelivery tells that the delivery type belongs to wholesale. It also tells which wholesale delivery belongs to which wholesale.
Superclass	Delivery

Attributes	-	

Associations	The association to Wholesale class Each WholesaleDelivery has one Wholesale. The association to WholesaleDeliveryProduct class Each WholesaleDelivery has at least one WholesaleDeliveryProduct.

Volumes	80 000 times

3.1.22. The description of WholesaleDeliveryProduct

Class name	WholesaleDeliveryProduct
Specification	WholesaleDeliveryProduct is holding information about the amount of money calculated according to wholesale delivery quantity and wholesale price of a product for every wholesale delivery that tells which wholesale delivery product belongs to which wholesale delivery.
Superclass	Delivery

Attributes	/wholesaleDeliveryPrice	Calculate price of per wholesale delivery product for every delivery of wholesale
	wholesaleDeliveryQuantity	Quantity per product for every delivery in wholesale

Associations	The association to WholesaleDelivery class Each WholesaleDeliveryProduct belongs to only one WholesaleDelivery. The association to WholesaleProduct class Each WholesaleDeliveryProduct has one WholesaleProduct. The association to Product class Each WholesaleDeliveryProduct holds information about one Product. The association to StockEvent class Each WholesaleDeliveryProduct belongs to one StockEvent.

Volumes	800 000 times

3.1.23. The description of WholesaleProduct

Class name	WholesaleProduct
Specification	WholesaleProduct is holding information about the amount of money calculated according to a wholesale quantity (minimum wholesale quantity defined by the company) and wholesale price of a wholesale product in wholesale that tells which wholesale product belongs to which wholesale. It also holds information about the delivered quantity and date of a wholesale product in the wholesale.
Superclass	-

Attributes	/wholesalePrice	Calculate price of a wholesale product for wholesale
	wholesaleQuantity	Quantity per product in wholesale
	/wholesaleDelivery Quantity	Calculate quantity of a delivered wholesale product for wholesale
	wholesaleDeliveryDate	Date of a delivered wholesale product to Customer

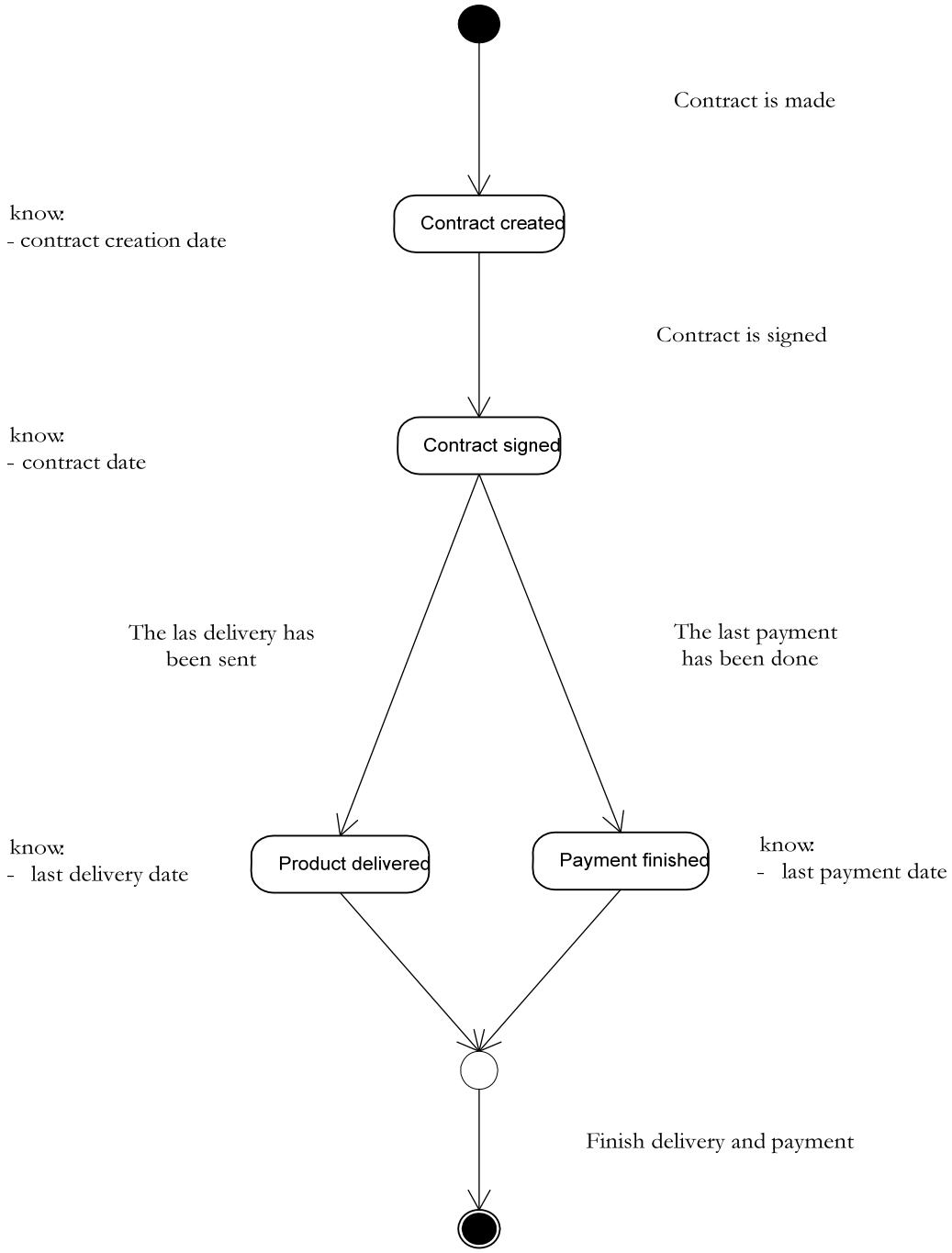
Associations	The association to Wholesale class Each WholesaleProduct belongs to only one Wholesale. The association to WholesaleDeliveryProduct class Each WholesaleProduct may have many WholesaleDeliveryProducts or not at all. The association to Product class Each WholesaleProduct belongs to only one Product.

Volumes	10 000 wholesale products

3.2. Life cycle of the business entities

The purpose of this description is to show what information about a contract during the contract sale.

3.2.1. Life cycle of contract



4. The state of the application software

This description includes the business based requirements of the application software. The purpose of this description is to show the preliminary model of the required application software.

1. Preliminary use cases
2. Summary of the use of data
3. Data processing rules
4. Architectural requirements
5. Security requirement

4.1. Preliminary use cases

The purpose of this description is to show the state of the data-process tasks, the scope of automation, and the preliminary use cases with data devices and data requirements.

The preliminary use cases have been collected from the state business process model of the Sales Management Process and presented in process order. The document type is a table.

The table shows the obvious use cases, which can be found at this stage.

The final decisions on use cases of the software requirement specification phase.

4.1.1. Preliminary use case: 1. Record Product process

Table 4.1.1: The preliminary use case of the Record Product Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
1.1 Record stock status						
Record stock status	Record the stock status for a new product.	- Enter product name, quantity, stock number. Add product.	A new product with new product number. New quantity in stock.	Sales-Assistant	constant	display terminal
Update stock status	Record or update the stock status for an existing product.	- Find existing product Access keys = product number / product name. - Update product. - Enter quantity, stock number. - Accept product.	New or updated quantity in stock.	Sales-Assistant	constant	display terminal

Table 4.1.1: The preliminary use case of the Record Product Process (continue 1)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
1.2 Record product price						
Record product price	Record retail price, or/and wholesale price and wholesale quantity, or/and contract price for a new product.	- Enter product name, retail price, wholesale price, wholesale quantity, contract price. - Add product.	A new product with new product number. New product price(s).	Sales-Assistant	constant	display terminal
Update product price	Record or update retail price, or/and wholesale price and wholesale quantity, or/and contract price for an existing product.	- Find existing product Access keys = product number / product name - Update product. - Enter retail price, wholesale price, wholesale quantity, contract price. - Accept product.	New or updated product price(s).	Sales-Assistant	constant	display terminal

4.1.2. Preliminary use case: 2. Record Potential Customer process

Table 4.1.2: The preliminary use case of the Record Potential Customer Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
2.1 Record potential customer						
Record customer	Record personal data of a potential customer.	- Enter customer information: first name, last name, ID card number, address number, street, ward, district, city, phone, cell, email. - Add customer.	New potential customer data with new customer number.	Sales-Assistant	constant	display terminal
Update customer	Update personal data for an existing customer.	- Find existing customer Access keys = customer name / customer number. - Update customer. - Enter customer new personal information. - Accept customer.	Updated customer data.	Sales-Assistant	constant	display terminal

4.1.3. Preliminary use case: 3. Handle Contract Sale process

Table 4.1.3: The preliminary use case of the Handle Contract Sale Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
3.1 Handle contract sale						
Make contract	Make a new contract sale for a customer.	- Find existing customer for new contract: Access keys = customer name or customer number. - Find existing staff for new contract: Access key = staff name. - Find existing product for new contract: Access key = product name. - Enter quantity for selected product. - Add product to the contract. - Find next product and add product to the contract till the last product for the contract.	New contract sale data with new contract number and new contract creation date.	Sales-Assistant	constant	display terminal

Table 4.1.3: The preliminary use case of the Handle Contract Sale Process (continue 1)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
3.1 Handle contract sale						
Make contract		- Enter terms and conditions, payment due date, delivery due date, contract date. - Add contract.				
Update contract	Update an existed contract which has not been carried out yet.	- Find existing contract - Access key = contract number. - If forget the exact contract number, select the Customer by access keys = customer name/customer number, then find the contract by access key = contract partial number. - Update contract - Enter the necessary update information: - *Contract data*: terms and conditions, payment due date, delivery due date, contract date.	Updated contract sale data with new contract creation date.	Sales-Assistant	constant	display terminal

Table 4.1.3: The preliminary use case of the Handle Contract Sale Process (continue 2)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
Update contract		- *Staff data*: Access key = staff name for changing other staff. - *Product data*: Access key = product name for update product for the contract sale. - Accept contract.				
3.1 Handle contract sale						
View contract	View a contract on screen.	- Find existing contract - Access key = contract number. - If forget the exact contract number, select the Customer by access keys = customer name/customer number, then find the contract by access key = contract partial number. - View contract or Print contract.	Existing contract sale data.	Sales-Assistant	constant	display terminal
Print contract	Print out a contract to paper					paper

Table 4.1.3: The preliminary use case of the Handle Contract Sale Process (continue 3)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
3.2 Handle delivery						
Add delivery	Record delivery quantity for a contract sale.	- Find existing contract - Access key = contract number. - If forget the exact contract number, select the Customer by access keys = customer name/customer number, then find the contract by access key = contract partial number. - Select delivery. - Find contract delivery product: - Access keys = product name / product number - Enter contract delivery quantity for a product - Add other products for the same delivery until the last one. - Enter: delivery receipt number, delivery date. - Add delivery.	New delivery data for the contract sale.	Sales-Assistant	constant	display terminal

Table 4.1.3: The preliminary use case of the Handle Contract Sale Process (continue 3)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
3.3 Handle payment						
Add payment	Record payment sum for a contract sale.	Find existing contract - Access key = contract number. - If forget the exact contract number, select the Customer by access keys = customer name/customer number, then find the contract by access key = contract partial number. - Select payment. - Enter payment data: payment sum, payment date, payment receipt number. - Add payment.	New payment data for the contract sale.	Sales-Assistant	constant	display terminal

4.1.4. Preliminary use case: 4. Handle Wholesale process

Table 4.1.4: The preliminary use case of the Handle Wholesale Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
4.1 Handle wholesale						
Record wholesale	Record a new wholesale for a customer.	- Find existing customer for new wholesale: Access keys = customer name or customer number. - Find existing product for new wholesale: Access key = product name. - Enter quantity for selected product if the customer buys more than the minimum wholesale quantity in the system. - Add product to the wholesale. - Find next product and add product to the wholesale till the last product for the wholesale. - Add wholesale.	New wholesale data with new wholesale number.	Sales-Assistant	constant	display terminal

Table 4.1.4: The preliminary use case of the Handle Wholesale Process (continue 1)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
4.1 Handle wholesale						
Update wholesale	Update an existed wholesale.	- Find existing wholesale - Access key = wholesale number. - If forget the exact wholesale number, select the Customer by access keys = customer name/customer number, then find the wholesale by access key = wholesale partial number. - Update wholesale. - Enter the necessary update information: - *Product data*: Access key = product name for update product for the wholesale. - The wholesale quantity can not be changed lower than the minimum wholesale quantity in the system. - Accept wholesale.	Updated wholesale data.	Sales-Assistant	constant	display terminal

Table 4.1.4: The preliminary use case of the Handle Wholesale Process (continue 2)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
4.1 Handle wholesale						
View wholesale	View a wholesale detail on screen.	- Find existing wholesale - Access key = wholesale number. - If forget the exact wholesale number, select the Customer by access keys = customer name/customer number, then find the wholesale by access key = wholesale partial number. - View or print wholesale.	Existing wholesale data.	Sales-Assistant	constant	display terminal
Print wholesale	Print out wholesale detail to paper					paper

Table 4.1.4: The preliminary use case of the Handle Wholesale Process (continue 3)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
4.2 Handle delivery						
Add delivery	Record delivery quantity for a wholesale.	- Find existing wholesale - Access key = wholesale number. - If forget the exact wholesale number, select the Customer by access keys = customer name/customer number, then find the wholesale by access key = wholesale partial number. - Select delivery. - Find wholesale delivery product: - Access keys = product name / product number - Enter wholesale delivery quantity for a product - Add other products for the same delivery until the last one.	New delivery data for the wholesale.	Sales-Assistant	constant	display terminal

Table 4.1.4: The preliminary use case of the Handle Wholesale Process (continue 4)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
Add delivery		- Enter delivery data: delivery receipt number, delivery date. - Add delivery.				
4.3 Handle payment						
Add payment	Record payment sum for a wholesale.	- Find existing wholesale - Access key = wholesale number. - If forget the exact wholesale number, select the Customer by access keys = customer name/customer number, then find the wholesale by access key = wholesale partial number. - Select payment. - Enter payment data: payment sum, payment date, payment receipt number. - Add payment.	New payment data for the wholesale.	Sales-Assistant	constant	display terminal

4.1.5. Preliminary use case: 5. Handle Retail process

Table 4.1.5: The preliminary use case of the Handle Retail Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
5.1 Handle retail						
Record retail	Record a new retail for a customer.	- Find existing customer for new retail: Access keys = customer name or customer number. - Find existing product for new retail: Access key = product name. - Enter quantity for selected product. - Add product to the retail. - Find next product and add product to the retail till the last product for the retail. - Add retail.	New retail data with new retail number.	Sales-Assistant	constant	display terminal

Table 4.1.5: The preliminary use case of the Handle Retail Process (continue 1)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
5.1 Handle retail						
Update retail	Update an existed retail.	- Find existing retail - Access key = retail number. - If forget the exact retail number, select the Customer by access keys = customer name/customer number, then find the retail by access key = retail partial number. - Update retail. - Enter the necessary update information: - *Product data*: Access key = product name for update product for the retail. - Accept retail.	Updated retail data.	Sales-Assistant	constant	display terminal

Table 4.1.5: The preliminary use case of the Handle Retail Process (continue 2)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
5.1 Handle retail						
View retail	View a retail detail on screen.	- Find existing wholesale - Access key = wholesale number. - If forget the exact wholesale number, select the Customer by access keys = customer name/customer number, then find the wholesale by access key = wholesale partial number. - View wholesale.	Existing retail data.	Sales-Assistant	constant	display terminal
Print retail	Print out retail detail to paper					paper

Table 4.1.5: The preliminary use case of the Handle Retail Process (continue 3)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
5.2 Handle delivery						
Add delivery	Record delivery quantity for retail.	- Find existing retail - Access key = retail number. - If forget the exact retail number, select the Customer by access keys = customer name/customer number, then find the retail by access key = retail partial number. - Select delivery. - Find retail delivery product: - Access keys = product name / product number - Enter retail delivery quantity for a product - Add other products for the same delivery until the last one.	New delivery data for the retail.	Sales-Assistant	constant	display terminal

Table 4.1.5: The preliminary use case of the Handle Retail Process (continue 4)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
Add delivery		- Enter delivery data: delivery receipt number, delivery date. - Add delivery.				
5.3 Handle payment						
Add payment	Record payment sum for a retail.	- Find existing retail - Access key = retail number. - If forget the exact retail number, select the Customer by access keys = customer name/customer number, then find the retail by access key = retail partial number. - Select payment. - Enter payment data: payment sum, payment date, payment receipt number. - Add payment.	New payment data for the retail.	Sales-Assistant	constant	display terminal

4.1.6. Preliminary use case: 6. Handle Returned Product process

Table 4.1.6: The preliminary use case of the Handle Returned Product Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
6.1 Record returned product						
Record returned product	Record a returned product.	- Find existing customer for returned product: Access keys = customer name or customer number. - Find existing product for returned product: Access key = product name. - Enter returned product quantity and stock number for selected product. - Enter returned product price. - Accept returned product. - Enter payment receipt number and payment date. - Accept value of returned product.	New quantity in stock. New payment.	Sales-Assistant	constant	display terminal

4.1.7. Preliminary use case: 7. Record Feedback Process

Table 4.1.7: The preliminary use case of the Record Feedback Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
7.1 Record feedback						
Record feedback	Record feedback to the system.	- Find existing customer for returned product: Access keys = customer name or customer number. - Enter feedback. - Add feedback.	New feedback data.	Sales-Assistant	constant	display terminal

4.1.8. Preliminary use case: 8. Browse Report process

Table 4.1.8: The preliminary use case of the Browse Report Process

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
8.1 Create report						
Browse product information - Stock status - Retail - Wholesale	Browse a report of product current information about: - Stock status. - Retail price. - Wholesale price and quantity.		- A report of product list with stock status. - A report of product list with retail price. - A report of product list with wholesale price and wholesale quantity.	Sales-Assistant	constant	display terminal

Table 4.1.8: The preliminary use case of the Browse Report Process (continue 1)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
8.1 Create report						
Browse customer information - Detail - District	Make and browse a report of customer current information: - In detail. - Sorted by district		- A report of customer list in detail information. - A report of customer list sorted by district.	Sales-Assistant	constant	display terminal

Table 4.1.8: The preliminary use case of the Browse Report Process (continue 2)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
8.1 Create report						
Browse sales information about delivery. - Contract sale - Wholesale - Retail	Make and browse a report about the delivery to a customer in detail in a certain period including: - Contract sale delivery. - Wholesale delivery. - Retail delivery.	Enter time period/date, and then browse it.	- A report of delivery list in detail for contract sale - A report of delivery list in detail for wholesale. - A report of delivery list in detail for retail.	Sales-Assistant	constant	display terminal

Table 4.1.8: The preliminary use case of the Browse Report Process (continue 3)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
8.1 Create report						
Browse sales information about payment - Contract sale - Wholesale - Retail	Make and browse a report about the payment of a customer in detail in a certain period including: - Contract sale delivery. - Wholesale delivery. - Retail delivery.	Enter time period/date, and then browse it.	- A report of payment list in detail for contract sale - A report of payment list in detail for wholesale. - A report of payment list in detail for retail.	Sales-Assistant	constant	display terminal

Table 4.1.8: The preliminary use case of the Browse Report Process (continue 4)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
8.1 Create report						
Browse sales information about all customers' payment	Make and browse a report about all customers' payment status in detail in a certain period.	Enter time period/date, and then browse it.	A report of customer list with buy sum, payment sum and current debt in a certain period.	Sales-Assistant	constant	display terminal
Browse sales information about one sold product	Make and browse a report about one sold product with different customers' name and prices.	Enter time period/date, and then browse it.	A report of one sold product listing customers' names and prices.	Sales-Assistant	constant	display terminal

Table 4.1.8: The preliminary use case of the Browse Report Process (continue 5)

Preliminary use case	Description	Data requirements of the use case		Actor	Timing and volume	Display
		Action/Input	Output/Result			
8.1 Create report						
Browse returned product information.	Make and browse a report about returned product list in certain period.	Enter time period/date, and then browse it.	A report of returned product list with customers' name and returned product price.	Sales-Assistant	constant	display terminal
8.2 Give sales, product, customer, or returned product information						
Give sales, product, customer, or returned product information	Print the necessary report and give to whom it may concern.	Print necessary report	Necessary report mentioned in 8.1 Create Report.	Sales-Assistant	constant	paper

4.2. Summary of the access of data

The purpose of this traceability matrix is to show how the business entities are used in data-processing tasks in the Sales Management process. This description may be used, when checking that all entities are created and used in some data-processing task or when deciding on the sub-systems and their boundaries.

4.2.1. The accesses of classes: 1 Record Product process

Table 4.2.1: The state traceability matrix of 1 Record Product Process

Entity / Preliminary use case		Counter <<utility>>	Product	Stock	StockEvent
1.1	**Record stock status**				
	Record stock status	**C**	**C**	**C**	**C**
	Update stock status		**U**	**R**	**C**
1.2	**Record product price**				
	Record product price	**C**	**C**		
	Update product price		**U**		

(C=create / U = read and update / R = read / D = delete)

4.2.2. The accesses of classes: 2 Record Potential Customer process

Table 4.2.2: The state traceability matrix of 2 Record Potential Customer Process

Preliminary use case \ Entity		Counter <<utility>>	Customer
2.1	**Record potential customer**		
	Record customer	**C**	**C**
	Update customer		**U**

(C=create / U = read and update / R = read / D = delete)

4.2.3. The accesses of classes: 3 Handle Contract Sale process

Table 4.2.3: The state traceability matrix of 3 Handle Contract Sale Process

Preliminary use case \ Entity		Company	Customer	Contract Sale	ContractProduct	ContractDelivery	ContractDelivery-Product	Counter <<Utility>>	Delivery	Payment	Product	Staff	Stock	StockEvent
3.1	**Handle contract sale**													
	Make contract	**R**	**R**	**C**	**C**			**C**			**R**	**R**		
	Update contract	**R**	**R**	**U**	**U**						**R**	**R**		
	View contract	**R**	**R**	**R**	**R**						**R**	**R**		
	Print contract	**R**	**R**	**R**	**R**						**R**	**R**		
3.2	**Handle delivery**													
	Add delivery		**R**	**R**		**C**	**C**		**C**		**R/U**		**R**	**C**
3.3	**Handle payment**													
	Add payment		**R**	**R**						**C/U**				

(C=create / U = read and update / R = read / D = delete)

4.2.4. The accesses of classes: 4 Handle Wholesale process

Table 4.2.4: The state traceability matrix of 4 Handle Wholesale Process

Entity / Preliminary use case		Customer	Wholesale	WholesaleProduct	WholesaleDelivery	WholesaleDelivery-Product	Counter <<Utility>>	Delivery	Payment	Product	Stock	StockEvent
4.1	**Handle wholesale**											
	Record wholesale	**R**	**C**	**C**			**C**			**R**		
	Update wholesale	**R**	**U**	**U**						**R**		
	View wholesale	**R**	**R**	**R**						**R**		
	Print wholesale	**R**	**R**	**R**						**R**		
4.2	**Handle delivery**											
	Add delivery	**R**	**R**		**C**	**C**		**C**		**R/U**	**R**	**C**
4.3	**Handle payment**											
	Add payment	**R**	**R**						**C/U**			

(C=create / U = read and update / R = read / D = delete)

4.2.5. The accesses of classes: 5 Handle Retail process

Table 4.2.5: The state traceability matrix of 5 Handle Retail Process

Preliminary use case / Entity		Customer	Retail	RetailProduct	RetailDelivery	RetailDelivery-Product	Counter <<Utility>>	Delivery	Payment	Product	Stock	StockEvent
5.1	**Handle retail**											
	Record retail	**R**	**C**	**C**			**C**			**R**		
	Update retail	**R**	**U**	**U**						**R**		
	View retail	**R**	**R**	**R**						**R**		
	Print retail	**R**	**R**	**R**						**R**		
5.2	**Handle delivery**											
	Add delivery	**R**	**R**		**C**	**C**		**C**		**R/U**	**R**	**C**
5.3	**Handle payment**											
	Add payment	**R**	**R**						**C/U**			

(C=create / U = read and update / R = read / D = delete)

4.2.6. The accesses of classes: 6 Handle Returned Product process

Table 4.2.6: The state traceability matrix of 6 Handle Returned Product process

Preliminary use case \ Entity		Customer	Counter <<Utility>>	Payment	Product	ReturnedProduct	Stock	StockEvent
6.1	**Record returned product**							
	Record returned product	**R**	**C**	**C/U**	**R/U**	**C**	**R**	**C**

(C=create / U = read and update / R = read / D = delete)

4.2.7. The accesses of classes: 7 Record Feedback process

Table 4.2.7: The state traceability matrix of 7 Record Feedback Process

Preliminary use case \ Entity		Customer	Feedback
7.1	**Record feedback**		
	Add feedback	**R**	**C**

(C=create / U = read and update / R = read / D = delete)

4.2.8. The accesses of classes: 8 Browse Report process

Table 4.2.8: The state traceability matrix of 8 Browse Report Process

Preliminary use case \ Entity		Customer	ContractSale	ContractProduct	ContractDelivery	ContractDelivery-Product	Delivery	Payment	Product	Retail	RetailProduct	RetailDelivery	RetailDelivery-Product	ReturnedProduct	Stock	Wholesale	WholesaleProduct	WholesaleDelivery	WholesaleDelivery-Product
8.1	**Create report**																		
	Browse product information with stock status								**R**						**R**				
	Browse product information with retail								**R**										
	Browse product information with wholesale								**R**										
	Browse customer information in detail								**R**										

(C=create / U = read and update / R = read / D = delete)

Table 4.2.8: The state traceability matrix of 8 Browse Report Process (continue 1)

Preliminary use case \ Entity		Customer	ContractSale	ContractProduct	ContractDelivery	ContractDelivery-Product	Delivery	Payment	Product	Retail	RetailProduct	RetailDelivery	RetailDelivery-Product	ReturnedProduct	Stock	Wholesale	WholesaleProduct	WholesaleDelivery	WholesaleDelivery-Product
8.1	**Create report**																		
	Browse customer information sorted by district	**R**																	
	Browse sales information with contract sale delivery	**R**	**R**	**R**	**R**	**R**	**R**		**R**										
	Browse sales information with wholesale delivery	**R**					**R**		**R**							**R**	**R**	**R**	**R**
	Browse sales information with retail delivery	**R**					**R**		**R**	**R**	**R**	**R**	**R**						
	Browse sales information with contract sale payment	**R**	**R**					**R**											

(C=create / U = read and update / R = read / D = delete)

Table 4.2.8: The state traceability matrix of 8 Browse Report Process (continue 2)

Preliminary use case \ Entity		Customer	ContractSale	ContractProduct	ContractDelivery	ContractDelivery-Product	Delivery	Payment	Product	Retail	RetailProduct	RetailDelivery	RetailDelivery-Product	ReturnedProduct	Stock	Wholesale	WholesaleProduct	WholesaleDelivery	WholesaleDelivery-Product
8.1	**Create report**																		
	Browse sales information with wholesale payment	**R**						**R**								**R**			
	Browse sales information with retail payment	**R**						**R**		**R**									
	Browse sales information about all customers' payment	**R**						**R**											
	Browse sales information about one sold product	**R**	**R**	**R**					**R**	**R**	**R**					**R**	**R**		
	Browse returned product information.	**R**						**R**	**R**					**R**					

(C=create / U = read and update / R = read / D = delete)

4.3. Data processing rules

The purpose of this description is to describe all functional business rules of the preliminary use case, which have been collected during the system requirements engineering stage.

4.3.1. The data process rules in 1 Record Product process

1. Record stock status

The whole name of the new product should be unique. Try to use the same product name as same as the suppliers if possible. In case the same product but in different models, name the model behind the name.

The stock (warehouse) should be available to store the new product.

Quantity in stock can not be minus.

2. Update stock status

It may be a first new stock status for the existing product. It happens when the product prices are recorded before recording stock status.

Make sure whether the product existing in the system is the same as the one, which is going to be recorded.

Quantity in stock can not be minus.

3. Record product price

The wholesale price is always lower than the retail price.

The wholesale quantity should be defined once the wholesale price exists.

The contract price may be as same as the wholesale price.

All price fields are not compulsory.

4. Update product price

It may be a first new price for an existing product. It happens when the stock status is recorded before recording product price.

The old prices should be stored in database.

All prices can be updated, as well as the wholesale quantity.

The updated product prices do not influent the product prices of the previous sale information. That means the new price only provides to the new contract sale, wholesale or retail. The price in the old contract sale, wholesale, or retail does not change at all.

4.3.2. The data process rules in 2 Record Potential Customer process

1. Record customer

Two customers may have the same first name and last name. In that case, they can not have the same ID card number. If the customers do not provide the ID card number, their address can not be the same.

The customer information cannot be deleted, only updated.

2. Update customer

The update data should overwrite the existing one.

All fields can be updated except customer ID number, first name, surname, and ID card number.

4.3.3. The data process rules in 3 Handle Contract Sale process

1. Make contract

The customer has already existed in the system.

The contract creation date is the system date. The contract date can be edited, but it can not be later than the payment due date and delivery due date, neither earlier than the system date.

The contract price can not be higher than the retail price.

Current quantity in stock can be less than quantity in contract when making a contract

2. Update contract

The customer and his/her contract have already existed in the system.

The contract can not be updated after the delivery or payment has been carried out.

3. View contract

The customer and his/her contract have already existed in the system.

4. Print contract

The customer and his/her contract have already existed in the system.

The printer should be connected to the system.

5. Add delivery

The customer and his/her contract have already existed in the system.

It should be warned if the delivery due date past, but the delivery still can be recorded.

The system only displays the products concerning to the selected contract.

The total contract delivery quantity can not exceed the quantity in the contract, neither in stock.

6. Add payment

The customer and his/her contract have already existed in the system.

It should be warned if the payment due date past, but the payment still can be recorded.

In case that the payment is added more than the payment in the contract, the remnant payment will be cover to the customer's other current debt.

4.3.4. The data process rules in 4 Handle Wholesale process

1. Record wholesale

The customer has already existed in the system.

The wholesale quantity should be more than the minimum wholesale quantity in the system.

2. Update wholesale

The customer and his/her wholesale have already existed in the system.

The wholesale quantity can be updated after the delivery or payment has been carried out, but not less than the minimum wholesale quantity in the system.

3. View wholesale

The customer and his/her wholesale have already existed in the system.

4. Print wholesale

The customer and his/her wholesale have already existed in the system.

The printer should be connected to the system.

5. Add delivery

The customer and his/her wholesale have already existed in the system.

The total delivery quantity can not exceed the quantity in stock, neither in wholesale. Otherwise, the wholesale should be updated.

6. Add payment

The customer and his/her wholesale have already existed in the system.

In case that the payment is added more than the payment in the wholesale, the remnant payment will be cover to the customer's other current debt.

4.3.5. The data process rules in 5 Handle Retail process

1. Record retail

The customer has already existed in the system.

2. Update retail

The customer and his/her retail have already existed in the system.

The retail quantity can be updated after the delivery or payment has been carried out.

3. View retail

The customer and his/her retail have already existed in the system.

4. Print retail

The customer and his/her retail have already existed in the system.

The printer should be connected to the system.

5. Add delivery

The customer and his/her retail have already existed in the system.

The total delivery quantity can not exceed the quantity in stock, neither in retail. Otherwise, the retail should be updated.

6. Add payment

The customer and his/her retail have already existed in the system.

In case that the payment is added more than the payment in the retail, the remnant payment will be cover to the customer's other current debt.

4.3.6. The data process rules in 6 Handle Returned Product process

1. Record returned product

The returned product price is compromised between customer and the company. For instance, the returned product in contract sale sometimes happens after the contract has been terminated.

Value of returned product covers the current debt in any buy of the customer.

4.3.7. The data process rules in 7 Record Feedback process

1. Record feedback

The customer has already existed in the system.

Check the feedback before recording to the system.

The description in the feedback should not be empty.

4.3.8. The data process rules in 8 Browse Report process

The system does not display the data with empty information, for instance the product name does not display in the report of retail price list if there is no retail price on that product. The system only displays the required current fulfil information of the following reports:

- Browse product information with stock status
- Browse product information with retail.
- Browse product information with wholesale.
- Browse customer information in detail.
- Browse customer information sorted by district.

Customer name or ID and concerning sales ID should be given to browse the following reports:

- Browse sales information with contract sale delivery.
- Browse sales information with wholesale delivery.
- Browse sales information with retail delivery.
- Browse sales information with contract sale payment.
- Browse sales information with wholesale payment.
- Browse sales information with retail payment.

The time period/date should be given to browse the following reports:

- Browse sales information about all customers' payment.
- Browse sales information about one sold product (also required product name or ID).
- Browse returned product information (also required customer name or ID).

4.4. Architecture requirements

Distribution and data communication requirements

The services of the application software are offered by a standalone system. There is no integration with other systems or subsystems in this project.

The application software holds only one database. The database takes care of the history data.

Human computer interface (HCI) requirements

All services should be accessed through one common user interface.

User interfaces are created for different user roles of the Sales Management System.

The contents and structure of the user interface must be tested and approved by the sponsor or supervisor of this project before implementation.

The user interface should be implemented so that it can be easily changed to other HCI-standard.

The user guide must be integrated with the user interface and must be easy to use.

4.5. Security requirements

The purpose of this description is to specify safety and security requirements for business, data, and data processing tasks.

Thread	Influence	Risk classification	Security requirements
Outside use the system without authorities	Instability of the system	fatal	Each user must be identified
Workers perform operations that are not allowed	Data is not reliable, it may be destroyed	fatal	Different user roles with authorities must be created and used
Database incompatibility	Business results are not reliable	fatal	Operation procedure must be logical and careful.
Database failure	Database storage is out of order	fatal	Make backup in a certain period.
Leakage of the payment data	Inappropriate use of payment data	fatal	Database environment security should be implemented at several levels.
Leakage of the delivery data	Inappropriate use of delivery data	fatal	Database environment security should be implemented at several levels.
Sales Management System is out of use	It is impossible to record the sales process.	reasonable	The sales information must be able to be collected during the system failure, and be entered into the system later.

5. Validation

5.1. Test plan

Goals of the testing

The goal of the testing is to ensure that the content of the software requirements document is proper one and sufficient from the view point of the application processes.

The goal is to test the target state application processes, workflows of the staffs and use of application system – preliminary use cases and business entity classes and relationships.

Time and place

At 14:00, on Tuesday 10.02.2009. Haaga-Helia University of Applied Sciences.

Participants

Jalasoja Kirsti, tester.
Thanh Tang, project manager

Test methods

The test method is a quality assurance review.

The quality assurance review is performed according to the given test cases and the given order of the test cases.

Test objects

The system requirements document

- business process model
- business data model
- automation

Test types

1. Validity of
   - business processes
   - business data model

2. Consistency of the documents

Test suites

1. Test suite
   Consistency of the business process model descriptions
   Functionality of the business
   - context diagram
   - business process model
   - sufficient and proper use cases with actors

2. Test suite
   Proper classes, relationships, and attributes of the classes

Test cases

See 5.2 Test case

Test environment

The quality assurance review takes place at 6th floor of Haaga-Helia University of Applied Sciences.

No special tools are required except papers and pencils.

Test reporting

The test error should be reported.

Acceptance criteria and methods

Jalasoja Kirsti, tester, is responsible for acceptance.

Thanh Tang, project manager, is responsible for the corrected results and quality of the system requirements document.

5.2. Test case

Record product information

Number	Test case	Expected results
P1	Record stock status with new product	
P2	Record stock status with existing product	
P3	Record product prices with new product	
P4	Record product prices with existing product	

Record potential customer information

Number	Test case	Expected results
C1	Record potential customer information	
C2	Update potential customer information	

Handle contract sale information

Number	Test case	Expected results
CS1	Handle contract sale	
CS2	Handle delivery for contract sale	
CS3	Handle payment for contract sale	

Handle wholesale information

Number	Test case	Expected results
WS1	Handle wholesale	
WS2	Handle delivery for wholesale	
WS3	Handle payment for wholesale	

Handle retail information

Number	Test case	Expected results
R1	Handle retail	
R2	Handle delivery for retail	
R3	Handle payment for retail	

Record returned product information

Number	Test case	Expected results
RP1	Record returned product	

Record feedback information

Number	Test case	Expected results
F1	Record feedback	

Browse report

Number	Test case	Expected results
BR1	A report of product list with stock status.	
BR2	A report of product list with retail price.	
BR3	A report of product list with wholesale price and wholesale quantity.	
BR4	A report of customer list in detail information.	
BR5	A report of customer list sorted by area.	
BR6	A report of delivery list in detail information in a certain period for one customer.	
BR7	A report of payment list in detail information in a certain period for one customer.	

Browse report

Number	Test case	Expected results
BR8	A report of customer list with buy sum, payment sum and current debt in a certain period.	
BR9	A report of one sold product with different customers' names and prices.	
BR10	A report of returned product list with customers' name and returned product price.	

Contract Sale Sub System of Sales Management System
Case study: Tin Phong Trading Co., Ltd.
Software Requirements Document

Thanh Duc Tang
Haaga-Helia
Business Information Technology

Version	1.0	
Created by	Thanh Duc Tang	10.02.2009
Review by	Steering group meeting	12.02.2009
Approved by	Steering group meeting	12.02.2009

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5. Validation

5.1. Test plan

5.2. Test case

1. Overview of the Sales Management System

1.1 The company

Tin Phong Trading Co., Ltd. is a motorcycle spare-part trading company located in Ho Chi Minh city, Vietnam.

1.2 Office and organization

Tin Phong Trading Ltd., Co. has an office and two warehouses. The office includes Accounting Department and Sales Department. Two warehouses are considered as Warehouse Department.

All the main sales activities happen in the Sales Department. The Customers can come over to see the product samples or the salesmen promote the products the Customers through the Sales Department.

1.3 Business domain

The business idea of the company is to supply different kinds of motorcycle spare parts imported from abroad or from the manufacturers in Vietnam to the middle man, motorcycle workshop or the motorcycle spare-part stores in retail or wholesale scale.

The requirements of the market have been changed quite often because of many reasons, such as the unstable resources of products, the out-of-date model of the motorcycle, and so on. That makes the selection of products change quite often as well. However, there are about 2.000 products in selection usually. The most popular product groups are brake shoes, bolt, spring, head light cover, rear light cover, signal light cover, bearing, piston, gas filter, kick starter arm, corn, relay, IC, cushion.

1.4 The present state of business process and data process task and the present state information

1.4.1 The main actor

Sales Department is place where all the sales activity of the company takes place, such as Customer orders product, signs contract, picks up quotation list, makes payment, gives feedback, returns product, and so on.

There are Sales Assistant and salesmen in this department. The Sales Assistant is the main person who deals with the Sales Management System for all sales activities in this department. Because of the scale of the company, the director and the Accountant also takes part of this sales management process.

1.4.2 The main external agents

Accounting Department is a place where keeps, inspects, and audits financial record of the company.

Accounting Department is the external agent of the sales management process and internal agent of the company.

Customer may be a person, a workshop or a store that buys products at the company.

Customer is an external agent of Tin Phong Trading Ltd., Co.

A warehouse is a place where storages the company's products. Each ware house has its own stock. There is one Warehouse Keeper in each warehouse.

The warehouse is external agent of the sales management process and internal agent of the company.

1.5 Model of the Sales Management System

Environment of the Sales Management System

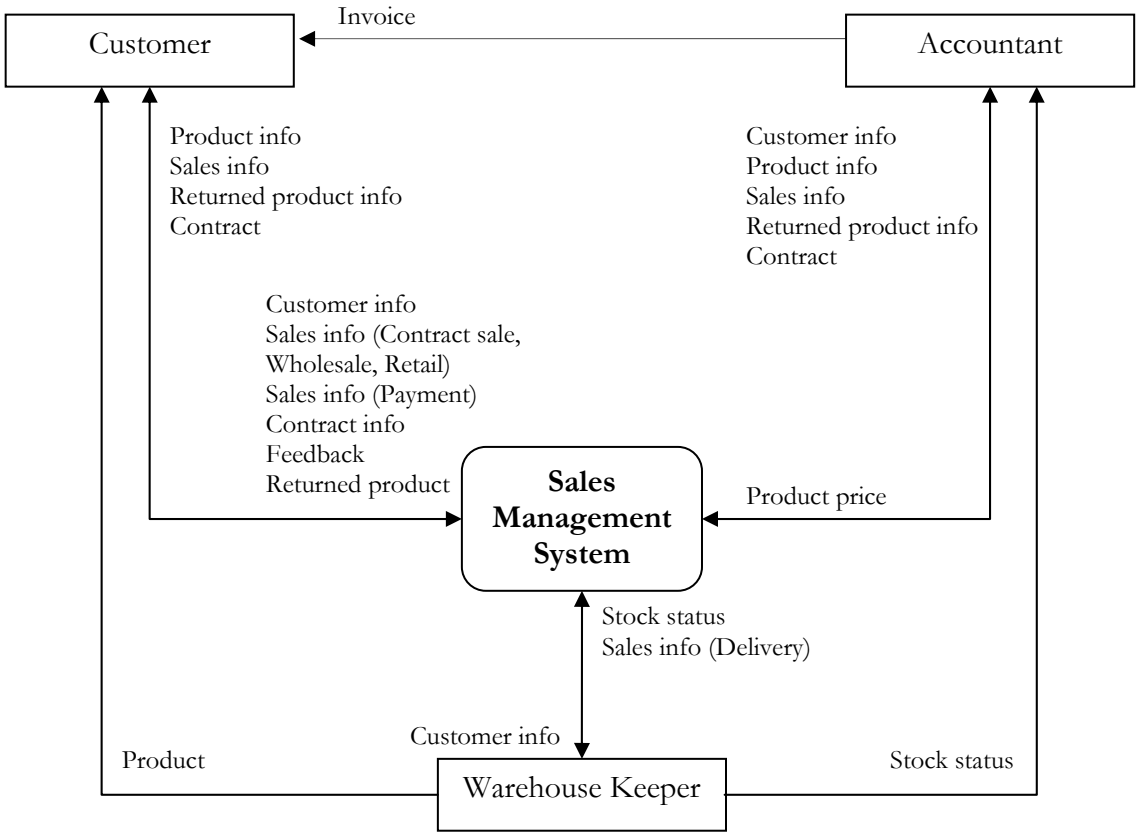


Figure 1.5: The state context diagram of the Sales Management System

Description of the model of Sales Management System

The product information includes the stock status and product prices. The stock status is recorded into the Sales Management System through the reports provided by the Warehouse Keeper after the products are inputted to the company's warehouse (also known as stock). The Warehouse Keeper also has to provide one copy of stock status report to the Accountant to check whether the stock status record is matched the record given from the Sales Management System later on. The product prices are recorded into the Sales Management System through the price lists provided by the Accountant. After then, the product information including stock status and product prices should provide to the Accountant as a check list and only to the Customer as a quotation list in which there is no stock status.

Before the customer makes his or her first buy from the company, the personal information given by a potential customer (also known as customer information) is recorded into the Sales Management System. After then, this customer information should provide to the Accountant and Warehouse Keeper to update the information to their record.

Sales information, which is divided in three types of sales: retail, wholesale, and contract sale, should be recorded into the Sales Management System when the customer buys the products at the company. For every type of sales, there are delivery and payment records. The payment made by the Customer is also recorded into the Sales Management System. The delivery is recorded into the Sales Management System through the delivery receipts provided by the Warehouse Keeper after the product is delivered from warehouse to customer's place.

For contract sale, when the customer is interested in buying a certain product in large quantity or wants to monopolize the product, s/he has to sign a contract with the company by providing the negotiated terms and conditions of the contract (contract information) to the Sales Assistant to record into the Sales Management System and make a contract. After the contract has been made, the Sales Assistant will print the contract from the Sales Management System to the Customer and Accountant.

The Accountant needs the sales information from the Sales Management System to inspect the financial record of the company and create an invoice to the customer. The Customer also needs the sales information to check his/her payment and delivery list sometimes.

The feedback and returned product given by the Customer are also recorded into the Sales Management System. The sum of the returned product will cover the current debt of the Customer. Exchanging the returned product is excluded in this solution. The Accountant needs the returned product information to inspect the financial record. The Customer sometimes also requires the returned product information.

The product is sent directly to the Customer from Warehouse Keeper.

1.6 Description of the external agents

The external agent influents the use of the system is described in the following templates.

1.6.1 Description of external agent: Accountant

Table 1.6.1: The description of external agent: Accountant

External agent	Description		
Accountant	Accountant is a person who keeps, inspects, and audits the financial record of the company.		
Events and responses		**Frequency in use**	**Important level**
Ac01 When the Accountant gives product price which includes retail price, wholesale price and wholesale quantity, and contract price to Sales Assistant to record into the Sales Management System manually.		Maximum 5 times per month.	A
Ac02 In case that the product has already existed in the system, the Sales Assistant updates the prices based on the existed product in the system		Maximum 5 times per month.	A
Ac03 After the contract sale has been signed, the contract sale is in progress. The Accountant needs a copy of contract sale to follow the progress.		Maximum 25 times per year.	A

Important level: A: Most - B Middle - C: Less

Table 1.6.1: The description of external agent: Accountant (continue)

Events and responses	Frequency in use	Important level
Ac04 When the Accountant needs a quotation list to check whether the record in the system is correct or not.	Maximum 5 times per month.	C
Ac05 The Accountant needs the stock status report to check whether the record in the system is matched the Warehouse Keeper's stock status report.	Maximum 5 times per month.	C
Ac06 When the company has a new customer, the Accountant needs the customer information	It depends on the situation.	B
Ac07 When the Accountant needs a sales report to follow the payment record in the system whether it matches the account record.	Maximum 2 times per day.	B
Ac08 The Account needs the returned product report to follow the payment in the account.	Maximum 5 times per month.	B

Important level: A: Most - B Middle - C: Less

1.6.2 Description of external agent: Customer

Table 1.6.2: The description of external agent: Customer

External agent	Description	
Customer	Customer is a person, or a workshop, or a store that buys the products of the company.	
Events and responses	**Frequency in use**	**Important level**
Cu01 When the salesmen offer the products to a new customer, they will send some product samples and quotation list to the customer, or a customer comes over to the company to get information about the products, the information of the potential customer may be recorded	It depends on the situation.	A
Cu02 When the customer would like to buy big amount quantities of products from the company, the customer will negotiate the product price, payment, delivery, and other terms and conditions with the company to have final contract information.	Maximum 25 times per year.	A
Cu03 The customer will get and sign a contract sale with the company	Maximum 25 times per year.	A

Important level: A: Most - B Middle - C: Less

Table 1.6.2: The description of external agent: Customer (continue1)

Events and responses	Frequency in use	Important level
Cu04 When the customer makes payment for contract sale.	Maximum 10 times per month.	A
Cu05 When the customer would like to buy a product over the minimum wholesale quantity assigned by the company, the customer will get the product at wholesale price from the company.	Maximum 20 times per month.	A
Cu06 When the customer makes payment for wholesale	Maximum 10 times per month.	A
Cu07 When the customer would like to buy a product in small quantity or less than the minimum wholesale quantity assigned by the company, the customer will get the product at retail price from the company.	Maximum 50 times per day.	A
Cu08 When the customer makes payment for retail	Maximum 15 times per month.	A

Important level: A: Most - B Middle - C: Less

Table 1.6.2: The description of external agent: Customer (continue2)

Events and responses	Frequency in use	Important level
Cu09 When customer returns a product to the company either from contract sale, wholesale, or retail, the quantity of the returned product will be recorded into the Sales Management System, at the same time the value of the returned product is considered as a payment from the Customer.	Maximum 10 times per month.	A
Cu10 When customer gives feedback to the company about the product.	Maximum 5 times per month.	B
Cu011 When the customer requires a product information as a quotation list; Or the salesmen promote the products to the customer.	Maximum 500 times per year.	A
Cu12 When the customer requires his/her buy detail in a certain period.	Maximum 1200 times per year.	A
Cu13 The customer sometimes requires the returned product report	Maximum 60 times per year.	A

Important level: A: Most - B Middle - C: Less

1.6.3 Description of external agent: Warehouse Keeper

Table 1.6.3: The description of external agent: Warehouse Keeper

External agent	Description		
Warehouse Keeper	Warehouse Keeper is a person who prepares and keeps record of the input or output of the stock in the warehouse of the company.		
Events and responses		**Frequency in use**	**Important level**
Wa01 When the company imports the products from the suppliers, the Warehouse Keeper re-checks the quantity and makes a stock status report.		Maximum 200 times per year.	A
Wa02 When the product has already existed in the system, the Sales Assistant updates the quantity based on the existed product in the system		Maximum 200 times per year.	A
Wa03 After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for contract sale		Maximum 20 times per day.	A

Important level: A: Most - B Middle - C: Less

Table 1.6.3: The description of external agent: Warehouse Keeper (continue 1)

Events and responses	Frequency in use	Important level
Wa04 After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for wholesale	Maximum 30 times per day.	A
Wa05 After the products are delivered to the customer, the Salesman gives the delivery receipt given by the Warehouse Keeper to the Sale Assistant to record the delivery product for retail	Maximum 50 times per day.	A

Important level: A: Most - B Middle - C: Less

1.7 Description of the equipments

The company has four computers and two printers at the moment. One is for Director, one for Accountant, one for Sales Assistant, the last one for one of two Warehouse Keepers. The detail information of the computer will be described later.

2. Use case model of the Contract Sale Sub System of Sales Management System

The use case map is described the main service of all use cases in the system, but in this document only the Record product, Record potential customer, and Handle contract sale are described in detail. Other use cases might be described later.

2.1. Use case map

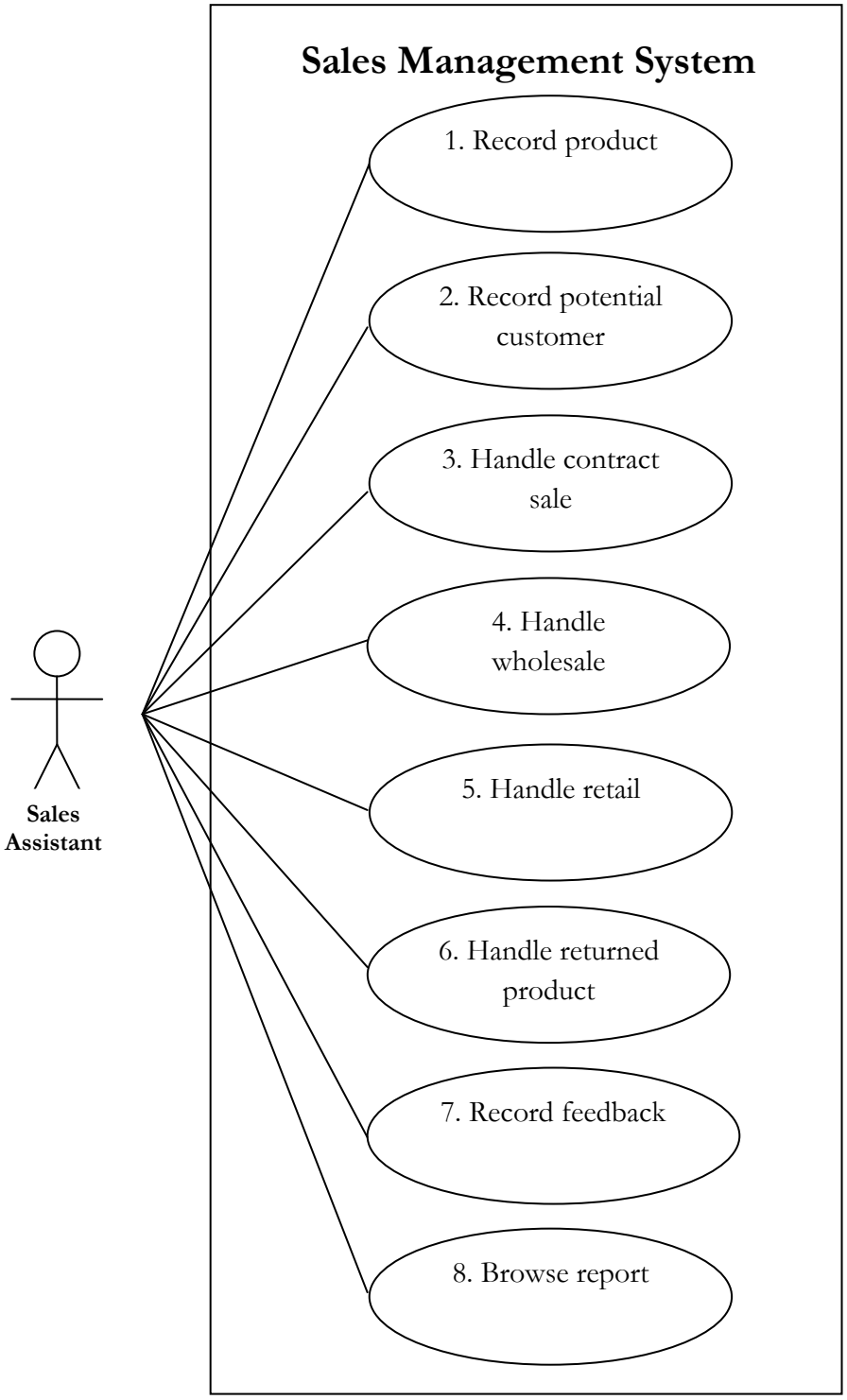


Figure 2.1: The use case map of the Sales Management System

2.2. Three main use cases description

UC01 Record product

With this use case, you can record a new product to the system; update or view a product existed in the system; view or print a report of product list with stock status, or retail price, or wholesale price and quantity.

The use case selections are:

1. Record a new product
2. Update product
3. View a product
4. View and print report of product list with stock status
5. View and print report of product list with wholesale
6. View and print report of product list with detail

UC02 Record potential customer

With this use case, you can record a new potential customer to the system; update or view a customer existed in the system; view or print a report of customer list with detail information.

The use case selections are:

1. Record a new potential customer
2. Update customer
3. View a customer
4. View and print report of customer list

UC03 Handle contract sale

With this use case, you can make a new contract to the system; update, or view and print the existed contract; handle delivery for adding delivery, viewing and printing a report of delivery list or handle payment for adding payment, viewing and printing a report of payment list for the existed contract.

The use case selections are:

1. Make a new contract

2. Update a contract
3. View and print a contract
4. Handle delivery for adding delivery, viewing and printing a report of delivery list
5. Handle payment for adding payment, viewing and printing a report of payment list

UC04 Handle wholesale

UC05 Handle retail

UC06 Handle returned product

UC07 Record feedback

UC08 Browse report

2.3. Actor description:

The actors of the Sales Management System are the users. The descriptions of the actors are following:

Actor/User role	Description	Authorities	Amount
Accountant	S/he only manages the Sale Assistant's work only s/he is absent or busy.	Full authorities	1
Director	A leader of the company will manage the Sales Assistant's work when both s/he and the Accountant are absent or busy.	Full authorities	1
Sales Assistant	S/he has full authorities to manage this Sales Management System such as record product, customer, sales, returned product, feedback, and make and browse reports.	Full authorities	1
Salesman	The salesmen can read and print the list product price and customer list.	Only read and print the list product price and customer list.	6 to 10

2.4. Use case

The three main use cases: Record product, Record potential customer, and Handle contract sale are described more detail here in these diagrams and descriptions. No technical solutions are described here, only functionality.

The use case diagrams describe structures of the above-mentioned main use cases and include all sub use cases, actors. The use case diagrams are made using UML.

The textual descriptions of the use cases describe the functionality of the use cases in each use case selection with alternatives, exception, and data processing rules. The textual descriptions have been made using use case description templates.

The sub use cases of every main use case are described right after all use case selection descriptions of the same main use case.

2.4.1. UC01 Record product – use case

With this use case, you can record a new product to the system; update or view a product existed in the system; view or print a report of product list with stock status, or retail price, or wholesale price and quantity.

Use case diagram

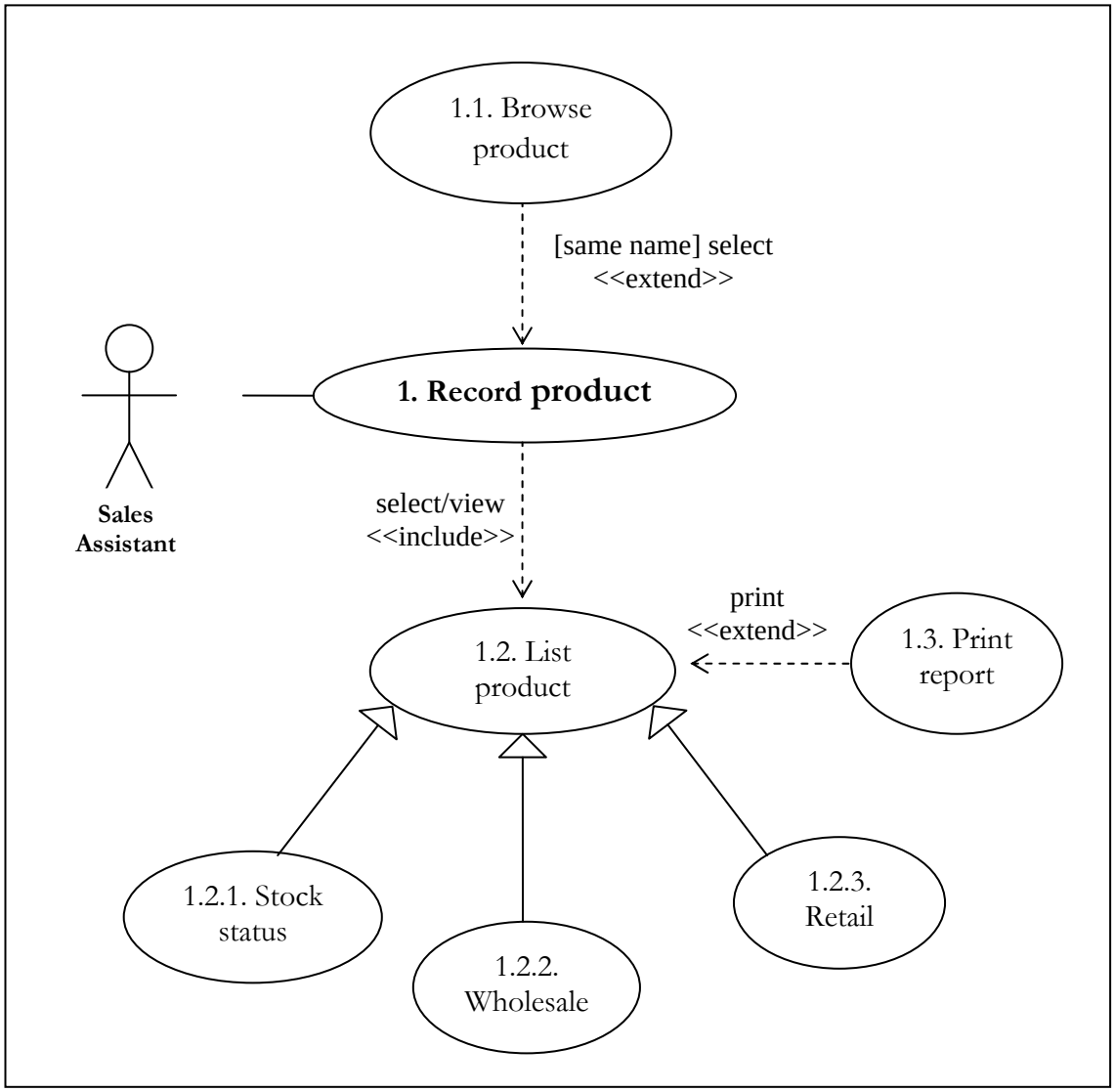


Figure 2.4.1: The use case diagram of Record product – use case

UC01 Record product – use case descriptions

Overview
With this use case, you can record a new product to the system; update or view a product existed in the system; view or print a report of product list with stock status, or retail price, or wholesale price and quantity.

Use case selections
1. Record a new product 2. Update product 3. View a product 4. View and print report of product list with stock status 5. View and print report of product list with wholesale 6. View and print report of product list with detail

Actors	**Usage**
Sales Assistant	Some products are updated every day.

Usability requirement

Additional information: References to screens and printouts are in the user interface model.
Screens: S1: Record product S1_1: Browse product S1_2_1: List product with stock status S1_2_2: List product with wholesale S1_2_3: List product with retail Printouts: P_1_2_1: List product with stock status P_1_2_2: List product with wholesale P_1_2_3: List product with retail

UC01 Record product

Selection 1: Record a new product

Precondition
The new product name does not exist in the system.

Results
Accepted product name A product number is generated by the system Accepted quantity in stock, retail price, wholesale price, wholesale quantity, and contract price if any.

Scenario (flow of activities)
1. Select Record product – use case 1 The system activates the Record product – use case 1, and displays the company name, and an empty template with the following fields: product name, product number, input-quantity, quantity in stock, stock number, retail price, wholesale price, wholesale quantity, and contract price.
2. Enter and accept a new product name, and other data associated with the new product The system adds a new product, then generates and displays the new product number in the Record product – use case 1. *Exception 1: The system can not add a new product which has a same product name in the system.* *Processing rule P1-1*

UC01 Record product

Selection 2: Update product

Precondition
At least the product name and product number have already existed in the system. Other data of the product may exist in the system.

Results
Updated data of the product.

Scenario (flow of activities)
1. Select Record product – use case 1 The system activates the Record product – use case 1, and displays the company name, and an empty template with the following fields: product name, product number, input-quantity, quantity in stock, stock number, retail price, wholesale price, wholesale quantity, and contract price.
2. Select a product: see the scenario at step 2 in Selection 3: View a product
3. Enter and accept the new data for the selected product The system updates and displays the new data in the Record product – use case 1.
4. Repeat step 2 and 3 as many times as necessary for updating the stock status or the product prices for the selected product. *Processing rule P1-2*

UC01 Record product

Selection 3: View a product

Precondition
At least the product name and product number have already existed in the system. Other data of the product may exist in the system.

Results
Data of an existed product

Scenario (flow of activities)
1. Select Record product – use case 1 The system activates the Record product – use case 1, and displays the company name, and an empty template with the following fields: product name, product number, input-quantity, quantity in stock, stock number, retail price, wholesale price, wholesale quantity, and contract price.
2. Select a product 2.1. Enter partial product name and find product name - If there is only one product with the same partial name The system displays the product data in the Record product – use case 1 You may update the data of the product. - If there are many products with the same partial name The system displays a list of products in the Browse product – sub use case 1.1 Select the product from the list The system displays the product data in the Record product – use case 1 You may update the data of the product. *Exception 1: No partial product name exists in the system*

UC01 Record product

Selection 3: View a product (continue)

Scenario (flow of activities)
2.2. Enter whole product name The system displays the product data in the Record product – use case 1 You may update the data of the product. *Exception 2: No product name exists in the system* 2.3. Enter whole product number The system displays the product data in the Record product – use case 1 You may update the data of the product. *Exception 3: No product number exists in the system* *Processing rule P1-3*

UC01 Record product

Selection 4: View and print report of product list with stock status

Precondition
The product name, product number and quantity in stock have already existed in the system.

Results
Report of product list with stock status

Scenario (flow of activities)
1. Select Record product – use case 1 The system activates the Record product – use case 1, and displays the company name, and an empty template with the following fields: product name, product number, input-quantity, quantity in stock, stock number, retail price, wholesale price, wholesale quantity, and contract price.
2. Select Stock status The control goes to the Stock status – hierarchy sub use case 1.2.1.
3. Select List product The control goes to the List product – sub use case 1.2 with the selected Stock status – hierarchy sub use case 1.2.1, The system displays a report of product list with stock status.
4. Print report of product list with stock status The report of product list with stock status is printed out in Print report – sub use case 1.3 *Processing rule P1-4*

UC01 Record product

Selection 5: View and print report of product list with wholesale

Precondition
The product name, product number and wholesale price and quantity have already existed in the system.

Results
Report of product list with wholesale price and wholesale quantity

Scenario (flow of activities)
1. Select Record product – use case 1 The system activates the Record product – use case 1, and displays the company name, and an empty template with the following fields: product name, product number, input-quantity, quantity in stock, stock number, retail price, wholesale price, wholesale quantity, and contract price.
2. Select Wholesale The control goes to the Wholesale – hierarchy sub use case 1.2.2.
3. Select List product The control goes to the List product – sub use case 1.2 with the selected Wholesale – hierarchy sub use case 1.2.2, The system displays a report of product list with wholesale price and wholesale quantity.
4. Print report of product list with wholesale The report of product list with wholesale is printed out in Print report – sub use case 1.3 *Processing rule P1-5*

UC01 Record product

Selection 6: View and print report of product list with retail

Precondition
The product name, product number and retail price have already existed in the system.

Results
Report of product list with retail price

Scenario (flow of activities)
1. Select Record product – use case 1 The system activates the Record product – use case 1, and displays the company name, and an empty template with the following fields: product name, product number, input-quantity, quantity in stock, stock number, retail price, wholesale price, wholesale quantity, and contract price.
2. Select Retail The control goes to the Retail – hierarchy sub use case 1.2.3.
3. Select List product The control goes to the List product – sub use case 1.2 with the selected Retail – hierarchy sub use case 1.2.3, The system displays a report of product list with retail price.
4. Print report of product list with retail The report of product list with retail is printed out in Print report – sub use case 1.3 *Processing rule P1-6*

UC01 Record product

Sub use case 1.1 – Browse product descriptions

Overview
With this sub use case, you may see a list of products with the same partial name in different model (the model in the product name), browse the list and select product that you want.

Precondition
There may be many products with the same partial name in the system.

Results
A list of product name and product number, which have the same partial name given in the previous use case. A select product name from the list.

Use case selection
Given in previous use case 1. Find a product using name = partial name (like Ki* or Kick*)

Description
Selection 1: The system displays a list of all products in Browse Product – sub use case 1.1, which names match the partial product name.
Select a product The control returns to the previous use case and selected product is in use in the previous use case.
Return The control returns to the previous use case without a selected product.

Additional information
Screens: S1_1: Browse product

UC01 Record product

Sub use case 1.2 – List product descriptions

Overview
With this sub use case, you may view or print out a report of product list with stock status or retail or wholesale based on the selected hierarchy sub use case. This sub use case only activates with one of the following hierarchy sub use cases is selected: - Stock status - Wholesale - Retail

Results
Report of product list with stock status, or with wholesale price and quantity, or with retail price based on the selected hierarchy sub use case mentioned above.

Use case selections
1. Print report

Description
Selection 1: The system print out a selected report in Print report – sub use case 1.3

Additional information
Screens: S1_2_1: List product with stock status S1_2_2: List product with wholesale S1_2_3: List product with retail price Printouts: P1_2_1: List product with stock status P1_2_2: List product with wholesale P1_2_3: List product with retail price

UC01 Record product

Hierarchy sub use case 1.2.1 – Stock status descriptions

A report of product list with stock status

Overview
With this hierarchy sub use case, you may view a report of product list with stock status.

Precondition
The product name, product number, stock number, and quantity in stock have already existed in the system.

Results
Report of product list with stock status

Use case selections

Description

Additional information

UC01 Record product

Hierarchy sub use case 1.2.2 – Wholesale descriptions

A report of product list with wholesale price and wholesale quantity

Overview
With this hierarchy sub use case, you may view a report of product list with wholesale price and wholesale quantity.

Precondition
The product name, product number, and wholesale price and wholesale quantity have already existed in the system.

Results
Report of product list with wholesale price and wholesale quantity.

Use case selections

Description

Additional information

UC01 Record product

Hierarchy sub use case 1.2.3 – Retail descriptions

A report of product list with retail price

Overview
With this hierarchy sub use case, you may view a report of product list with retail price.

Precondition
The product name, product number, and retail price have already existed in the system.

Results
Report of product list with retail price

Use case selections

Description

Additional information

UC01 Record product

Sub use case 1.3 – Print report descriptions

Overview
With this sub use case, you can print out a selected report.

Precondition
The report can be seen. Printer is connected to the system.

Results
Selected report on paper.

Use case selections

Description

Additional information

UC01 Record product – use case

Business processing rules

Table 2.4.1: Record product – use case business processing rule

No	Processing rules description	Used in
P1-1	- New product name cannot duplicate as same as the existed product name in the system. - Other data associated with the new product such as the following fields: input-quantity, retail price, wholesale price, wholesale quantity, and contract price in the Record product – use case 1 are not compulsory to enter when you record a new product. - Input-quantity field can not be recorded in negative number at the first time. - All prices and wholesale quantity should be recorded in positive number. It is not allowed to record negative number. - Decimal number is not required in all number fields. - When the wholesale price is filled, the wholesale quantity should be filled too.	UC01 – Selection 1
P1-2	- Input-quantity field can be recorded in negative number after the first time. - All prices and wholesale quantity should be recorded in positive number. It is not allowed to record negative number. - After update quantity in stock = input-quantity + before update quantity in stock. - All new prices are only valid from the time being updated for the sales, do not influent the previous sales prices.	UC01 – Selection 2

Table 2.4.1: Record product – use case business processing rule (continue)

No	Processing rules description	Used in
P1-2	- All the previous prices are saved in the system. - When the wholesale price is filled, the wholesale quantity should be filled too.	UC01 – Selection 2
P1-3	- Preliminary product name, product number. - Preliminary quantity in stock, retail price, wholesale price, wholesale quantity, and contract price if any. - Negative number may display only at the quantity in stock by the sign minus "-", not in the prices and wholesale quantity.	UC01 - Selection 3
P1-4	- The product name and product number are not displayed if the stock status does not exist in the system. - The default list product is stock status.	UC01 – Selection 4
P1-5	- The product name and product number are not displayed when the data of wholesale does not exist in the system.	UC01 – Selection 5
P1-6	- The product name and product number are not displayed when the data of retail does not exist in the system.	UC01 – Selection 6

2.4.2. UC02 Record potential customer – use case

With this use case, you can record a new potential customer to the system; update or view a customer existed in the system; view or print a report of customer list with detail information.

Use case diagram

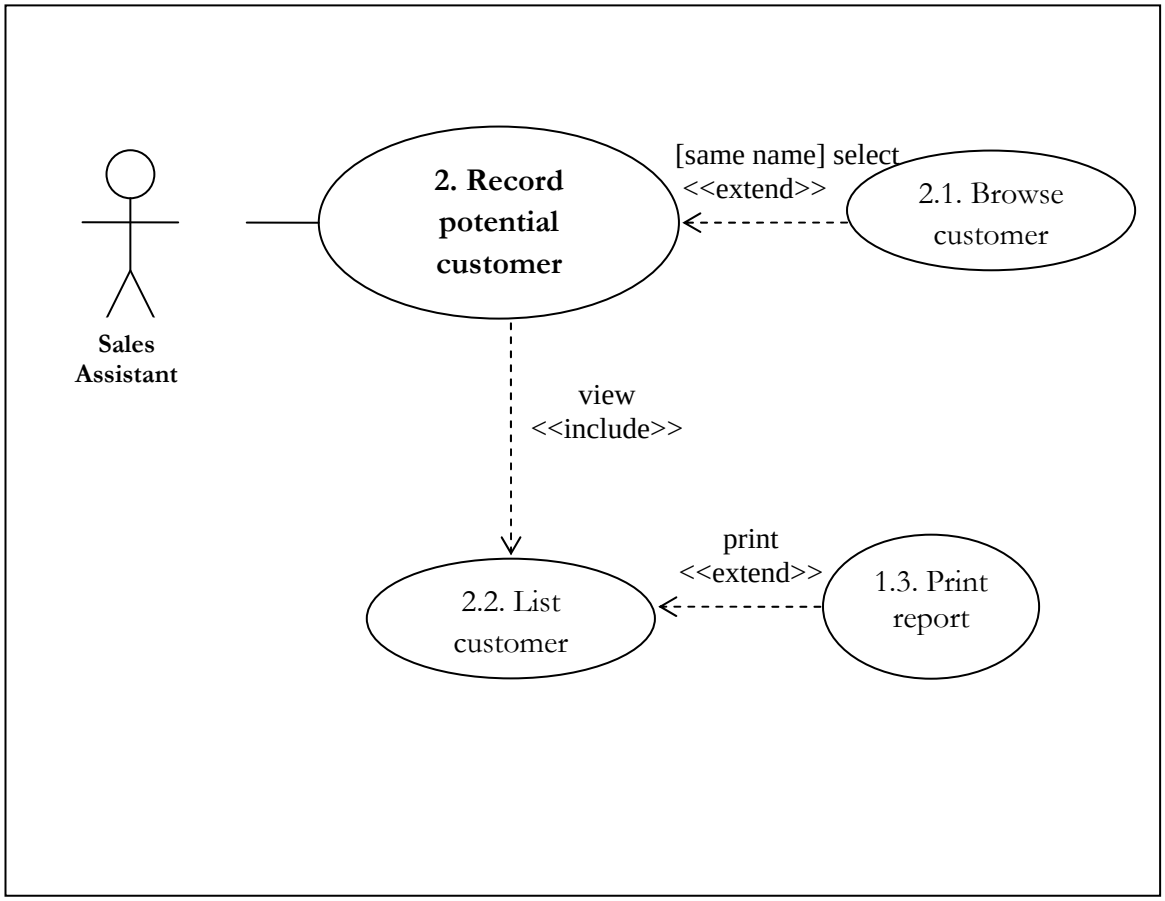


Figure 2.4.2: The use case diagram of Record potential customer – use case

UC02 Record potential customer – use case descriptions

Overview
With this use case, you can record a new potential customer to the system; update or view a customer existed in the system; view or print a customer list report with detail information.

Use case selections
1. Record a new potential customer 2. Update customer 3. View a customer 4. View and print report of customer list

Actors	**Usage**
Sales Assistant	-

Usability requirement

Additional information: References to screens and printouts are in the user interface model.
Screens: S2: Record potential customer S2_1: Browse customer S2_2: List customer Printouts: P2_2: List customer

UC02 Record potential customer

Selection 1: Record a new potential customer

Precondition
The data of a new potential customer like ID card number, address does not exist in the system.

Results
Accepted potential customer. A customer number is generated by the system.

Scenario (flow of activities)
1. Select Record potential customer – use case 2 The system activates the Record potential customer – use case 2, and displays the company name, and an empty template with the following fields: customer first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email.
2. Enter and accept a new potential customer data The system adds a new potential customer data, then generates and displays the new customer number in the Record potential customer – use case 2 *Exception 1: The system can not add a new potential customer which has a same ID card number, and address in the system.* *Processing rule P2-1*

UC02 Record potential customer

Selection 2: Update customer

Precondition
At least the customer name and customer number have already existed in the system. Other data of the customer may exist in the system.

Results
Updated data of the customer.

Scenario (flow of activities)
1. Select Record potential customer – use case 2 The system activates the Record potential customer – use case 2, and displays the company name, and an empty template with the following fields: customer first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email.
2. Select a customer: see the scenario at step 2 in Selection 3: View a customer.
3. Enter and accept the new data for the selected customer The system updates and displays the new data in the Record potential customer – use case 2.
4. Repeat step 2 and 3 as many times as necessary for updating information for the selected customer. *Processing rule P2-2*

UC02 Record potential customer

Selection 3: View a customer

Precondition
The data of a customer has already existed in the system.

Results
Detail information of a customer

Scenario (flow of activities)
1. Select Record potential customer – use case 2 The system activates the Record potential customer – use case 2, and displays the company name, and an empty template with the following fields: customer first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email.
2. Select a customer 2.1. Enter partial customer first/last name and find customer name - If there is only one customer with the same partial first/last name The system displays the customer data in the Record potential customer – use case 2 You may update the data of the customer. - If there are many customers with the same partial first/last name The system displays a list of customers in the Browse customer – sub use case 2.1 Select the customer from the list The system displays the customer data in the Record potential customer – use case 2 You may update the data of the customer. *Exception 1: No partial customer first/last name exists in the system*

UC02 Record potential customer

Selection 3: View a customer (continue)

Scenario (flow of activities)
2.2. Enter whole customer first/last name The system displays the customer data in the Record potential customer – use case 2. You may update the data of the customer. *Exception 2: No customer first/last name exists in the system* 2.3. Enter whole customer number The system displays the customer data in the Record potential customer – use case 2. You may update the data of the customer. *Exception 3: No customer number exists in the system* *Processing rule P2-3*

UC02 Record potential customer

Selection 4: View and print report of customer list

Precondition
The data of customers have already existed in the system.

Results
Report of customer list

Scenario (flow of activities)
1. Select Record potential customer – use case 2 The system activates the Record potential customer – use case 2, and displays the company name, and an empty template with the following fields: customer first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email.
2. Select List product The control goes to the List customer – sub use case 2.2. And the system displays a report of customer list with detail information.
3. Print report of customer list The report of customer list is printed out in Print report – sub use case 1.3

UC02 Record potential customer

Sub use case 2.1 – Browse customer descriptions

Overview
With this sub use case, you may see a list of customers with the same whole or partial first/last name, browse the list and select customer that you want.

Precondition
There may be many customers with the same whole or partial first/last name in the system.

Results
A list of customer name and customer number, which have the same whole or partial first/last name given in the previous use case. A select customer name from the list.

Use case selection
Given in the previous use case 1. Find a customer using name = last name and first name. 2. Find a customer using name = first name. 3. Find a customer using name = last name. 4. Find a customer using name = partial first name (like T* or Thu*) 5. Find a customer using name = partial last name (like N* or Nguy*)

Description
Selection 1: The system displays a list of all customers in the Browse customer – sub use case 2.1, which has the same last names and first names Selection 2: The system displays a list of all customers in the Browse customer – sub use case 2.1, which has the same first names. Selection 3: The system displays a list of all customers in the Browse customer – sub use case 2.1, which has the same last names.

UC02 Record potential customer

Sub use case 2.1 – Browse customer descriptions (continue)

Description
Selection 4: The system displays a list of all customers in the Browse customer – sub use case 2.1, which first names match the partial first name. Selection 5: The system displays a list of all customers in the Browse customer – sub use case 2.1, which last names match the partial last name.
Select a customer The control returns to the previous use case and selected customer is in use in the previous use case.
Return The control returns to the previous use case without a selected customer.

Additional information
Screens: S2_1: Browse customer

UC02 Record potential customer

Sub use case 2.2 – List customer descriptions

A report of customer list with detail information

Overview
With this sub use case, you may view or print out a report of customer list with detail information.

Precondition
The data of customers have already existed in the system.

Results
Report of customer list with detail information

Use case selections
1. Print report

Description
Selection 1: A report of customer list with detail information is print out in Print report – sub use case 1.3.

Additional information
Screens: S2_2: List customer Printouts: P2_2: List customer

UC02 Record potential customer – use case

Business processing rules

Table 2.4.2: Record potential customer – use case business processing rule

No	Processing rules description	Used in
P2-1	- Same first name or/and last name may happen. - It is not allowed to have the same address. That means same address number, street, ward, district, and city. - It is not allowed to have same phone, cell, or email. - All fields are compulsory except ID card number, cell, and email. - ID number is in 12 digits.	UC02 – Selection 1
P2-2	- The first name, last name, customer number, ID card number can not be updated.	UC02 – Selection 2
P2-3	- Preliminary customer first names, last name, customer number, address number, street, ward, district, city, and phone. - Preliminary customer ID card number, cell, and email if any.	UC02 - Selection 3

2.4.3. UC03 Handle contract sale – use case

With this use case, you can make a new contract to the system; update, or view and print the existed contract; handle delivery for adding delivery, viewing and printing a report of delivery list or handle payment for adding payment, viewing and printing a report of payment list for the existed contract.

Use case diagram

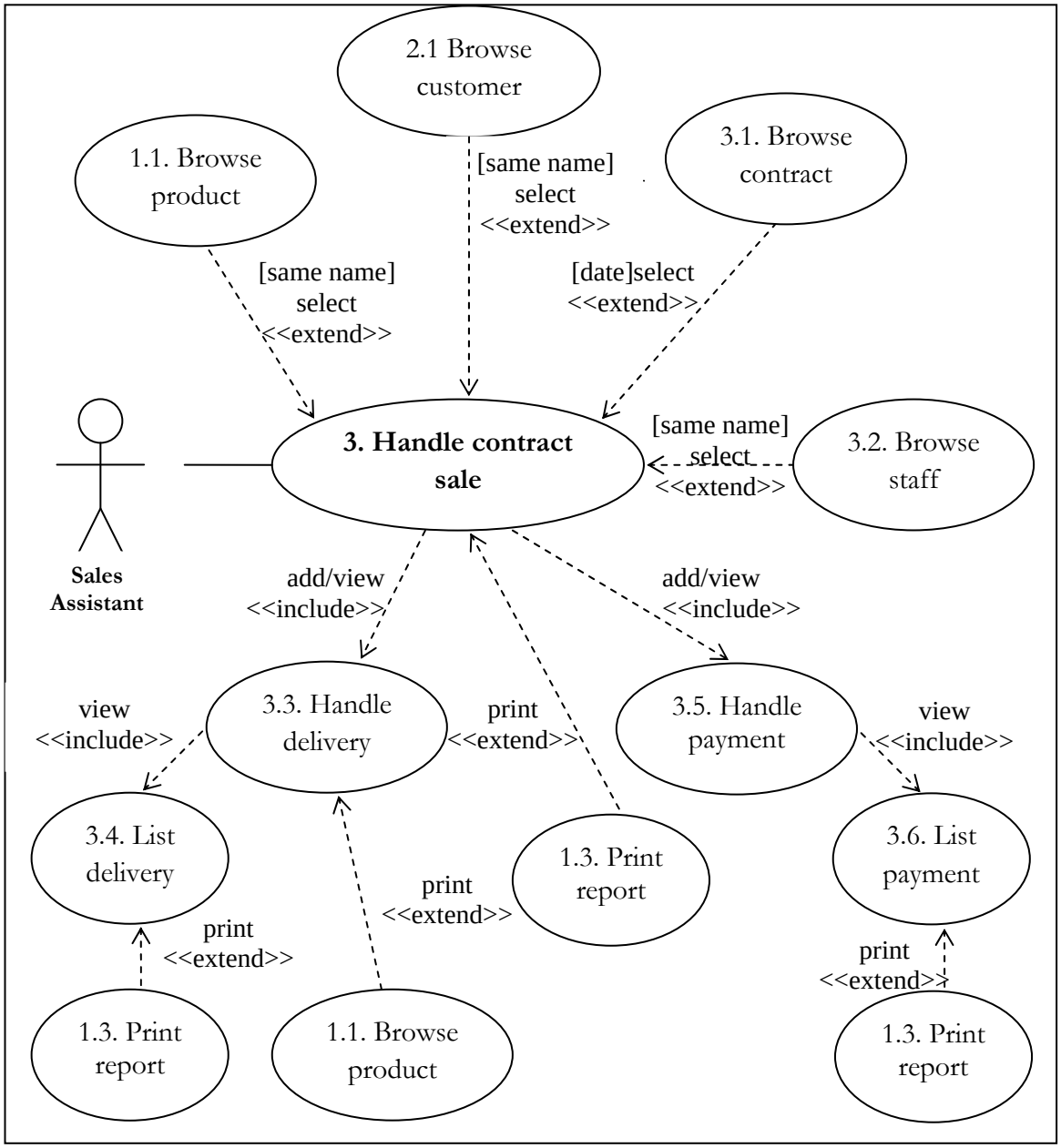


Figure 2.4.3: The use case diagram of Handle contract sale – use case

UC03 Handle contract sale – use case descriptions

Overview
With this use case, you can make a new contract to the system; update, or view and print the existed contract; handle delivery for adding delivery, viewing and printing a report of delivery list or handle payment for adding payment, viewing and printing a report of payment list for the existed contract.

Use case selections
1. Make a new contract 2. Update a contract 3. View and print a contract 4. Handle delivery for adding delivery, viewing and printing a report of delivery list 5. Handle payment for adding payment, viewing and printing a report of payment list

Actors	**Usage**
Sales Assistant	-

Usability requirement

Additional information
Screens: S3: Handle contract sale S1_1: Browse product S2_1: Browse customer S3_1: Browse contract S3_2: Browse staff S3_3: Handle delivery S3_4: List delivery S3_5: Handle payment S3_6: List payment Printouts: P3: Contract P3_4: List delivery P3_6: List payment

UC03 Handle contract sale

Selection 1: Make a new contract

Precondition
The data of customer, product, and staff have already existed in the system.

Results
Accepted contract. A contract number is generated by the system.

Scenario (flow of activities)
1. Select Handle contract sale – use case 3 The system activates the Handle contract sale – use case 3, and displays the company name, and an empty template with the following fields: - Customer data: first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email. - Contract data: contract number, contract date, contract creation date, payment due date, delivery due date, terms and conditions, contract total amount. - Staff data: first name, last name, position. - Product data: product name, contract price, contract quantity, product sum.
2. Select a customer: 2.1. Enter partial customer first/last name and find customer name - If there is only one customer with the same partial first/last name The system displays the customer data in the Handle contract sale – use case 3. - If there are many customers with the same partial first/last name The system displays a list of customers in the Browse customer – sub use case 2.1 Select the customer from the list. The system displays the customer data in the Handle contract sale – use case 3. *Exception 1: No partial customer first/last name exists in the system*

UC03 Handle contract sale

Selection 1: Make a new contract (continue 1)

Scenario (flow of activities)
2.2. Enter whole customer first/last name The system displays the customer data in the Handle contract sale – use case 3. *Exception 2: No customer first/last name exists in the system* 2.3. Enter whole customer number The system displays the customer data in the Handle contract sale – use case 3. *Exception 3: No customer number exists in the system*
3. Select a staff (representative) 3.1. Enter partial staff first/last name and find staff name - If there is only one staff with the same partial first/last name The system displays the staff data in the Handle contract sale – use case 3. - If there are more than one staffs the same partial first/last name The system displays a list of staffs in the Browse staff – sub use case 3.2 Select the staff from the list. The system displays the staff data in the Handle contract sale – use case 3. *Exception 1: No partial staff first/last name exists in the system* 3.2. Enter whole staff first/last name The system displays the staff data in the Handle contract sale – use case 3. *Exception 2: No staff first/last name exists in the system*

UC03 Handle contract sale

Selection 1: Make a new contract (continue 2)

Scenario (flow of activities)
3.3. Enter whole staff number The system displays the staff data in the Handle contract sale – use case 3. *Exception 3: No staff number exists in the system*
4. Select a product 4.1. Enter partial product name and find product name - If there is only one product with the same partial name The system displays the product data in the Handle contract sale – use case 3. - If there are many products with the same partial name The system displays a list of products in the Browse product – sub use case 1.1 Select the product from the list The system displays the product data in the Handle contract sale – use case 3. *Exception 1: No partial product name exists in the system* 4.2. Enter whole product name The system displays the product data in the Handle contract sale – use case 3. *Exception 2: No product name exists in the system*
5. Enter product quantity and accept the selected product The system displays the product sum. The contract total amount is added.
6. Repeat step 4 and 5 for each contract product until adding the last one.

UC03 Handle contract sale

Selection 1: Make a new contract (continue 3)

Scenario (flow of activities)
7. Enter other contract data: contract date (sign), payment due date, delivery due date, terms and conditions and add contract The system adds all entered and selected data above into database as a new contract sale data. The system generates a new contract number and displays the contract creation date. *Processing rule P3-1*

UC03 Handle contract sale

Selection 2: Update a contract

Precondition
The data of customer and contract sale have already existed in the system.

Results
Updated data of the contract.

Scenario (flow of activities)
1. Select Handle contract sale – use case 3 The system activates the Handle contract sale – use case 3, and displays the company name, and an empty template with the following fields: - Customer data: first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email. - Contract data: contract number, contract date, contract creation date, payment due date, delivery due date, terms and conditions, contract total amount. - Staff data: first name, last name, position. - Product data: product name, contract price, contract quantity, product sum.
2. Select a customer: see the scenario at step 2 in Selection 1: Make a new contract. This step can be skipped, if the Sales Assistant remembers the contract number exactly.
3. Select a contract 3.1. Enter whole contract number The system displays the contract sale data in the Handle contract sale – use case 3 3.2. Enter partial contract number - If there is only one contract with the same partial number The system displays the contract sale data in the Handle contract sale – use case 3.

UC03 Handle contract sale

Selection 2: Update a contract (continue)

Scenario (flow of activities)
- If there are many contracts with the same partial number The system displays a list of contract in the Browse contract – sub use case 3.1. Select the contract from the list The system displays the contract sale data in the Handle contract sale – use case 3. *Exception 1: No contract number exists in the system*
4. Enter and accept the new data The system updates and displays the new data in the Handle contract sale – use case 3. *Processing rule P3-2*

UC03 Handle contract sale

Selection 3: View and print a contract

Precondition
The data of customer and contract sale have already existed in the system.

Results
An accepted contract.

Scenario (flow of activities)
1. Select Handle contract sale – use case 3 The system activates the Handle contract sale – use case 3, and displays the company name, and an empty template with the following fields: - Customer data: first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email. - Contract data: contract number, contract date, contract creation date, payment due date, delivery due date, terms and conditions, contract total amount. - Staff data: first name, last name, position. - Product data: product name, contract price, contract quantity, product sum.
2. Select a customer: see the scenario at step 2 in Selection 1: Make a new contract. This step can be skipped, if the Sales Assistant remembers the contract number exactly.
3. Select a contract: see the scenario at step 3 in Selection 2: Update a new contract.
4. Select view contract The system display a contract view as same as the data in step 3 above.
5. Print a contract The contract is printed out in Print report – sub use case 1.3 *Processing rule P3-3*

UC03 Handle contract sale

Selection 4: Handle delivery for adding delivery, viewing and printing a report of delivery list

Precondition
The data of customer and contract sale have already existed in the system. The customer and contract have been selected

Results
An empty template for handling delivery

Scenario (flow of activities)
1. Select Handle contract sale – use case 3 The system activates the Handle contract sale – use case 3, and displays the company name, and an empty template with the following fields: - Customer data: first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email. - Contract data: contract number, contract date, contract creation date, payment due date, delivery due date, terms and conditions, contract total amount. - Staff data: first name, last name, position. - Product data: product name, contract price, contract quantity, product sum.
2. Select a customer: see the scenario at step 2 in Selection 1: Make a new contract.
3. Select a contract: see the scenario at step 3 in Selection 2: Update a new contract.
4. Select Handle delivery The control go to Handle delivery – sub use case 3.3 And the system displays an empty template for handling delivery *Processing rule 3-4*

UC03 Handle contract sale

Selection 5: Handle payment for adding payment, viewing and printing a report of payment list

Precondition
The data of customer and contract sale have already existed in the system. The customer and contract have been selected

Results
An empty template for handling payment

Scenario (flow of activities)
1. Select Handle contract sale – use case 3 The system activates the Handle contract sale – use case 3, and displays the company name, and an empty template with the following fields: - Customer data: first name, last name, customer number, ID card number, phone number, mobile, address number, street, ward, district, city, and email. - Contract data: contract number, contract date, contract creation date, payment due date, delivery due date, terms and conditions, contract total amount. - Staff data: first name, last name, position. - Product data: product name, contract price, contract quantity, product sum.
2. Select a customer: see the scenario at step 2 in Selection 1: Make a new contract.
3. Select a contract: see the scenario at step 3 in Selection 2: Update a new contract.
4. Select Handle payment The control go to Handle payment – sub use case 3.5 And the system displays an empty template for handling payment *Processing rule 3-5*

UC03 Handle contract sale

Sub use case 3.1 – Browse contract descriptions

Overview
With this sub use case, you may see a list of contracts with the same partial contract number, browse the list and select contract that you want.

Precondition
There may be many contracts with the same partial contract number in the system.

Results
A list of contract numbers, which have the same partial contract number given in the previous use case. A select contract number from the list.

Use case selection
Given in the previous use case 1. Find a contract using number = partial contract number (like 0* or 02*)

Description
Selection 1: The system displays a list of all contracts in the Browse contract – sub use case 3.1, which has the same partial contract number.
Select a contract The control returns to the previous use case and selected contract is in use in the previous use case.
Return The control returns to the previous use case without a selected contract.

Additional information
Screens: S3_1: Browse contract

UC03 Handle contract sale

Sub use case 3.2 – Browse staff descriptions

Overview
With this sub use case, you may see a list of staffs with the same whole or partial name, browse the list and select staff that you want.

Precondition
There may be more than one staffs with the same whole or partial first/last name in the system.

Results
A list of staff name with position, which have the same first/last partial name given in the previous use case. A select staff name from the list.

Use case selection
Given in the previous use case 1. Find a staff using name = last name and first name. 2. Find a staff using name = first name. 3. Find a staff using name = last name. 4. Find a staff using name = partial first name (like H* or Han*) 5. Find a staff using name = partial last name (like P* or Phu*)

Description
Selection 1: The system displays a list of all staffs in the Browse staff – sub use case 3.2, which has the same last names and first names Selection 2: The system displays a list of all staffs in the Browse staff – sub use case 3.2, which has the same first names. Selection 3: The system displays a list of all staffs in the Browse staff – sub use case 3.2, which has the same last names. Selection 4: The system displays a list of all staffs in the Browse staff – sub use case 3.2, which first names match the partial first name. Selection 5: The system displays a list of all staffs in the Browse staff – sub use case 3.2, which last names match the partial last name.

UC03 Handle contract sale

Sub use case 3.2 – Browse staff descriptions (continue)

Description	
Select a staff	The control returns to the previous use case and selected staff is in use in the previous use case.
Return	The control returns to the previous use case without a selected staff.

Additional information
Screens: S3_2: Browse staff

UC03 Handle contract sale

Sub use case 3.3 – Handle delivery descriptions

Overview
With this sub use case, you may add delivery to the system, or get report of delivery list.

Precondition
The customer and the contract have been selected. The quantity in stock has enough for the delivery.

Results
An accepted delivery. The quantity of the product in contract sale and in stock is subtracted. Report of delivery list.

Use case selections
1. Add a delivery 2. Get report of delivery list

Scenario
Selection 1: Add a delivery 1.1. Select a product 1.1.1. Enter partial product name and find product name - If there is only one product with the same partial name The system displays the product data in the Handle delivery – sub use case 3.3.

UC03 Handle contract sale

Sub use case 3.3 – Handle delivery descriptions (continue 1)

Scenario
- If there are many products with the same partial name The system displays a list of products in the Browse product – sub use case 1.1 Select the product from the list The system displays the product data in the Handle delivery – sub use case 3.3. *Exception 1: No partial product name exists in the system* 1.1.2. Enter whole product name The system displays the product data in the Handle delivery – sub use case 3.3. *Exception 2: No product name exists in the system* 1.2. Enter delivery quantity and accept the selected product The system displays next line for selecting the next product in the same delivery 1.3. Repeat step 1.1 and step 1.2 as many products added as necessary in the same delivery. 1.4. Enter receipt number, delivery date and add delivery The system adds a new delivery. The quantities of the products in contract sale and in stock are subtracted. Other deliveries will be repeated this selection as many time as this delivery ends. *Exception 1: Delivery quantity can not add when the delivery quantity is more than the quantity in stock.*

UC03 Handle contract sale

Sub use case 3.3 – Handle delivery descriptions (continue 2)

Scenario
Selection 2: Get report of delivery list Select List delivery The control goes to List delivery – sub use case 3.4 And the system displays a report of delivery list *Exception 2: Report of delivery list does not display if there is no delivery.* *Processing rule 3-6*

Additional information
Screens: S3_3: Handle delivery S1_1: Browse product

UC03 Handle contract sale

Sub use case 3.4 – List delivery descriptions

Overview
With this sub use case, you may view or print out a report of delivery list with detail information.

Precondition
The customer and contract have been selected. The data of deliveries of the selected customer and contract have already existed in the system.

Results
Report of delivery list with detail information

Use case selections
1. Print report

Description
Selection 1: A report of delivery list with detail information is print out in Print report – sub use case 1.3.

Additional information
Screens: S3_4: List delivery Printouts: P3_4: List delivery

UC03 Handle contract sale

Sub use case 3.5 – Handle payment descriptions

Overview
With this sub use case, you may add payment to the system, or get report of payment list.

Precondition
The customer and the contract have been selected.

Results
An accepted payment. The current debt of the customer is subtracted. Report of payment list.

Use case selections
1. Add payment 2. Get report of payment list

Scenario
Selection 1: Enter payment data and add payment The current debt of the customer is subtracted. Other payments in the same contract will be repeated this step as many time as this payment ends. Selection 2: Select List payment The control go to List payment – sub use case 3.6 And the system displays a report of payment list. *Exception 1: Report of payment list does not display if there is no payment.* *Processing rule 3-6*

Additional information
Screens: S3_5: Handle payment

UC03 Handle contract sale

Sub use case 3.6 – List payment descriptions

Overview
With this sub use case, you may view or print out a report of payment list with detail information.

Precondition
The customer and contract have been selected. The data of payments of the selected customer and contract have already existed in the system.

Results
Report of payment list with detail information

Use case selections
1. Print report

Description
Selection 1: A report of payment list with detail information is print out in Print report – sub use case 1.3.

Additional information
Screens: S3_6: List payment Printouts: P3_6: List payment

UC03 Handle contract sale – use case

Business processing rules

Table 2.4.3: Handle contract sale – use case business processing rule

No	Processing rules description	Used in
P3-1	- Preliminary customer number, first name, last name, ID card number, address number, street, ward, district, city, phone or cell. - Preliminary staff first and last name, address number, street, ward, district, city, phone, position. - Preliminary product name, product number, contract price. - Current quantity in stock can be less than quantity in contract when making a contract - All fields in the contract template are compulsory. - The contract price can not be edited. - The quantity should be more than "1", and positive number - Amount is equal to contract price multiplies contract quantity. - Contract total amount is all product sums - Contract date cannot be earlier than the contract creation date. - Delivery due date and payment due date should be at least one date later than the contract date. - Contract number is generated by the system and next after the previous contract.	UC03 – Selection 1
P3-2	- Contract can not be updated after adding delivery or payment.	UC03 – Selection 2
P3-3	- This contract template shows as report which can not be changed, only read and print out.	UC03 – Selection 3
P3-4	- Customer should have at least one a contract sale with the company.	UC03 – Selection 4

Table 2.4.3: Handle contract sale – use case business processing rule (continue)

No	Processing rules description	Used in
P3-5	- Customer should have at least one a contract sale with the company.	UC03 – Selection 5
P3-6	- All fields in template are compulsory. - Delivery due date is still valid. Otherwise, the system displays the delivery due date in red colour after adding the delivered quantity to the system. - Delivered quantity should be less than remnant quantity. - Contract should be in valid, that means the delivery has not been finished even delivery due date is over.	UC03 – Selection 4 Sub use case 3.3 – Selection 1
P3-7	- All fields in template are compulsory. - Payment due date is still valid. Otherwise, the system displays the payment due date in red colour after adding the payment sum to the system. - Payment sum should be less than the current debt. - Contract should be in valid, that means the payment has not been finished even payment due date is over.	UC03 – Selection 5 Sub use case 3.5 – Selection 1

3. Business class model

The purpose of this model is to show business entities, which are needed in the Sales Management System and its use cases. No data transfer components are seen here.

The business class model contains a class diagram, class description, and state diagram. In this document, only the business class diagram and description of Sales Management Process for Contract Sale and the Standalone classes of Counter, Company and Staff are described in detail.

The class diagram describes classes and their relationships, the main attributes and operations of the classes.

The business class model descriptions are as follows:

The business class diagrams are following:

1. Business class description of Sales Management Process _ described later.
2. Business class description of Sales Management Process (Payment) _ described later.
3. **Business class description of Sales Management Process (Contract sale)**
4. Business class description of Sales Management Process (Wholesale) _ described later.
5. Business class description of Sales Management Process (Retail) _ described later.
6. Business class description of Sales Management Process (Delivery) _ described later.
7. Business class description of Sales Management Process (Returned product) _ described later.
8. Standalone classes of Counter, Company and Staff.

Business class description:

1. The description of Company
2. The description of ContractDelivery
3. The description of ContractDeliveryProduct
4. The description of ContractProduct
5. The description of ContractSale
6. The description of Counter
7. The description of Customer
8. The description of Delivery
9. The description of Feedback (described later)
10. The description of Payment
11. The description of Product
12. The description of Retail (described later)
13. The description of RetailDelivery (described later)
14. The description of RetailDeliveryProduct (described later)
15. The description of RertailProduct (described later)
16. The description of ReturnedProduct (described later)
17. The description of Staff
18. The description of Stock
19. The description of StockEvent
20. The description of Wholesale (described later)
21. The description of WholesaleDelivery (described later)
22. The description of WholesaleDeliveryProduct (described later)
23. The description of WholesaleProduct (described later)

Business class state diagrams

State diagram of Contract

Business activity

State diagram

Business class diagram of the Sales Management Process

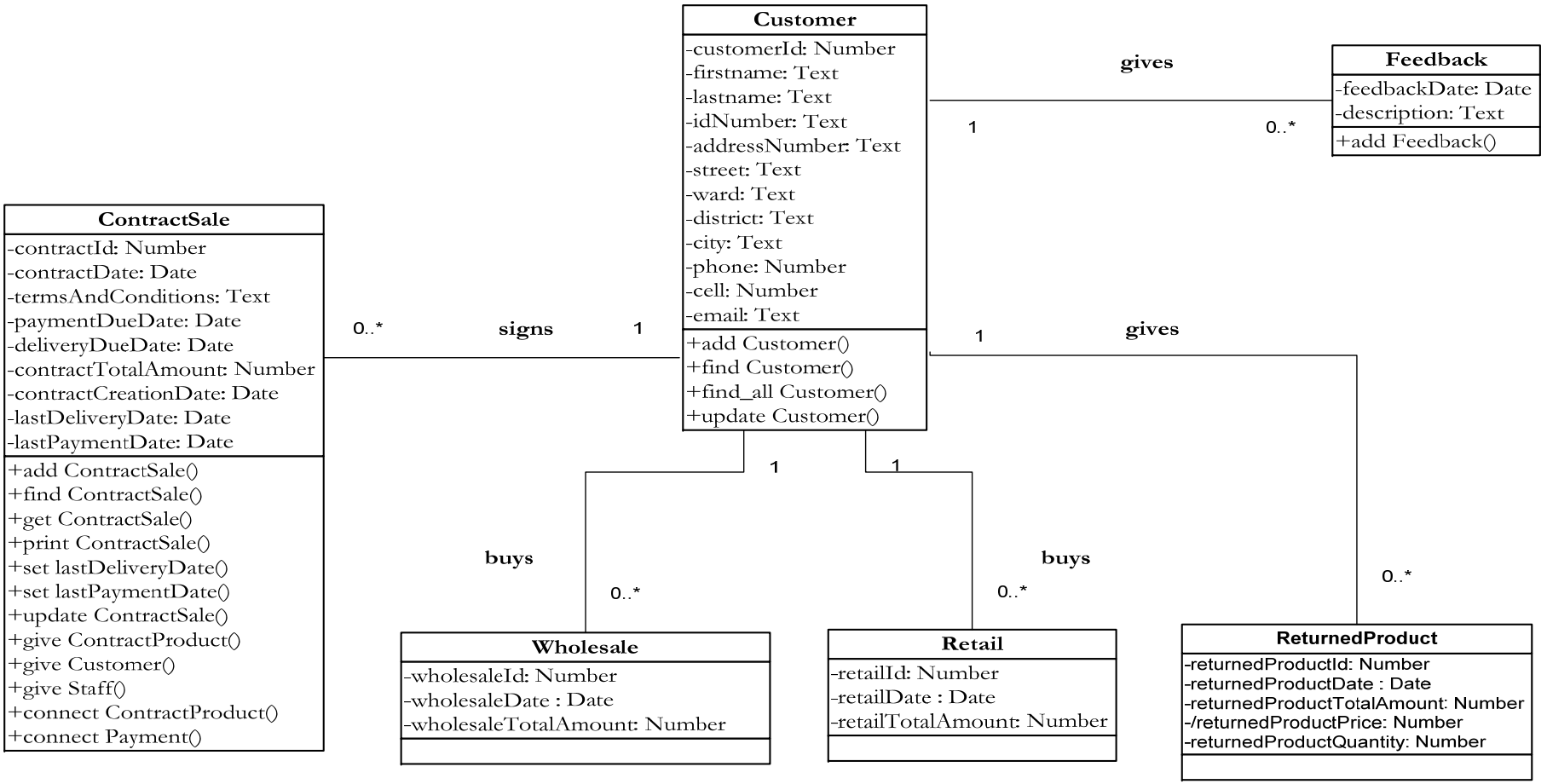


Figure 3.1.1: Business class diagram of the Sales Management Process

3.1.2. Business class diagram of the Sales Management Process (Payment)

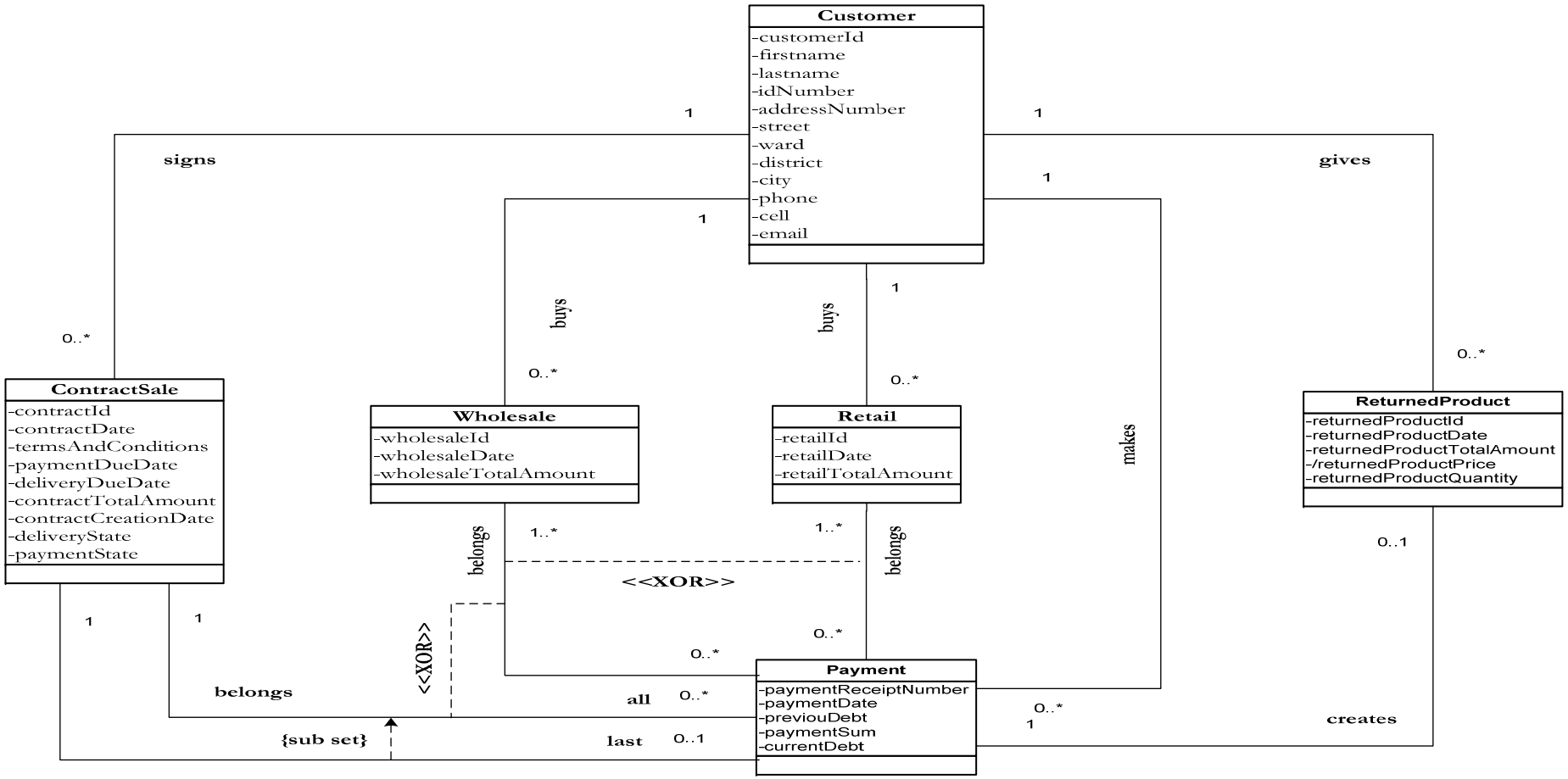


Figure 3.1.2: Business class diagram of the Sales Management Process (Payment)

3.1.3. Business class diagram of the Sales Management Process (Contract sale)

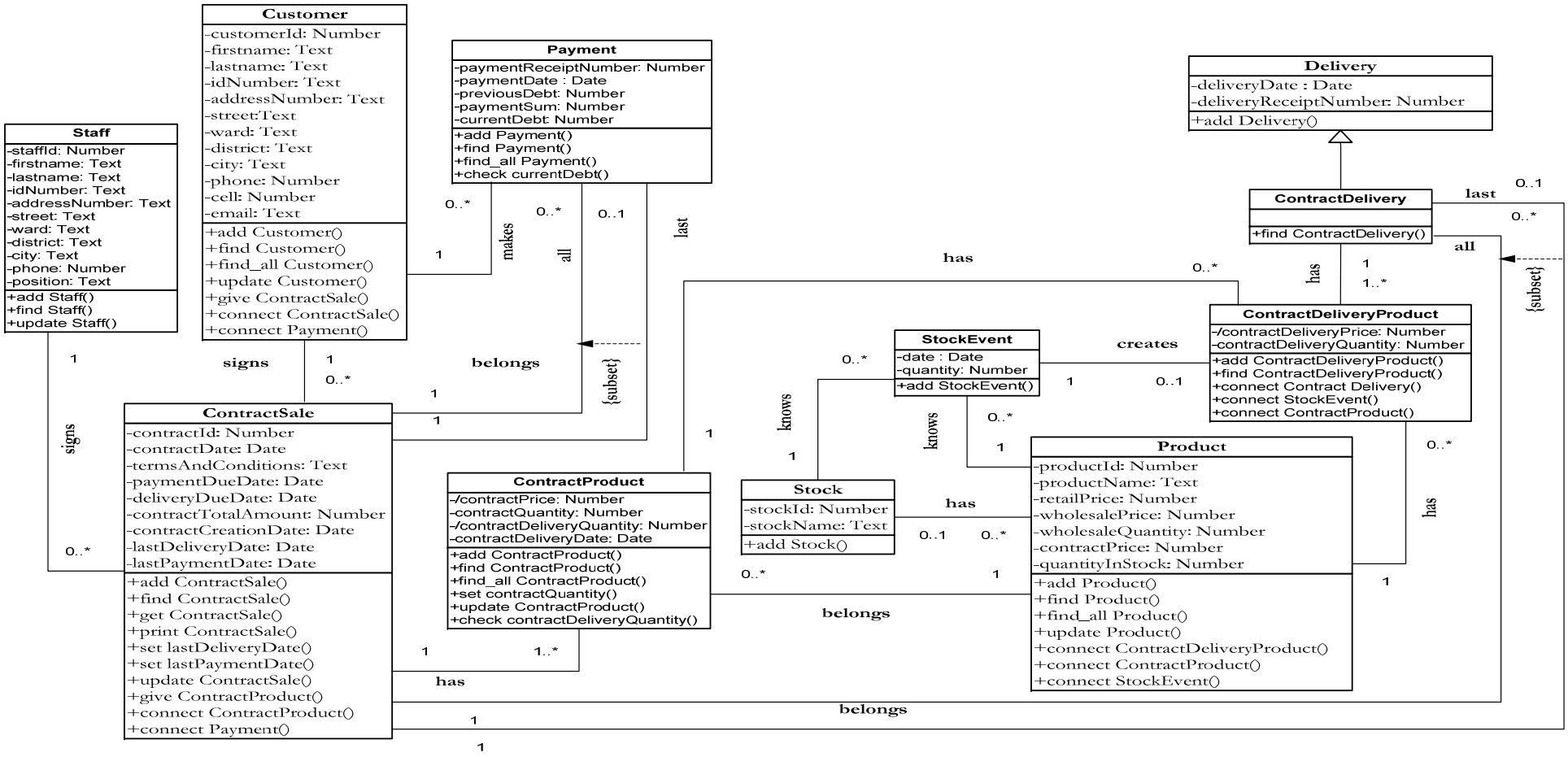


Figure 3.1.3: Business class diagram of the Sales Management Process (Contract sale)

3.1.4. Business class diagram of the Sales Management Process (Wholesale)

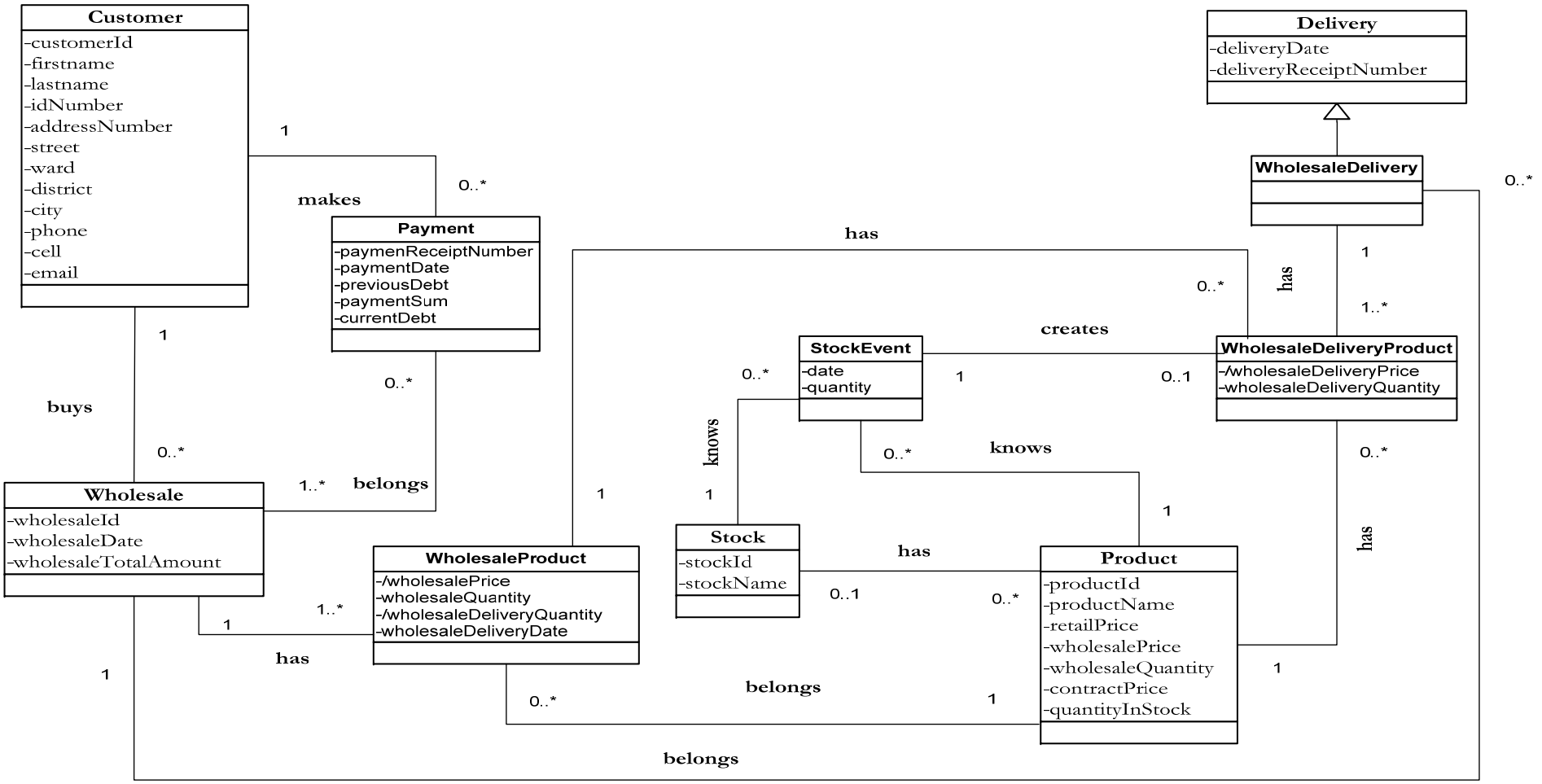


Figure 3.1.4: Business class diagram of the Sales Management Process (Wholesale)

3.1.5. Business class diagram of the Sales Management Process (Retail)

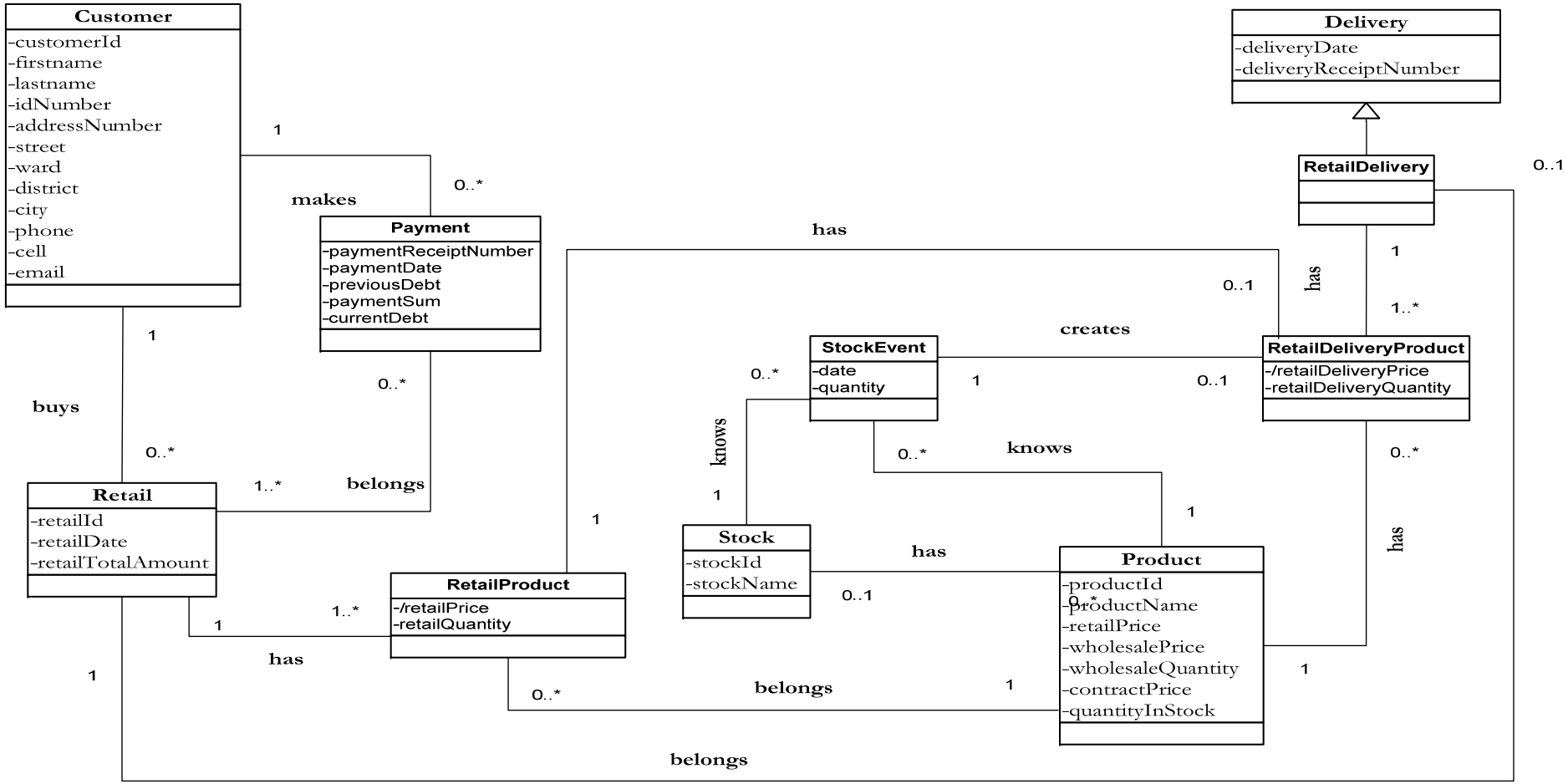


Figure 3.1.5: Business class diagram of the Sales Management Process (Retail)

3.1.6. Business class diagram of the Sales Management Process (Delivery)

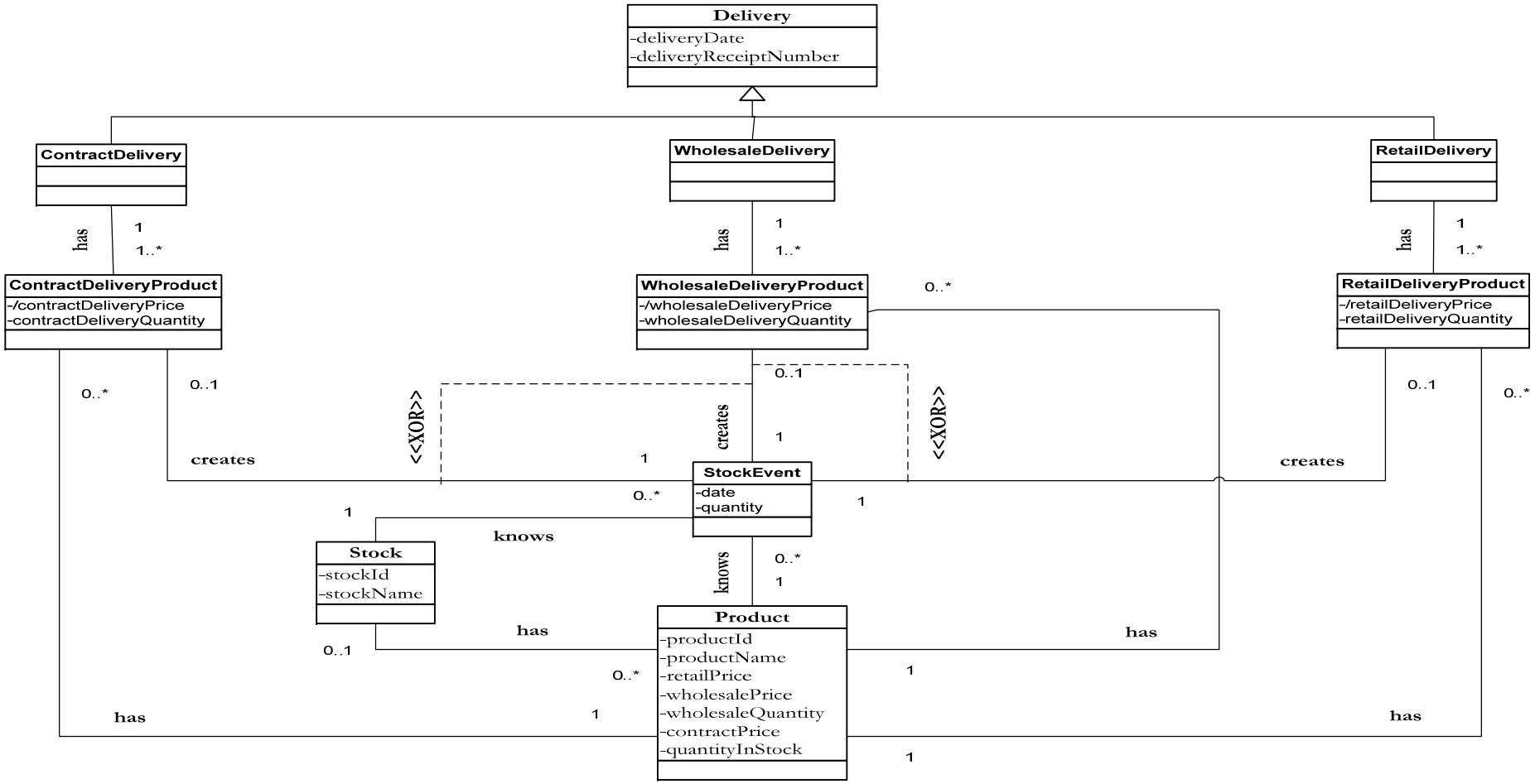


Figure 3.1.6: Business class diagram of the Sales Management Process (Delivery)

3.1.7. Business class diagram of the Sales Management Process (Returned product)

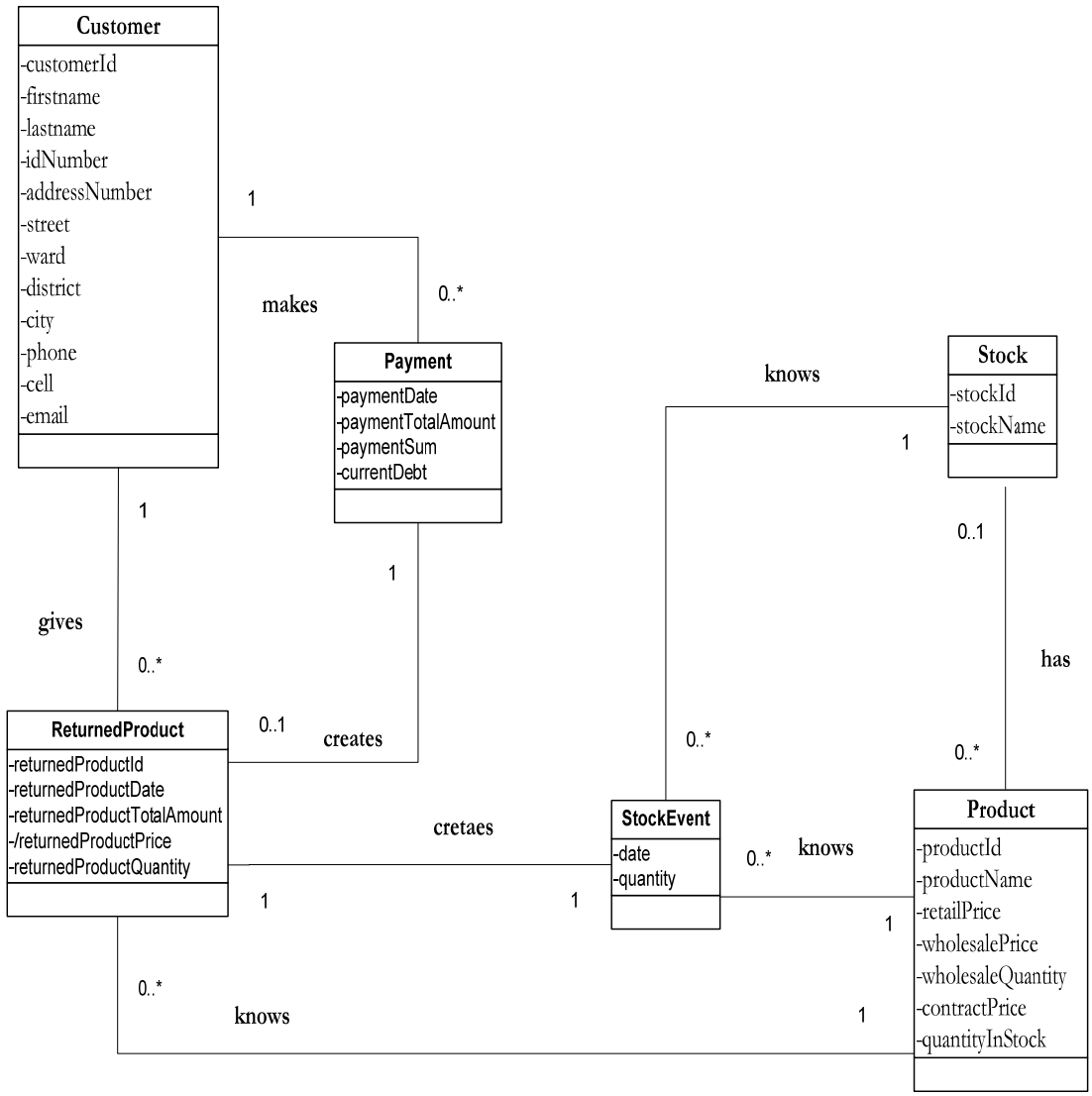


Figure 3.1.7: Business class diagram of the Sales Management Process (Returned product)

3.1.8. Standalone classes of Counter, Company and Staff

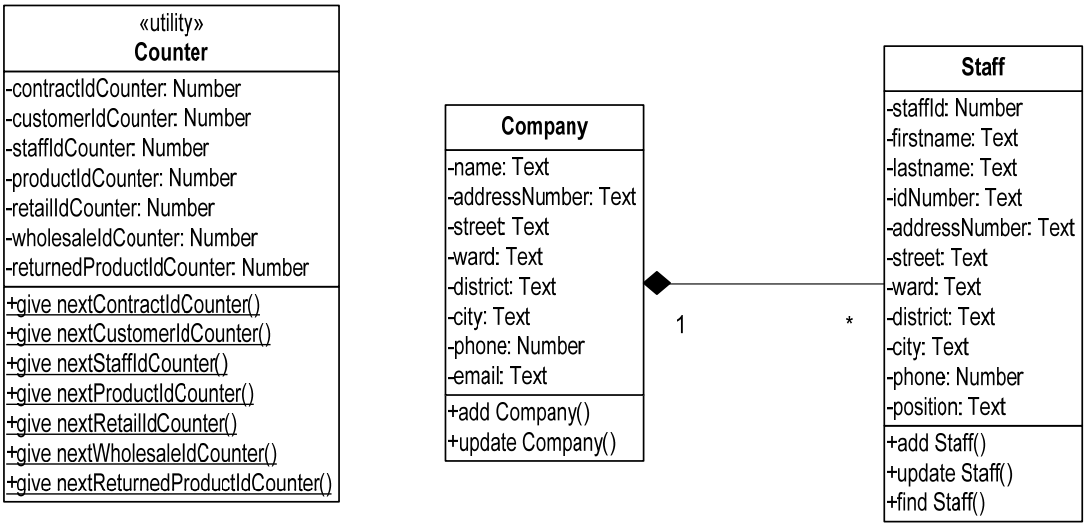


Figure 3.1.8: Standalone classes of Counter, Company and Staff

3.2. Business class description

3.2.1. The description of Company

Class name	Company
Specification	Company is a business enterprise trading motorcycle spare-parts.
Superclass	-

Attributes			
	name: Text	Company's name	COMPANY NAME
	addressNumber: Text	Address number where the company is located	COMPANY ADDRESS NUMBER
	street: Text	Street name where the company is located	COMPANY STREET
	ward: Text	Ward number/name where the company is located	COMPANY WARD
	district: Text	District number/name where the company is located	COMPANY DISTRICT
	city: Text	City where company is located	COMPANY CITY
	phone: Number	Company's line phone number	COMPANY PHONE NUMBER
	email: Text	Company's email address	COMPANY EMAIL

Associations	One Company is composed by many Staffs

Responsibilities	knows its own
Operations	add Company (name, addressNumber, street, ward, didtrict, city, phone, email) Create new Company object, initialize attribute values and set attribute values

The description of Company (continue)

Operations	update Company (addressNumber, street, ward, district, city, phone, email) Update Company object, set attribute values.

3.2.2. The description of ContractDelivery

Class name	ContractDelivery
Specification	ContractDelivery tells that the delivery type belongs to contract. It also tells which contract delivery belongs to which contract sale.
Superclass	Delivery

Attributes	-	

Associations	The association to ContractSale class Each ContractDelivery has one ContractSale. The association to ContractDeliveryProduct class Each ContractDelivery has at least one ContractDeliveryProduct.

Responsibilities	knows its ContractSale knows its ContractDeliveryProduct
Operations	find ContractDelivery(contractDelivery) Search the ContractDelivery by object Id

3.2.3. The description of ContractDeliveryProduct

Class name	ContractDeliveryProduct
Specification	ContractDeliveryProduct is holding information about the amount of money calculated according to contract delivery quantity and contract price of a product for every contract delivery that tells which contract delivery product belongs to which contract delivery that also means that how many contract delivery products include in one contract delivery.
Superclass	-

Attributes	/contractDeliveryPrice: Number	Calculate price of per contract delivery product for every delivery of a contract sale	CONTRACT DELIVERY PRODUCT AMOUNT
	contractDeliveryQuantity: Number	Quantity per product for every delivery in a contract sale	CONTRACT PRODUCT DELIVERY QUANTITY

Associations	The association to ContractDelivery class Each ContractDeliveryProduct belongs to only one ContractDelivery. The association to ContractProduct class Each ContractDeliveryProduct belongs to one ContractProduct. The association to Product class Each ContractDeliveryProduct holds information about one Product. The association to StockEvent class Each ContractDeliveryProduct belongs to one StockEvent.

The description of ContractDeliveryProduct (continue)

Responsibilities	knows its ContractDelivery knows its ContractProduct knows its Product knows its StockEvent
Operations	add ContractDeliveryProduct(/contractDeliveryPrice, contractDeliveryQuantity) Create new ContractDeliveryProduct object, initialize attribute values and set attribute values find ContractDeliveryProduct(delivery) Find the contractDeliveryProduct by given Delivery object Id connect ContractDelivery(contractDelivery) Make a link between the current ContractDeliveryProduct and the ContractDelivery object connect ContractProduct(contractProduct) Make a link between the current ContractDeliveryProduct and the ContractProduct object connect StockEvent(StockEvent) Make a link between the current ContractDeliveryProduct and the StockEvent object.

3.2.4. The description of ContractProduct

Class name	ContractProduct
Specification	ContractProduct is holding information about the amount of money calculated according to a contract quantity and contract price of a product in a contract sale that tells which contract product belongs to which contract sale. It holds information about the delivered quantity and date of each product in the contract sale. It also knows whether the total delivery quantity of the contract is delivered or not to notice the contract sale last delivery.
Superclass	-

Attributes	/contractPrice: Number	Calculate price of a contract product for the contract sale	PRODUCT SUM
	contractQuantity: Number	Quantity per product in the contract sale	CONTRACT PRODUCT QUANTITY
	/contractDelivery Quantity: Number	Calculate the remnant quantity of a delivered contract product for the contract sale	CONTRACT PRODUCT DELIVERY QUANTITY
	contractDeliveryDate: Date	Date of a delivered contract product to Customer	CONTRACT DELIVERY DATE

Associations	The association to ContractSale class Each ContractProduct belongs to only one ContractSale. The association to ContractDeliveryProduct class Each ContractProduct may have many ContractDeliveryProducts or not at all.

The description of ContractProduct (continue)

Associations	The association to Product class Each ContractProduct belongs to only one Product.

Responsibilities	knows its ContractSale knows its ContractDeliveryProduct knows its Product
Operations	add ContractProduct(/contractPrice, contractQuantity) Create new ContractProduct object, initialize attribute values and set attribute values find ContractProduct(contractSale) Find data of the contractProduct by given ContractSale object Id find_all ContractProduct(contractSale) Find data of all contractProducts by given ContractSale object Id set contractQuantity() Set the contractQuantity value to ContractProduct. update ContractProduct(contractDeliveryDate, /contractDeliveryQuantity) Update ContractSale object, set attribute values. check contractDeliveryQuantity() Check the remnant contractDeliveryQuantity of a product for the last Delivery date.

3.2.5. The description of ContractSale

Class name	ContractSale
Specification	ContractSale is an agreement sale on certain products based on a contract between the customer and the company.
Superclass	-

Attributes			
	contractId: Number	Unique identification number of a contract	CONTRACT NUMBER
	contractDate: Date	Signing date of a contract	CONTRACT DATE
	contractCreationDate : Date	System date making a contract	CONTRACT CREATION DATE
	termsAndConditions: Text	Terms and conditions of the contract	TERMS AND CONDITIONS
	paymentDueDate: Date	Due date for the last payment for the contract	PAYMENT DUE DATE
	deliveryDueDate: Date	Due date for the last delivery of the product	DELIVERY DUE DATE
	contractTotalAmount : Number	Total contract value	CONTRACT TOTAL AMOUNT
	lastDeliveryDate: Date	The last date of the last delivery for contract	LAST DELIVERY DATE
	lastPaymentDate: Date	The last date of the last payment for contract	LAST PAYMENT DATE

Associations	The association to ContractDelivery class Each ContractSale may have many ContractDeliverys or not at all. Each ContractSale may have one last ContractDelivery or not at all. The association to ContractProduct class Each ContractSale has at least one ContractProduct.

The description of ContractSale (continue 1)

Associations	The association to Customer class Each ContractSale is signed by only one Customer. The association to Payment class Each ContractSale may have many Payments or not at all. Each ContractSale may have one last Payment or not at all. The association to Staff class Each ContractSale is signed by only one Staff.

Responsibilities	knows its Customer knows its ContractProduct knows its Payment knows its Contract Delivery knows its Staff
Operations	add ContractSale(contractId, contractDate, contractCreationDate, termsAndConditions, paymentDueDate, DeliveryDueDate, contractTotalAmount) Create new ContractSale object, initialize attribute values and set attribute values Give a unique contractId find ContractSale(contractId) Find data of the ContractSale using contracteId. get ContractSale(contractSale) Give the ContractSale by object Id print ContractSale(contractSale) Print out the ContractSale by object Id

The description of ContractSale (continue 2)

Operations	set lastPaymentDate() Set lastPaymentDate value to the ContractSale. set lastDeliveryDate() Set lastDeliveryDate value to the ContractSale. update ContractSale(contractDate, contractCreationDate, termsAndConditions, delievryDueDate, paymentdueDate, contractTotalAmount) Update ContractSale object, set attribute values. give ContractProduct(contractProduct) Selected object gives all links to ContractProduct object, if own-links exists. connect ContractProduct(contractProduct) Make a link between the current ContractSale and the ContractProduct object. connect Payment(payment) Make a link between the current ContractSale and the Payment object.

3.2.6. The description of Counter<<utility>>

Class name	Counter <<utility>>
Specification	Counter is a utility class for giving a unique identification number to each new contract, or to each new customer, or to each new product, retail, wholesale, and returned product.
Superclass	-

Attributes			
	contractIdCounter: Number	Unique identification number of new contract	CONTRACT NUMBER COUNTER
	customerIdCounter: Number	Unique identification number of new customer	CUSTOMER NUMBER COUNTER
	staffIdCounter: Number	Unique identification number of new staff	STAFF NUMBER COUNTER
	productIdCounter: Number	Unique identification number of new product	PRODUCT NUMBER COUNTER
	retailIdCounter: Number	Unique identification number of new retail	RETAIL NUMBER COUNTER
	wholesaleIdCounter: Number	Unique identification number of new wholesale	WHOLESALE NUMBER COUNTER
	returnedProductId-Counter: Number	Unique identification number of a returned product	RETURNED-PRODUCT NUMBER COUNTER

Associations	-

The description of Counter <<utility>>

Responsibilities	knows its owner
Operations	give nextContractIdCounter() Check the last contract number and increase it by one. give nextCustomeIdCounter() Check the last customer number and increase it by one. give nextStaffIdCounter() Check the last staff number and increase it by one. give nextProductIdCounter() Check the last product number and increase it by one. give nextRetailIdCounter() Check the last retail number and increase it by one. give nextWholesaleIdCounter() Check the last wholesale number and increase it by one. give nextReturnedProductIdCounter() Check the last returned product number and increase it by one.

3.2.7. The description of Customer

Class name	Customer
Specification	Customer is a person, workshop or store that buys the company's products.
Superclass	-

Attributes			
	customerId: Number	Unique identification number of a customer	CUSTOMER NUMBER
	firstname: Text	First and middle name of a customer	CUSTOMER FIRSTNAME
	lastname: Text	Last name of a customer	CUSTOMER LASTNAME
	idNumber: Text	Identity card number of a customer	CUSTOMER ID CARD NUMBER
	addressNumber: Text	Address number where the customer resides	CUSTOMER ADDRESS NUMBER
	street: Text	Street name where the customer resides	CUSTOMER STREET
	ward: Text	Ward number/name where the customer resides	CUSTOMER WARD
	district: Text	District number/name where the customer resides	CUSTOMER DISTRICT
	city: Text	City where the customer resides	CUSTOMER CITY
	phone: Number	Customer's line phone number	CUSTOMER PHONE NUMBER
	cell: Number	Customer's mobile phone number	CUSTOMER CELL NUMBER
	email: Text	Customer's email address	CUSTOMER EMAIL

The description of Customer (continue 1)

Associations	The association to ContractSale class Each Customer may sign many ContractSales or not at all. The association to Payment class Each Customer may make many Payments or not at all *The association to Feedback class* *Each Customer may give many Feedbacks or not at all* *The association to Retail class* *Each Customer may buy many Retails or not at all* *The association to ReturnedProduct class* *Each Customer may give many ReturnedProducts or not at all* *The association to Wholesale class* *Each Customer may buy many Wholesales or not at all.*

Responsibilities	knows its ContractSale knows its Payment
Operations	add Customer(customerId, firstname, lastname, idNumber, addressNumber, street, ward, district, city, phone, cell, email) Create new Customer object, initialize attribute values and set attribute values Give a unique customeId find Customer(customerId) Find data of the customer using customerId find Customer(name) Find the data of the customer using name (first name and/or lastname)

The description of Customer (continue 2)

Operations	find_all Customer(customer) Find data of all customer object Id. update Customer(addressNumber, street, ward, district, city, phone, cell, email) Update Customer object, set attribute values. give ContractSale(contractSale) Selected object gives all links to ContractSale object, if own-links exists. connect ContractSale(contractSale) Make a link between the current Customer and the ContractSale object. connect Payment(payment) Make a link between the current Customer and the Payment object.

3.2.8. The description of Delivery

Class name	Delivery
Specification	Delivery is a distribution of product from the company to the customers.
Superclass	-

Attributes	deliveryDate: Date deliveryReceiptNumber: Text	Date of delivered product to customer Receipt number of the delivery	DELIVERY DATE DELIVERY RECEIPT NUMBER

Associations	Superclass of ContractDelivery,WholesaleDelivery, and RetailDelivery

Responsibilities	
Operations	add Delivery(deliveryDate, deliveryReceiptNumber) Create new Delivery object, initialize attribute values and set attribute values.

3.2.9. The description of Feedback

Class name	Feedback
Specification	Feedback is the returned information, opinion or idea from the customers about a specific product to the company.
Superclass	-

Attributes	feedbackDate description	Date of given feedback Information in details about product	FEEDBACK DATE DESCRIPTION OF FEEDBACK

Associations	The association to Customer class Each Feedback is given by only one Customer

Responsibilities	
Operations	

3.2.10. The description of Payment

Class name	Payment
Specification	Payment is sum of money paid by the customers to the company. It is also a sum created by a returned product.
Superclass	-

Attributes			
	paymentReceiptNum-ber: Number	Receipt number of the payment	PAYMENT RECEIPT NUMBER
	paymentDate: Date	Date when a customer pays	PAYMENT DATE
	previousDebt: Number	The debt that the customer owes the company at last time (previousDebt = the last currentDebt)	PREVIOUS DEBT
	paymentSum: Number	Sum of money that customer pays to the company or sum of value of returned product	PAYMENT SUM
	currentDebt: Number	The latest debt of the customer after buying products or making payment (currentDebt = previousDebt – paymentSum)	CURRENT DEBT

Associations	The association to Customer class Each Payment is made by only one Customer. The association to ContractSale class Each Payment may belong to only one ContractSale.

The description of Payment (continue)

Associations	The association to Retail class Each Payment may belong to at least one Retail sale. The association to Wholesale class Each Payment may belong to at least one Wholesale. The association to ReturnedProduct class Each Payment may belong to one ReturnedProduct or not at all.

Responsibilities	knows its Customer knows its ContractSale
Operations	add Payment(paymentReceiptNumber, paymentDate, previuosDebt, paymentSum, currentDebt) Create new Payment object, initialize attribute values and set attribute values. find Payment (contractSale) Find data of Payment using ContractSale object Id find Payment (customer) Find data of Payment using Customer object Id find all_Payment (customer) Find data of all Payments using Customer object Id check currentDebt() Check the currentDebt for the last Payment date.

3.2.11. The description of Product

Class name	Product
Specification	Product is a merchandise that is sold by the company to the customers
Superclass	-

Attributes	productId: Number	Unique identification number of a product	PRODUCT NUMBER
	productName: Text	Name of a product	PRODUCT NAME
	retailPrice: Number	Price of the product per unit for retail	RETAIL PRICE
	wholesalePrice: Number	Price of the product per unit for wholesale	WHOLESALE PRICE
	wholesaleQuantity: Number	Minimum quantity defined for wholesale	WHOLESALE LIMIT QUANTITY
	contractPrice: Number	Price of the product per unit for contract sales	CONTRACT PRICE
	quantityInStock: Number	Quantity in stock (warehouse)	QUANTITY IN STOCK

Associations	The association to ContractProduct class Each Product may belong to many ContractProducts or not at all. The association to ContractDeliveryProduct class Each Product may belong to many ContractDeliverieProducts or not at all. *The association to WholesaleProduct class* *Each Product may belong to many WholesaleProducts or not at all.* *The association to WholesaleDeliveryProduct class* *Each Product may belong to many WholesaleDeliverieProducts or not at all.*

The description of Product (continue 1)

Associations	*The association to RetailProduct class* *Each Product may belong to many RetailProducts or not at all.* *The association to RetailDeliveryProduct class* *Each Product may belong to many RetailDelivereProducts or not at all.* *The association to ReturnedProduct class* *Each Product may belong to many ReturnedProducts or not at all.* The association to Stock class Each Product may have in one Stock (warehouse) or not at all. The association to StockEvent class Each Product may have many input or output StockEvents or not at all.

Responsibilities	knows its Stock knows its StockEvent
Operations	add Product(productId, productName, retailPrice, wholesalePrice, wholesaleQuantity, contractPrice, quantityInStock) Create new Product object, initialize attribute values and set attribute values Give a unique ProductId find Product(productName) Find data of Product by product name. find Product(productId) Find data of Product by productId.

The description of Product (continue 2)

Operations	find_all Product(product) Find data of all Product object Id. update Product (retailPrice, wholesalePrice, wholesaleQuantity, contractPrice, quantityInStock) Update Product object, set attribute values. connect ContractDeliveryProduct(contractDeliveryProduct) Make a link between the current Product and the ContractDeliveryProduct object connect StockEvent(StockEvent) Make a link between the current Product and the StockEvent object connect ContractProduct(contractProduct) Make a link between the current Product and the ContractProduct object.

3.2.12. The description of Retail

Class name	Retail
Specification	Retail is a sale of products to customer usually in small quantities.
Superclass	-

Attributes	retailId	Unique identification number of retail	RETAIL NUMBER
	retailDate	Date of retail	RETAIL DATE
	retailTotalAmount	Total amount of retail	RETAIL TOTAL AMOUNT

Associations	The association to RetailDelivery class Each Retail has one RetailDelivery or not at all. The association to RetailProduct class Each Retail has at least one RetailProduct. The association to Customer class Each Retail is bought by only one Customer. The association to Payment class Each Retail may have many Payments or not at all.

Responsibilities	
Operations	

3.2.13. The description of RetailDelivery

Class name	RetailDelivery
Specification	RetailDelivery tells that the delivery type belongs to retail. It also tells which retail delivery belongs to which retail.
Superclass	Delivery

Attributes	-	

Associations	The association to Retail class Each RetailDelivery has one Retail. The association to RetailDeliveryProduct class Each RetailDelivery has at least one RetailDeliveryProduct.

Responsibilities	
Operations	

3.2.14. The description of RetailDeliveryProduct

Class name	RetailDeliveryProduct
Specification	RetailDeliveryProduct is holding information about the amount of money calculated according to retail delivery quantity and retail price of a product for every retail delivery that tells which retail delivery product belongs to which retail delivery.
Superclass	Delivery

Attributes	/retailDeliveryPrice	Calculate price of per retail delivery product for every delivery of retail	RETAIL DELIVERY AMOUNT
	retailDeliveryQuantity	Quantity per product for every delivery in retail	RETAIL DELIVERY QUANTITY

Associations	The association to RetailDelivery class Each RetailDeliveryProduct belongs to only one RetailDelivery. The association to RetailProduct class Each RetailDeliveryProduct belongs to only one RetailDelivery. The association to Product class Each RetailDeliveryProduct holds information about one Product. The association to StockEvent class Each RetailDeliveryProduct belongs to one StockEvent.

Responsibilities	
Operations	

3.2.15. The description of RetailProduct

Class name	RetailProduct
Specification	RetailProduct is holding information about the amount of money calculated according to retail quantity and retail price of a retail product in retail that tells which retail product belongs to which retail.
Superclass	-

Attributes	/retailPrice	Calculate price of a retail product for retail	RETAIL AMOUNT
	retailQuantity	Quantity per product in retail	RETAIL QUANTITY

Associations	The association to Retail class Each RetailProduct belongs to one Retail. The association to RetailDeliveryProduct class Each RetailProduct may have one RetailDeliveryProduct. The association to Product class Each RetailProduct belongs to only one Product.

Responsibilities	
Operations	

3.2.16. The description of ReturnedProduct

Class name	ReturnedProduct
Specification	ReturnedProduct is a product that is returned by a customer, and also tells which customer returns the product.
Superclass	-

Attributes	returnedProductId	Unique identification number of a returned product	RETURNED PRODUCT NUMBER
	returnedProductDate	Date of returned product	RETURNED PRODUCT DATE
	returnedProductTotal Amount	Total amount of returned product	RETURNED PRODUCT TOTAL AMOUNT
	/returnedProductPrice	Calculate price of the returned product	RETURNED PRODUCT AMOUNT
	returnedProductQuantity	Quantity of the returned product	RETURNED PRODUCT QUANTITY

Associations	The association to Customert class Each ReturnedProduct belongs to one Customer. The association to Payment class Each ReturnedProduct creates one Payment. The association to Product class Each ReturnedProduct holds information about one Product. The association to StockEvent class Each ReturnedProduct belongs to one StockEvent.

The description of ReturnedProduct (continue)

Responsibilities	
Operations	

3.2.17. The description of Staff

Class name	Staff
Specification	Staff is a person who works for the company.
Superclass	-

Attributes	staffId: Number	Unique identification number of a staff	STAFF NUMBER
	firstname: Text	First and middle name of a staff	STAFF FIRSTNAME
	lastname: Text	Last name of a staff	STAFF LASTNAME
	idNumber: Text	Identity card number of a staff	STAFF ID CARD NUMBER
	addressNumber: Text	Address number where the staff resides	STAFF ADDRESS NUMBER
	street: Text	Street name where the staff resides	STAFF STREET
	ward: Text	Ward number/name where the staff resides	STAFF WARD
	district: Text	District number/name where the staff resides	STAFF DISTRICT
	city: Text	City where the staff resides	STAFF CITY
	phone: Number	Staff's phone number	STAFF PHONE NUMBER
	position: Text	Staff's position	STAFF POSITION

Associations	Staff class is a composition class of Company class. The association to ContractSale class Each Staff may have many Contractsales or not at all.

Responsibilities	knows its owns knows Contractsale

The description of Staff (continue)

Operations	add Staff(staffId, firstname, lastname, idNumber, addressNumber, street, ward, district, city, phone, email) Create new Staff object, initialize attribute values and set attribute values. find Staff(name) Find data of the Staff by using name (first name or/and last name). update Staff (addressNumber, street, ward, district, city, phone, email) Update Staff object, set attribute values.

3.2.18. The description of Stock

Class name	Stock
Specification	Stock is a place for storing the product, also known as warehouse.
Superclass	-

Attributes	stockId: Number	Unique identification number of the warehouse	STOCK NUMBER
	stockName: Text	Name of the warehouse	STOCK NAME

Associations	The association to Product class Each Stock may have many Products or not at all. The association to StockEvent class Each Stock may have many Stock Events or not at all.

Responsibilities	
Operations	add Stock(stockName, stockId) Create new Stock object, initialize attribute values and set attribute values.

3.2.19. The description of StockEvent

Class name	StockEvent
Specification	StockEvent is holding the input or output information about the quantity of product in warehouse.
Superclass	-

Attributes	date: Date	Date showing the input or output of the quantity in stock	STOCK EVENT DATE
	quantity: Number	Quantity inputted and outputted in stock at warehouse	STOCKE EVENT QUANTITY

Associations	The association to ContractDeliveryProduct class Each StockEvent may have only one ContractDeliveryProduct or not at all. The association to Product class Each StockEvent belongs to only one Product. The association to RetailDeliveryProduct class Each StockEvent may have only one RetailDeliveryProduct or not at all. The association to Stock class Each StockEvent belongs to only one Stock. The association to WholesaleDeliveryProduct class Each StockEvent may have only one WholesaleDeliveryProduct or not at all.

Responsibilities	

The description of StockEvent (continue)

Operations	add StockEvent(date, quantity) Create new StockEvent object, initialize attribute values and set attribute values.

3.2.20. The description of Wholesale

Class name	Wholesale
Specification	Wholesale is a sale of products to customer usually in big certain quantities defined by the company.
Superclass	-

Attributes	wholesaleId	Unique identification number of wholesale	WHOLESALE NUMBER
	wholesaleDate	Date of wholesale	WHOLESALE DATE
	wholesaleTotalAmount	Total amount of wholesale	WHOLESALE TOTAL AMOUNT

Associations	The association to WholesaleDelivery class Each Wholesale may have many WholesaleDeliverys or not at all. The association to WholesaleProduct class Each Wholesale has at least one WholesaleProduct. The association to Customer class Each Wholesale is bought by only one Customer. The association to Payment class Each Wholesale have at least one Payment or not at all.

Responsibilities	
Operations	

3.2.21. The description of WholesaleDelivery

Class name	WholesaleDelivery
Specification	WholesaleDelivery tells that the delivery type belongs to wholesale. It also tells which wholesale delivery belongs to which wholesale.
Superclass	Delivery

Attributes	-	

Associations	The association to Wholesale class Each WholesaleDelivery belongs to one Wholesale. The association to WholesaleDeliveryProduct class Each WholesaleDelivery has at least one WholesaleDeliveryProduct.

Responsibilities	
Operations	

3.2.22. The description of WholesaleDeliveryProduct

Class name	WholesaleDeliveryProduct
Specification	WholesaleDeliveryProduct is holding information about the amount of money calculated according to wholesale delivery quantity and wholesale price of a product for every wholesale delivery that tells which wholesale delivery product belongs to which wholesale delivery.
Superclass	Delivery

Attributes	/wholesaleDeliveryPrice	Calculate price of per wholesale delivery product for every delivery of wholesale	WHOLESALE DELIVERY AMOUNT
	wholesaleDeliveryQuantity	Quantity per product for every delivery in wholesale	WHOLESALE DELIVERY QUANTITY

Associations	The association to WholesaleDelivery class Each WholesaleDeliveryProduct belongs to only one WholesaleDelivery. The association to WholesaleProduct class Each WholesaleDeliveryProduct has one WholesaleProduct. The association to Product class Each WholesaleDeliveryProduct holds information about one Product. The association to StockEvent class Each WholesaleDeliveryProduct belongs to one StockEvent.

The description of WholesaleDeliveryProduct (continue)

Responsibilities	
Operations	

3.2.23. The description of WholesaleProduct

Class name	WholesaleProduct
Specification	WholesaleProduct is holding information about the amount of money calculated according to a wholesale quantity (minimum wholesale quantity defined by the company) and wholesale price of a wholesale product in wholesale that tells which wholesale product belongs to which wholesale. It also holds information about the delivered quantity and date of a wholesale product in the wholesale.
Superclass	-

Attributes	/wholesalePrice	Calculate price of a wholesale product for wholesale	WHOLESALE AMOUNT
	wholesaleQuantity	Quantity per product in wholesale	WHOLESALE QUANTITY
	/wholesaleDelivery Quantity	Calculate quantity of a delivered wholesale product for wholesale	WHOLESALE DELIVERY QUANTITY
	wholesaleDeliveryDate	Date of a delivered wholesale product to Customer	WHOLESALE DELIVERY DATE

Associations	The association to Wholesale class Each WholesaleProduct belongs to only one Wholesale. The association to WholesaleDeliveryProduct class Each WholesaleProduct may have many WholesaleDeliverieProducts or not at all. The association to Product class Each WholesaleProduct belongs to only one Product.

The description of WholesaleProduct (continue)

Responsibilities	
Operations	

3.3. Business class state diagrams of Contract sale

The life cycles are described now from the application software point of view using state diagram technique and UML.

The business entity, which has essential changes during its life cycle, is the contract sale of the Sales Management System.

The state diagram includes information items: activities, actions and states, and attributes which values are set in each action.

Here is the state diagram of concerning the ContractSale class, which contains:

- Business activities
- State diagram

3.3.1. Business activity

The activities, which have effect on the life cycle of a contract sale, are as follows:

1. The Sales Assistant adds a new contract sale to the system.

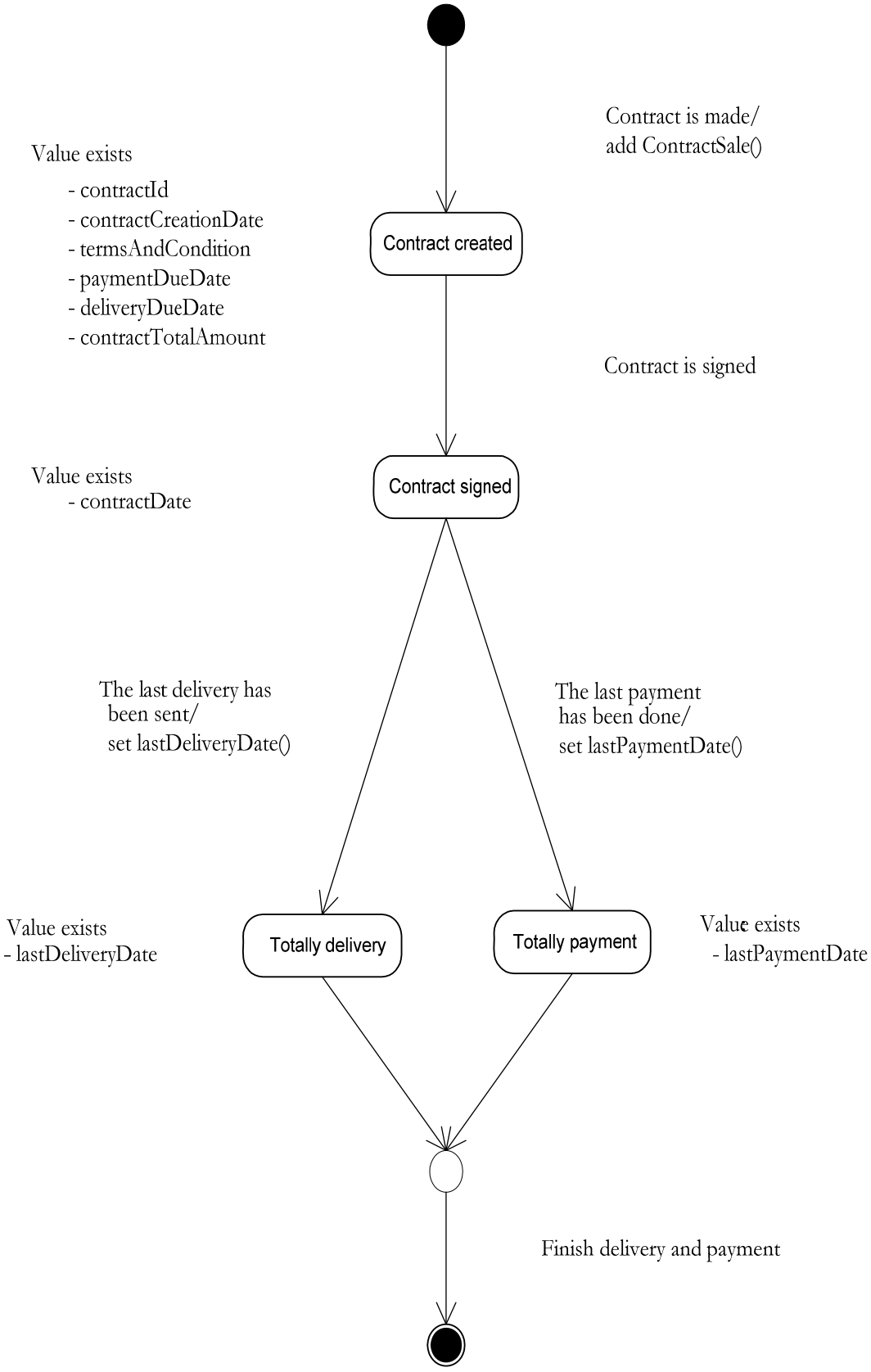
2. The Customer signs the contract with a Sales Representative (Staff) of the Company.

3. The contract product will be delivered to the Customer until the last delivery in the contract sale. Every contract delivery quantity and date is set into the system which will check contract delivery quantity if the last delivery or not. The last delivery date for the contract sale will be noticed by the system.

4. The contract payment is made by the Customer until the last payment sum is done. Every contract payment sum and date is set into the system which will check current debt if zero or not. The last payment date for the contract sale will be noticed by the system.

5. When the last delivery date and the last payment date have existed in the system, the contract is terminated.

3.3.2. State diagram of Contract sale



4. User interface model

The purpose of describing the user interface is to show the contents of the screens, reports and templates of the system to be developed.

The login screen is in a standard window.

There is a user interface for Sales Assistant user and it covers only the following use case selection:

UC01 Record product – use case
UC02 Record potential customer – use case
UC03 Handle contract sale – use case

The user interface is modelled using class diagram technique of UML and text.

4.1. Preliminary screen diagrams

4.1.1. Main screen diagram
4.1.2. Record product diagram
4.1.3. Record potential customer diagram
4.1.4. Handle contract sale diagram

4.2. Screen outlines

S1: Record product
S1_1: Browse product
S1_2_1: List product with stock status
S1_2_2: List product with wholesale
S1_2_3: List product with retail

S2: Record potential customer
S2_1: Browse customer
S2_2: List customer

S3: Handle contract sale

S3_1: Browse contract

S3_2: Browse staff

S3_3: Handle delivery

S3_4: List delivery

S3_5: Handle payment

S3_6: List payment

4.3. Print layouts

P_1_2_1: List product with stock status

P_1_2_2: List product with wholesale

P_1_2_3: List product with retail

P2_2: List customer

P3: Contract

P3_4: List delivery

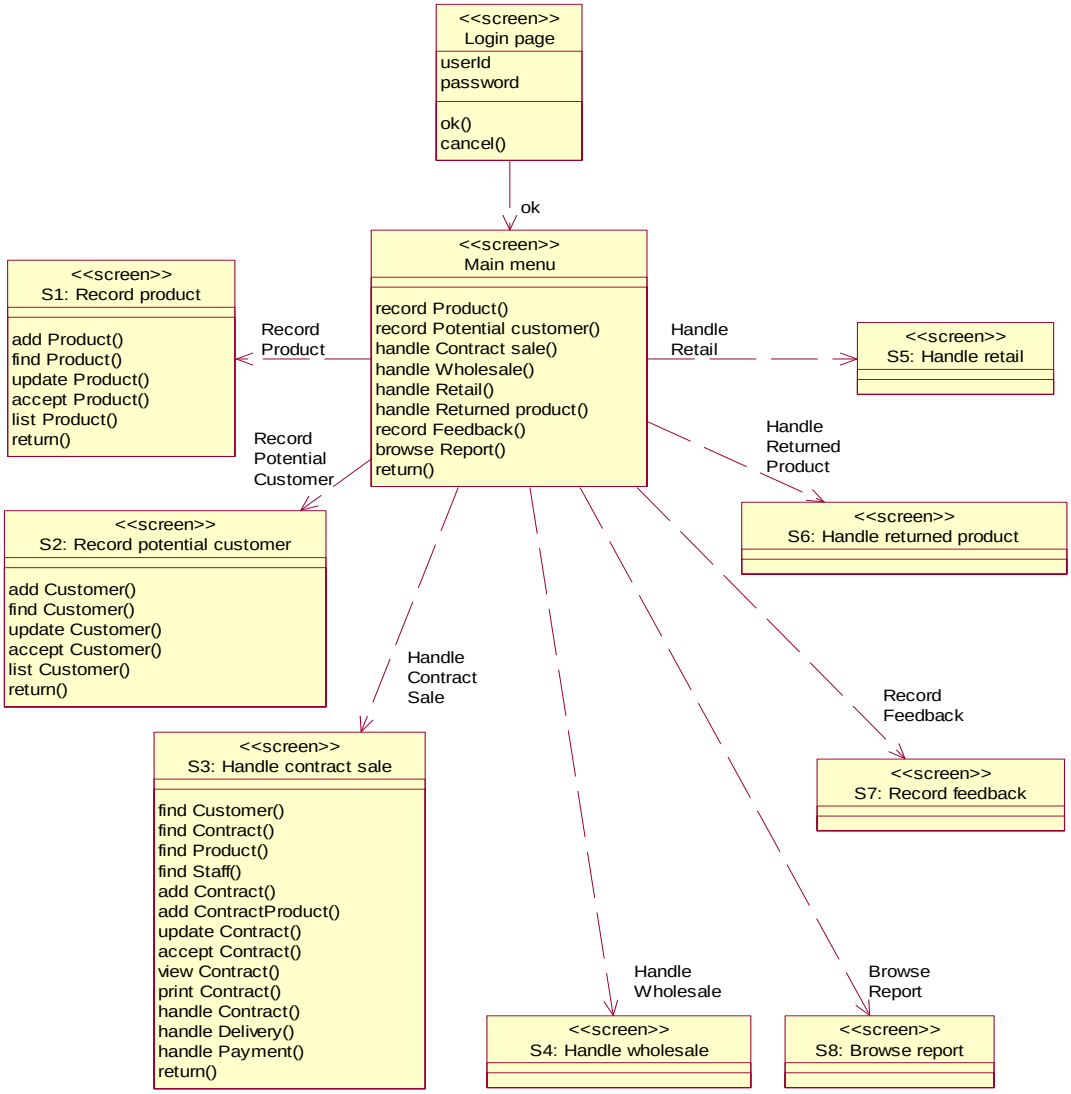
P3_6: List payment

4.4. Preliminary screen description for 4.3. Screen outlines

4.1. Preliminary screen diagrams

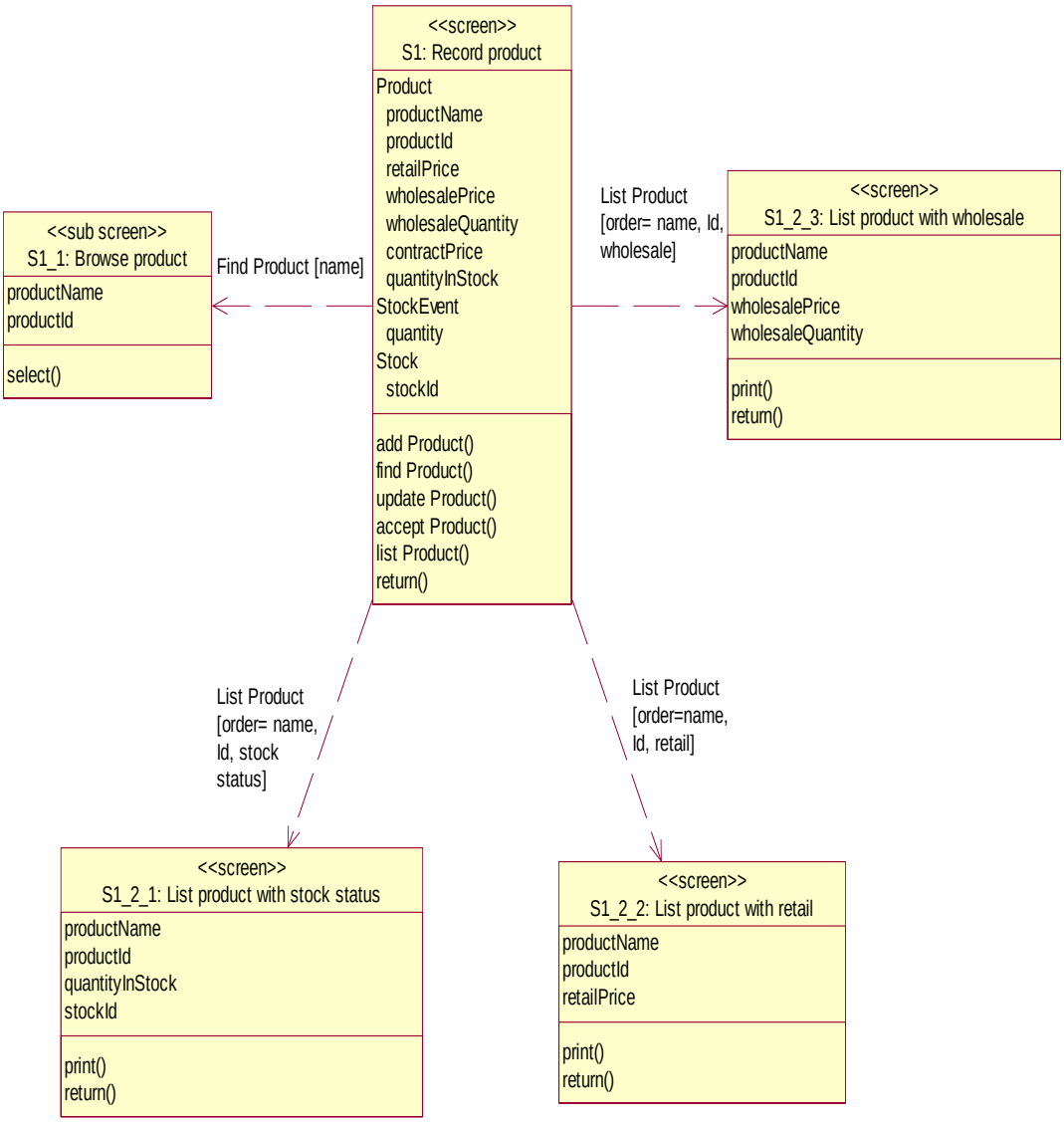
The functions of Sales Management System are grouped to the preliminary screen diagrams, but in this software requirements only the main menu, record product, record customer, and handle contract sale preliminary screen diagrams are described.

4.1.1. Main menu diagram



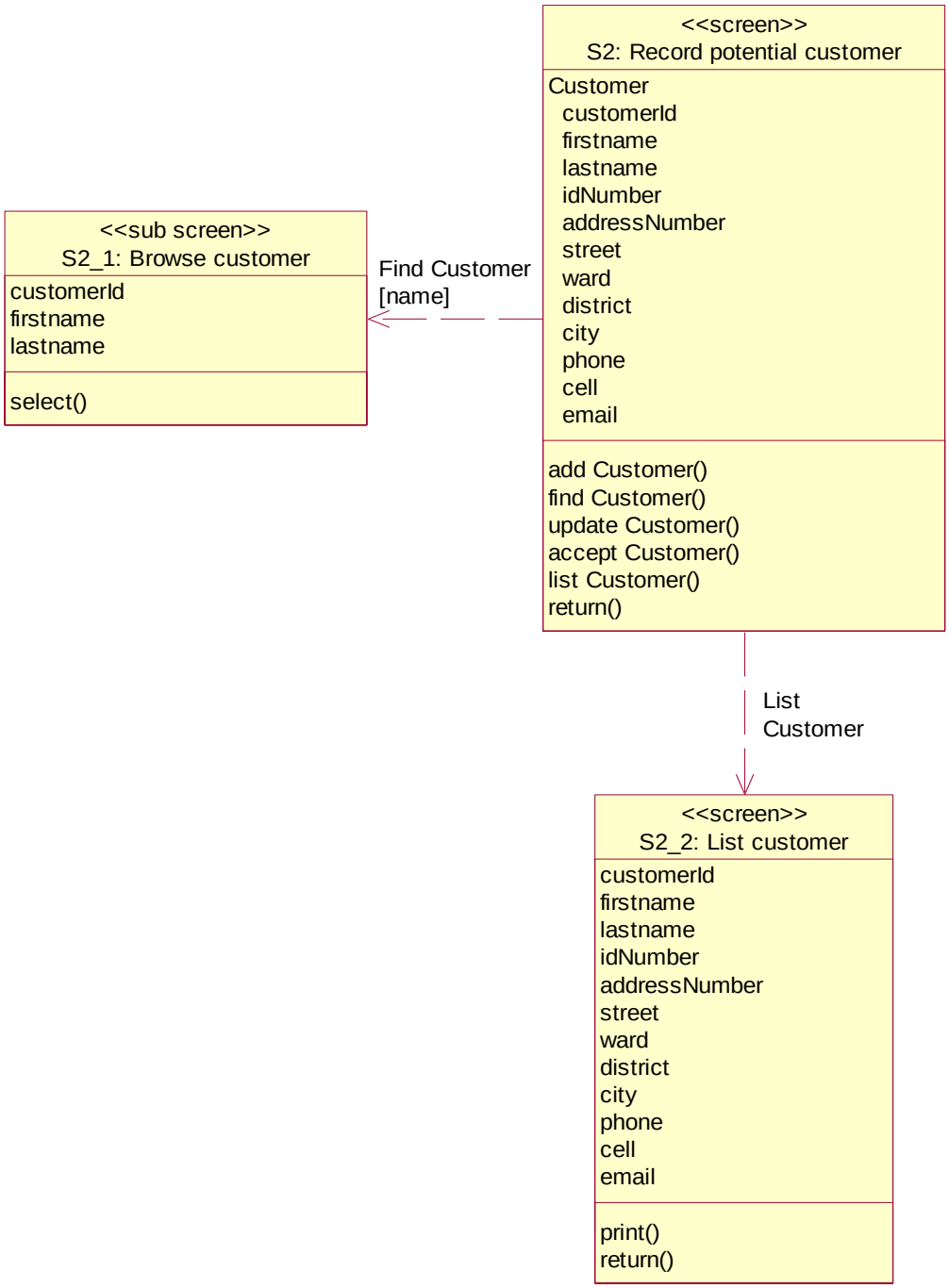
Picture 4.1.1: Main menu diagram

4.1.2. Record product diagram



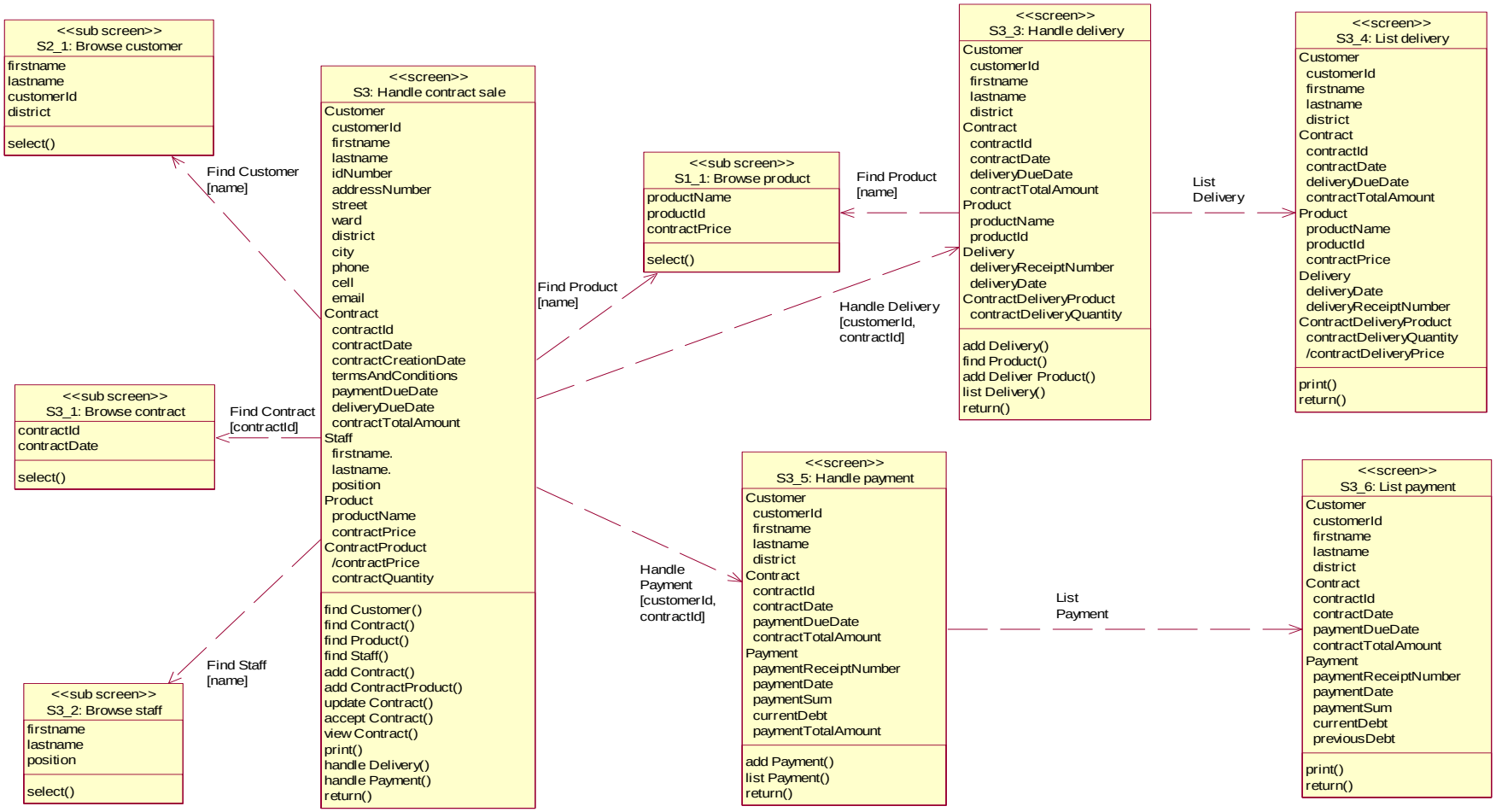
Picture 4.1.2: Record product diagram

4.1.3. Record potential customer diagram



Picture 4.1.3: Record potential customer diagram

4.1.4. Handle contract sale diagram



Picture 4.1.4: Handle contract sale diagram

4.2. Screen outlines

The screen outlines are not final screens. They are the drafts of screen.

Login page screen: The user will use his/her ID number and passwrod to login the system. After loggin the system, the user will see the Main menu screen.

Main menu screen: In this screen, the user can select one of the following use cases:

- S1: Record product.
- S2: Record potential customer.
- S3: Handle contract sale
- S4: Handle wholesale
- S5: Handle retail
- S6: Handle returned product
- S7: Record feedback
- S8: Browse report

S1: Record product

Figure 4.2.1: Record product screen outline

S1_1: Browse product

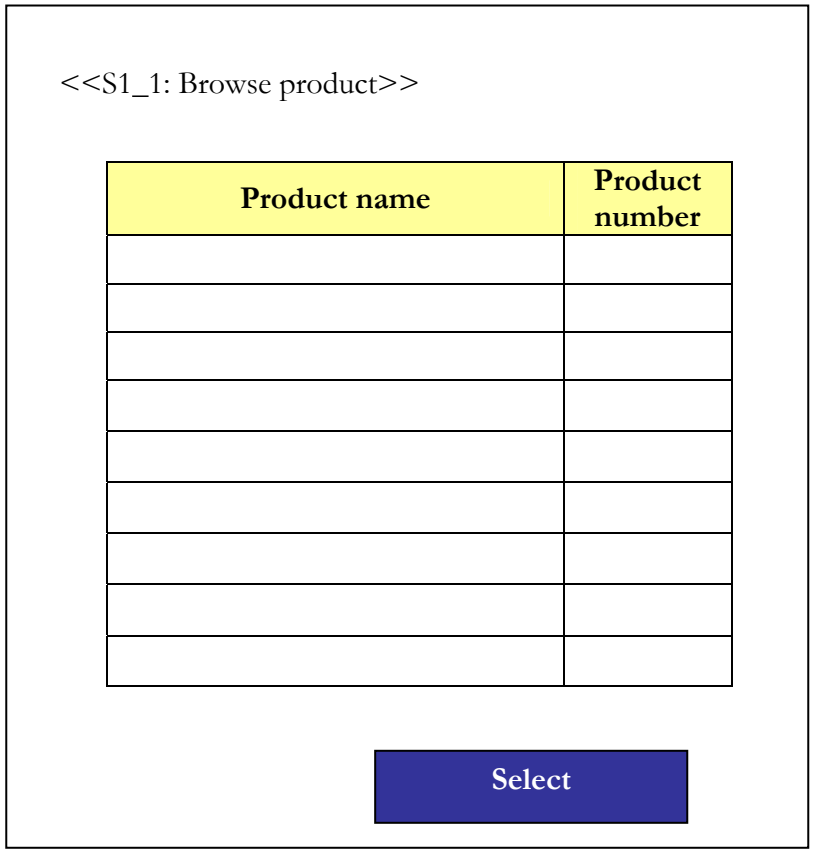


Figure 4.2.2: Browse product screen outline

S1_2_1: List product with stock status

<<S1_2_1: List product with stock status>>

TIN PHONG TRADING CO., LTD.

Ban ton kho

Date: __/__/20__

No	Product number	Product name	Quantity in stock	Stock number

Print

Exit

Figure 4.2.3: List product with stock status screen outline

S1_2_2: List product with wholesale

<<S1_2_2: List product with wholesale>>

TIN PHONG TRADING CO., LTD.

Ban bao gia ban si

Date: __/__/20__

No	Product number	Product name	Wholesale price	Wholesale quantity

Print Exit

Figure 4.2.4: List product with wholesale screen outline

S1_2_3: List product with retail

Figure 4.2.5: List product with retail screen outline

S2: Record potential customer

Figure 4.2.6: Record potential customer screen outline

S2_1: Browse customer

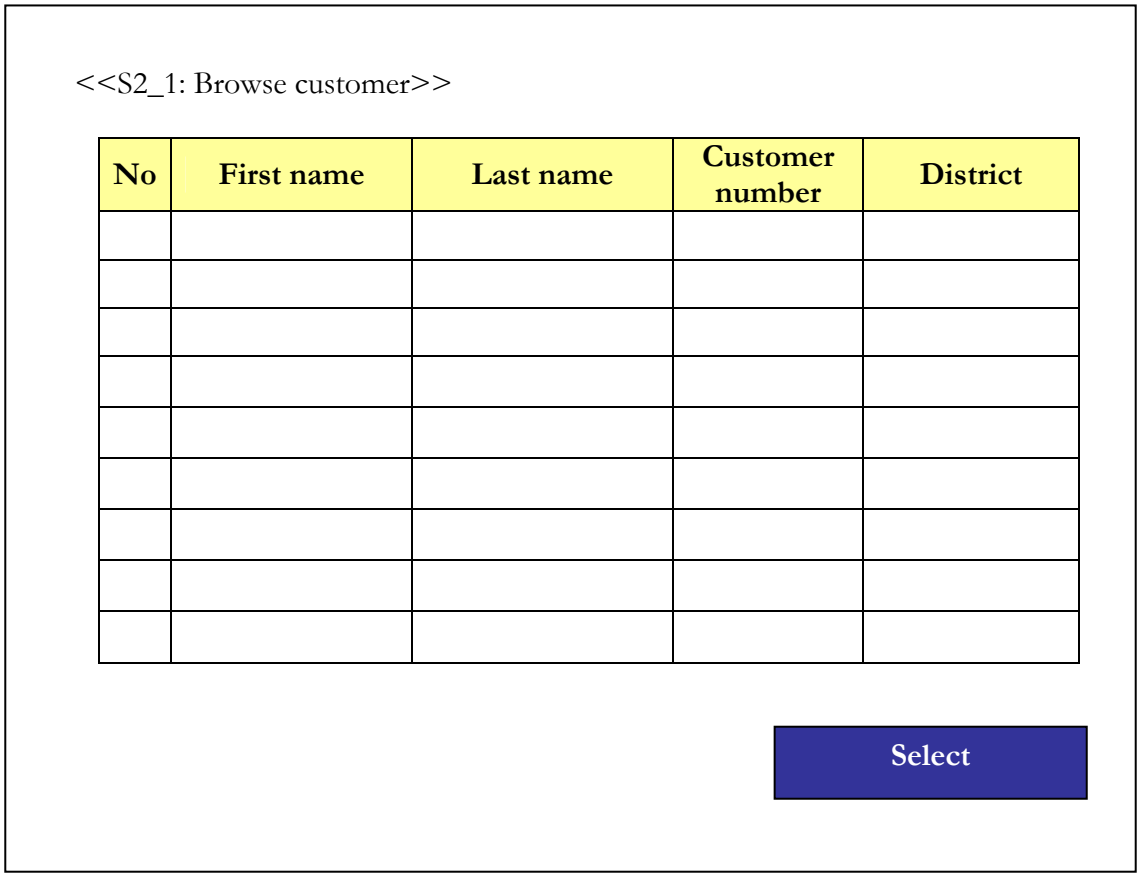


Figure 4.2.7: Browse customer screen outline

S2_2: List customer screen draft

<<S2_2: List customer>>

TIN PHONG TRADING CO., LTD.

Danh sach khach hang

Date: __/__/20__

No	Customer number	Last name	First name	ID Card number	Phone number	Mobile	Address (AddressNumber, street, ward, district, city)	Email

Print Exit

Figure 4.2.8: List customer screen outline

S3: Handle contract sale

Figure 4.2.9: Handle contract sale screen outline

S3_1: Browse contract

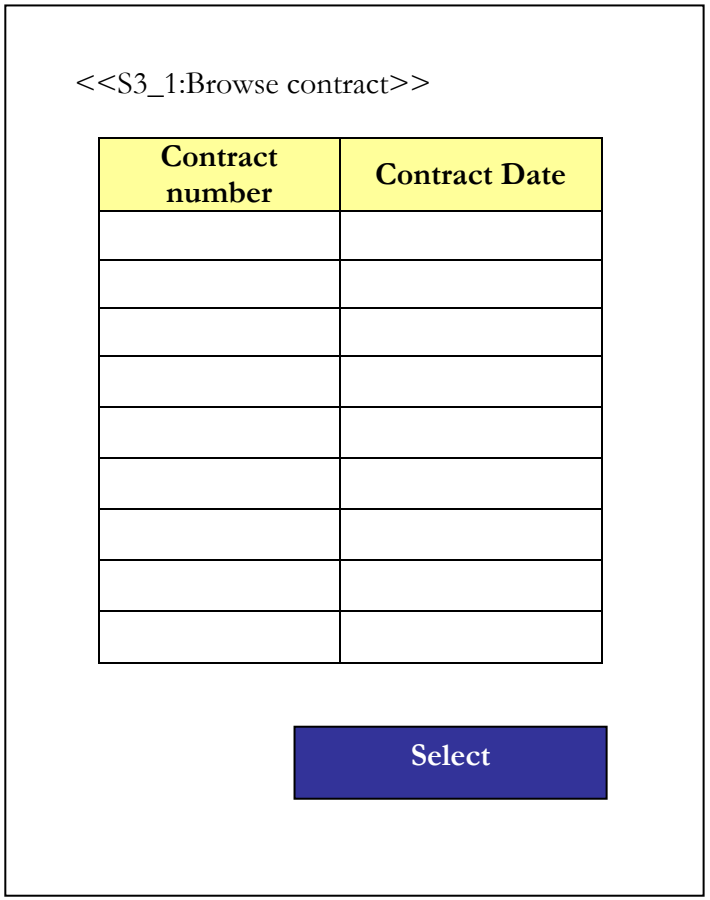


Figure 4.2.10: Browse contract screen outline

S3_2: Browse staff

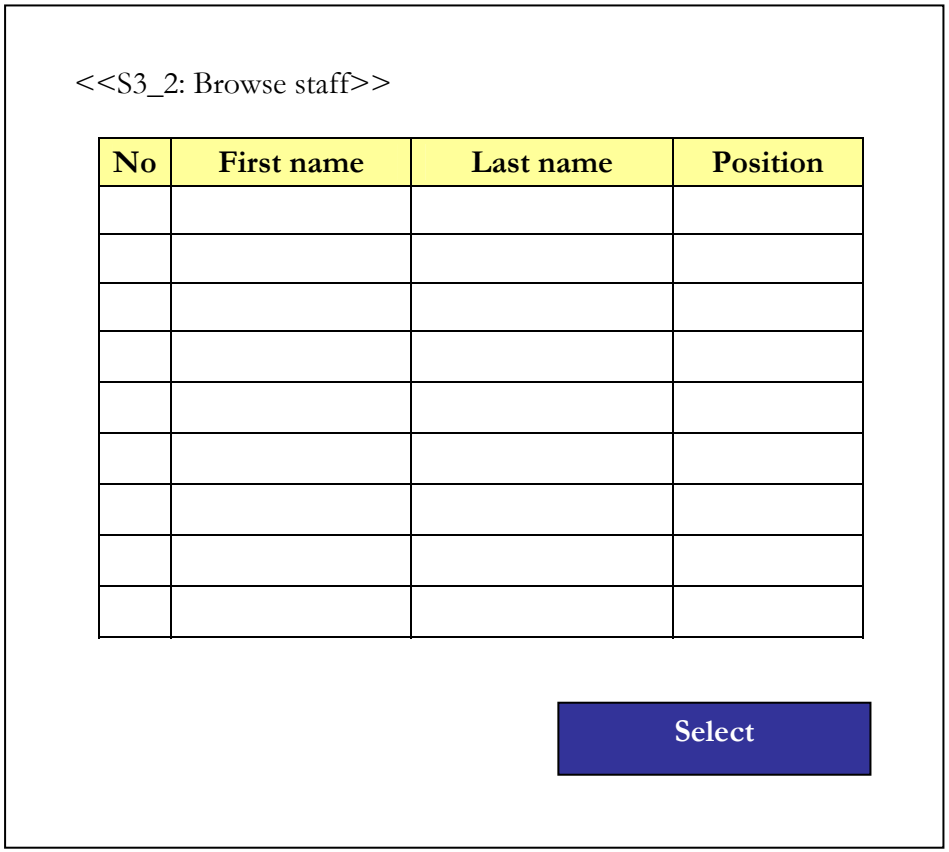


Figure 4.2.11: Browse staff screen outline

S3_3: Handle Delivery

Figure 4.2.12: Handle delivery screen outline

S3_4: List Delivery

<<S3_4: List delivery>>

TIN PHONG TRADING CO., LTD.

Bang ke chi tiet giao hang

Date: __/__/20__

Contract

Contract number : 001
Contract date : 28.01.2008
Contract total amount: 108 000 000 VND
Delivery due date : 28.03.2009

Customer

Number : 0001
Last name : Phan
First name: Thang
District : Go Vap

No	Delivery date	Receipt No.	Product No.	Product name	Contract price	Quantity	Total amount
1	01.12.2008	0234	1234	Kick starter C100	12 000	1 000	12 000 000
2	12.12.2008	1023	1234	Kick starter C100	12 000	1 200	14 400 000
Delivered sum			1234	Kick starter C100	12 000	**2 200**	**26 400 000**
Remain sum			1234	Kick starter C100	12 000	**6 800**	**81 600 000**
1	01.12.2008	0320	6789	Head light set C70	56 000	200	11 200 000
2	15.12.2008	0655	6789	Head light set C70	56 000	300	16 800 000
3	28.12.2008	0933	6789	Head light set C70	56 000	500	28 000 000
Delivered sum			6789	Head light set C70	56 000	**1 000**	**56 000 000**
Remain sum			6789	Head light set C70	56 000	**1 800**	**100 800 000**

Exit Print

Figure 4.2.13: List Delivery screen outline

S3_5: Handle payment

Figure 4.2.14: Handle payment screen outline

S3_6: List payment

<<S3_6: List payment>>

TIN PHONG TRADING CO., LTD.

Bang ke chi tiet thanh toan

Date: __/__/20__

Contract

Contract number : 001
Contract date : 28.11.2008
Contract total amount: 108 000 000 VND
Payment due date : 12.03.2009

Customer

Number : 0001
Last name : Phan
First name: Thang
District : Go Vap

No	Payment date	Receipt number	Previous debt	Payment sum	Current debt
1	30.11.2008	091563	108 000 000	18 000 000	90 000 000
2	22.12.2008	101254	90 000 000	20 000 000	70 000 000
3	12.01.2009	115473	70 000 000	20 000 000	50 000 000
4	22.02.2009	124567	50 000 000	25 000 000	25 000 000

Exit Print

Figure 4.2.15: List payment screen outline

4.3. Print layouts

Here are the report print layouts.

P_1_2_1: List product with stock status

TIN PHONG TRADING CO., LTD.

Ban ton kho

Date: __/__/20__

No	Product number	Product name	Quantity in stock	Stock number

1(3)

Figure 4.3.1: List product with stock status print layout

P_1_2_2: List product with wholesale

TIN PHONG TRADING CO., LTD.

Ban bao gia ban si

Date: __/__/20__

No	Product number	Product name	Wholesale price	Wholesale quantity

1(3)

Figure 4.3.2: List product with wholesale print layout

P_1_2_3: List product with retail

TIN PHONG TRADING CO., LTD.

Ban bao gia ban le

Date: __/__/20__

No	Product number	Product name	Retail price

1(3)

Figure 4.3.3: List product with retail print layout

P2_2: List customer

TIN PHONG TRADING CO., LTD.

Danh sach khach hang

Date: __/__/20__

No	Customer number	Last name	First name	ID Card number	Phone number	Mobile	Address (AddressNumber, street, ward, district, city)	Email

1 (12)

Figure 4.3.4: List customer print layout

P3: Contract

TIN PHONG TRADING CO., LTD.
HOP DONG MUA BAN

So HD: [ContractNumber]
Ngay: [ContractDate]

Ben Ban: **Tin Phong Trading Co., Ltd.**
Dia chi: 89 Duong So 1A P. Binh Tri Dong, Q. Binh Tan, Ho Chi Minh City, Vietnam
Tel: +84832601329 **Email:** [email address]
Do Ong/Ba: [Staff full name, position]

Ben Mua: [Customer full name]
So CMND: [IDCardnumber]
Dia chi: [AddressNumber, Street, Ward, District, City]
Tel: [Phone] **Mobile:** [Cell]

Hai ben chung toi dong y ky ket Hop dong mua ban voi cac dieu khoan duoi day:

STT	Ten hang	Don gia	So luong	Cong
[No]	[Product Name]	[Contract Price]	[Contract Quantity]	[Product Sum]
Tong gia tri hop dong				[ContractTotal Amount]

Han ngay giao hang [DeliveryDueDate]

Han ngay thanh toan [PaymentDueDate]

Dieu khoan khac [TermsAndConditions]

Hai ben chung toi cam ket thuc hieu dung cac dieu khoan neu tren. Neu ben nao vi pham phai hoan toan chiu trach nhiem truoc phap luat.

BEN BAN **BEN MUA**

Figure 4.3.5: Contract print layout

P3_4: List delivery

TIN PHONG TRADING CO., LTD.

Bang ke chi tiet giao hang

Date: __/__/20__

Contract

Contract number : 001
Contract date : 28.01.2008
Contract total amount: 108 000 000 VND
Delivery due date : 28.03.2009

Customer

Number : 0001
Last name : Phan
First name: Thang
District : Go Vap

No	Delivery date	Receipt No.	Product No.	Product name	Contract price	Quantity	Total amount
1	01.12.2008	0234	1234	Kick starter C100	12 000	1 000	12 000 000
2	12.12.2008	1023	1234	Kick starter C100	12 000	1 200	14 400 000
Delivered sum			1234	Kick starter C100	12 000	**2 200**	**26 400 000**
Remain sum			1234	Kick starter C100	12 000	**6 800**	**81 600 000**
1	01.12.2008	0320	6789	Head light set C70	56 000	200	11 200 000
2	15.12.2008	0655	6789	Head light set C70	56 000	300	16 800 000
3	28.12.2008	0933	6789	Head light set C70	56 000	500	28 000 000
Delivered sum			6789	Head light set C70	56 000	**1 000**	**56 000 000**
Remain sum			6789	Head light set C70	56 000	**1 800**	**100 800 000**

Figure 4.3.6: List delivery print layout

P3_6: List payment

TIN PHONG TRADING CO., LTD.

Bang ke chi tiet thanh toan

Date: __/__/20__

Contract

Contract number : 001
Contract date : 28.11.2008
Contract total amount: 108 000 000 VND
Payment due date : 12.03.2009

Customer

Number : 0001
Last name : Phan
First name: Thang
District : Go Vap

No	Payment date	Receipt number	Previous debt	Payment sum	Current debt
1	30.11.2008	091563	108 000 000	18 000 000	90 000 000
2	22.12.2008	101254	90 000 000	20 000 000	70 000 000
3	12.01.2009	115473	70 000 000	20 000 000	50 000 000
4	22.02.2009	124567	50 000 000	25 000 000	25 000 000

Figure 4.3.7: List payment print layout

4.4. Preliminary screen and sub screen descriptions

The screen and sub screen descriptions include detailed descriptions and rules for each field and function of screen. The descriptions are shown on templates.

S1: Record product

Table 4.4.1: Preliminary screen descriptions of S1: Record product

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Product name	Name of a product	x	x	x	Text	30		Input for Add-, Update-, Find product. Output for Update product, after Finding selected product, Accept product.
Product number	Unique identification number of a product	x	x	x	Number	4	0001	Input for Update-, Find product. Output for Update product, after Finding selected product, Accept product.
Input quantity	Quantity inputted in stock at warehouse	x			Number	6		Input for Add-, Update product. Always with stock number if recording a new product. Accept negative number if quantity in stock more than input quantity.

Table 4.4.1: Preliminary screen descriptions of S1: Record product (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Quantity in stock	Current quantity in stock (warehouse)		x		Number	7		Output for Update, after Finding selected product, Accept product.
Stock number	Warehouse identification number	x	x		Number	2		Input for Add-, Update product. Output for Update product, after Finding selected product, Accept product.
Retail price	Price of the product per unit for retail	x	x		Number	8		
Contract price	Price of the product per unit for contract sales	x	x		Number	8		
Wholesale price	Price of the product per unit for wholesale	x	x		Number	8		Output for Update product, after Finding selected product, Accept product. Always with wholesale quantity
Wholesale quantity	Minimum quantity defined for wholesale	x	x		Number	6		Output for Update product, after Finding selected product, Accept product. Always with wholesale price

Table 4.4.1: Preliminary screen descriptions of S1: Record product (continue 2)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Add product	Add a new product							No duplicate whole name.
Find product	The system displays a sub screen for finding a product.							
Update product	Update product stock status or prices							
Accept product	Save for adding or updating product							
List product + Stock status	Report of product list with stock status.							The system displays only the product with stock status.
List product + Retail	Report of product list with retail price							The system displays only the product with retail price.
List product + Wholesale	Report of product list with wholesale price and wholesale quantity							The system displays only the product with wholesale data.
Exit	Return to previous screen							

S1_1: Browse product

Table 4.4.2: Preliminary sub screen descriptions of S1_1: Browse product

Descriptions of sub screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Product name	Name of a product		x	x	Text	30		Output from Find product
Product number	Unique identification number of a product		x	x	Number	4		
Descriptions of function keys								
Select	Select a product from the list							

S1_2_1: List product with stock status

Table 4.4.3: Preliminary screen descriptions of S1_2_1: List product with stock status

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No	Number showing the order of product on the list		x	x	Number	3		Output from List product + Stock status
Product name	Name of a product		x	x	Text	30		Output from List product + Stock status. The system only shows the products that have quantity in stock.
Product number	Unique identification number of a product		x	x	Number	4		
Quantity in stock	Current quantity in stock (warehouse)		x		Number	7		Output from List product + Stock status
Stock number	Warehouse identification number		x		Number	2		
Date__/__/20__	System date		x	x	Date			
Descriptions of function keys								
Print	Print out the report							Connect to printer
Exit	Return to previous screen							

S1_2_2: List product with wholesale

Table 4.4.4: Preliminary screen descriptions of S1_2_2: List product with wholesale

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No	Number showing the order of product on the list		x	x	Number	3		Output from List product + Wholesale
Product name	Name of a product		x	x	Text	30		Output from List product + Wholesale The system only shows the products that have wholesale data
Product number	Unique identification number of a product		x	x	Number	4		
Wholesale price	Price of the product per unit for wholesale		x		Number	8		Output from List product + Wholesale Always with wholesale quantity
Wholesale quantity	Minimum quantity defined for wholesale		x		Number	6		Output from List product + Wholesale Always with wholesale price
Date__/__/20__	System date		x	x	Date			Output from List product + Wholesale
Descriptions of function keys								
Print	Print out the report							Connect to printer
Exit	Return to previous screen							

S1_2_3: List product with stock retail

Table 4.4.5: Preliminary screen descriptions of S1_2_3: List product with retail

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No	Number showing the order of product on the list		x	x	Number	3		Output from List product + Retail.
Product name	Name of a product		x	x	Text	30		Output from List product + Retail. The system only shows the products that have quantity in stock.
Product number	Unique identification number of a product		x	x	Number	4		
Retail price	Price of the product per unit for retail		x		Number	8		Output from List product + Retail.
Date__/__/20__	System date		x	x	Date			
Descriptions of function keys								
Print	Print out the report							Connect to printer
Exit	Return to previous screen							

S2: Record customer

Table 4.4.6: Preliminary screen descriptions of S2: Record customer

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
First name	First and middle name of a customer	x	x	x	Text	30		Input for Add-, Update-, or Find customer. Output for Add-, Update customer, after Finding selected customer, Accept customer.
Last name	Last name of a customer	x	x	x	Text	20		
Customer number	Unique identification number of a customer	x	x	x	Number	4	0001	Input for Update-, Find customer. Output for Update customer, after Finding selected customer, Accept customer.
ID card number	Identity card number of a customer	x	x		Text	12		Input for Add-, or Update customer. Output for Update customer, after Finding selected customer, Accept customer.
Phone number	Customer's line phone number	x	x	x	Number	10		
Mobile	Customer's mobile phone number	x	x		Number	10		

Table 4.4.6: Preliminary screen descriptions of S2: Record customer (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Address number	Address number where the customer resides	x	x	x	Text	9		Input for Add-, or Update customer. Output for Update customer, after Finding selected customer, Accept customer.
Street	Street name where the customer resides	x	x	x	Text	20		
Ward	Ward number/name where the customer resides	x	x		Text	15		
District	District number/name where the customer resides	x	x	x	Text	15		
City	City where the customer resides	x	x	x	Text	15		
Email	Customer's email address	x	x		Text	60		

Table 4.4.6: Preliminary screen descriptions of S2: Record customer (continue 2)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Add customer	Add a new potential customer							
Find customer	The system displays a sub screen for finding a customer.							
Update customer	Update customer information							
Accept customer	Save for adding or updating customer							
List customer	Report of customer list in detail information							
Exit	Return to previous screen							

S2_1: Browse customer

Table 4.4.7: Preliminary sub screen descriptions of S2_1: Browse customer

Descriptions of sub screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No	Number showing the order of customer on the list		x	x	Number	3		Output from Find customer
First name	First and middle name of a customer		x	x	Text	30		
Last name	Last name of a customer		x	x	Text	20		
Customer number	Unique identification number of a customer		x	x	Number	4		
District	District number/name where the customer resides		x	x	Text	15		
Descriptions of function keys								
Select	Select a customer from the list							

S2_2: List customer

Table 4.4.8: Preliminary screen descriptions of S2_2: List customer

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No	Number showing the order of customer on the list		x	x	Number	3		Output from List customer
Date__/__/20__	System date		x	x	Date			
Customer number	Unique identification number of a customer		x	x	Number	4		
First name	First and middle name of a customer		x	x	Text	30		
Last name	Last name of a customer		x	x	Text	20		
ID card number	Identity card number of a customer		x		Text	12		
Phone number	Customer's line phone number		x	x	Number	10		
Mobile	Customer's mobile phone number		x		Number	10		

Table 4.4.8: Preliminary screen descriptions of S2_2: List customer (continue)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Address number	Address number where the customer resides		x	x	Text	9		Output from List customer
Street	Street name where the customer resides		x	x	Text	20		
Ward	Ward number/name where the customer resides		x		Text	15		
District	District number/name where the customer resides		x	x	Text	15		
City	City where the customer resides		x	x	Text	15		
Email	Customer's email address		x		Text	60		
Descriptions of function keys								
Print	Print out the report							Connect to printer
Exit	Return to previous screen							

S3: Handle contract sale

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
First name	First and middle name of a customer	x	x	x	Text	30		Input for Find customer. Output for Add-, Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected customer, Accept contract..
Last name	Last name of a customer	x	x	x	Text	20		
Customer number	Unique identification number of a customer	x	x	x	Number	4		
ID card number	Identity card number of a customer		x		Text	12		Output for Add-, Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected customer, Accept contract.
Phone number	Customer's line phone number		x	x	Number	10		
Mobile	Customer's mobile phone number		x		Number	10		
Address number	Address number where the customer resides		x	x	Text	9		

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Street	Street name where the customer resides		x	x	Text	20		Output for Add-, Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected customer, Accept contract.
Ward	Ward number/name where the customer resides		x		Text	15		
District	District number/name where the customer resides		x	x	Text	15		
City	City where the customer resides		x	x	Text	15		
Email	Customer's email address		x		Text	60		
First name	First and middle name of a staff	x	x	x	Text	30		Input for Find staff. Output for Add-, Update-, View-, Print contract, or after Finding selected staff, Accept contract.
Last name	Last name of a staff	x	x	x	Text	20		

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 2)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Position	Position of staff in the company		x	x	Text	20		Output for Add-, Update-, Accept contract, View-, Print contract, or after Finding selected staff, Accept contract.
Contract number	Unique identification number of a contract	x	x	x	Number	3	001	Input for Find contract. Output for Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected contract, Accept contract.
Contract creation date	System date making a contract		x	x	Date	-		Output for Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected contract, Accept contract.

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 3)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Contract date	Signing date of a contract	x	x	x	Date	-		Input for Add-, Update contract. Output for Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected contract, Accept contract.
Payment due date	Due date for the last payment for the contract	x	x	x	Date	-		
Delivery due date	Due date for the last delivery of the product	x	x	x	Date	-		
Terms and conditions	Terms and conditions of the contract	x	x	x	Text	600		
Contract total amount	Total contract value		x	x	Number	15		Output for Add-, Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected contract, Accept contract, Add contract product.

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 4)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Product name	Name of a product	x	x	x	Text	30		Input for Find product, Add-, Update contract, Add contract product. Output for Add-, Update-, View-, Print contract, Handle delivery, Handle payment, or after Finding selected product, Accept contract, Add contract product.
Contract price	Price of the product per unit for contract sales		x	x	Number	8		Output for Add-, Update-, View-, Print contract, Handle payment, or after Finding selected product, Accept contract, Add contract product.

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 5)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Quantity	Quantity per product in the contract sale	x	x	x	Number	6		Input for Add-, Update contract, Add contract product. Output for Add-, Update-, View-, Print contract, Handle delivery, or after Accept contract, Add contract product.
Product sum	Calculate price of a contract product for the contract sale		x	x	Number	13		Output for Add-, Update-, View-, Print contract, Handle payment, or after Accept contract, Add contract product.
Descriptions of function keys								
Find customer	Find a customer existed in the system							
Find contract	Find a contract existed in the system							

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 6)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Find product	The system displays a sub screen for finding a product.							The system displays all given product partial names if any even the no stock status.
Find staff	The system displays a sub screen for finding a staff.							
Add contract	Add a new potential customer							Customer, contract should be selected.
Add contract product	Add a product to the contract after giving the quantity.							Product can not be added without quantity.
Update contract	Update customer information							Customer, contract should be selected. Data in contract can be changed except contract number.
Accept contract	Save for adding or updating customer							Customer, staff, at least one product should be selected.

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 7)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
View contract	Layout of contract displays on screen							Customer, contract should be selected. Data in contract can not be changed.
Print	Print out a contract							Customer, contract should be selected. Data in contract can not be changed. Printer should be connected.
Handle delivery	The system displays a new template for adding delivery, viewing and printing report of delivery list in detail information.							Customer, contract should be selected.

Table 4.4.9: Preliminary screen descriptions of S3: Handle contract sale (continue 8)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Handle payment	**The system displays a new template for adding payment, viewing and printing report of payment list in detail information.**							**Customer, contract should be selected.**
Exit	**Return to previous screen**							

S3_1: Browse contract

Table 4.4.10: Preliminary sub screen descriptions of S3_1: Browse contract

Descriptions of sub screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Contract number	Unique identification number of a contract.		x	x	Number	3		Output from Find contract.
Contract date	Signing date of a contract		x	x	Date	-		
Descriptions of function keys								
Select	Select a contract from the list							

S3_2: Browse staff

Table 4.4.11: Preliminary sub screen descriptions of S3_2: Browse staff

Descriptions of sub screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No	The order number from the staff list.		x	x	Number	3		Output from Find staff.
First name	First and middle name of a staff		x	x	Text	30		
Last name	Last name of a staff		x	x	Text	20		
Position	Position of staff in the company		x	x	Text	20		
Descriptions of function keys								
Select	Select a staff from the list							

S3_3: Handle delivery

Table 4.4.12: Preliminary screen descriptions of S3_3: Handle delivery

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Contract number	Unique identification number of a contract		x	x	Number	3		Output from selected Handle Delivery in the previous screen.
Contract date	Signing date of a contract		x	x	Date	-		
Delivery due date	Due date for the last delivery of the product		x	x	Date	-		
Contract total amount	Total contract value		x	x	Number	15		
First name	First and middle name of a customer		x	x	Text	30		
Last name	Last name of a customer		x	x	Text	20		
Customer number	Unique identification number of a customer		x	x	Number	4		
District	District number/name where the customer resides		x	x	Text	15		

Table 4.4.12: Preliminary screen descriptions of S3_3: Handle delivery (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Product name	Name of a product	x	x	x	Text	30		Input for Find product Output for Add delivery, after Finding selected product.
Product number	Unique identification number of a product	x	x	x	Number	4		
Quantity	Delivered quantity of a contract product for the contract sale	x		x	Number	6		Input for Add delivery
Delivery date	Date of delivered product to customer	x		x	Date	-		
Receipt number	Receipt number of the delivery	x		x	Number	6		

Table 4.4.12: Preliminary screen descriptions of S3_3: Handle delivery (continue 2)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Find product	The system displays a sub screen for finding a product.							The customer and contract has been selected.
Add deliver product	Add another product in the same delivery if any.							
Add delivery	Add delivery data to the system.							The customer and contract has been selected. The delivery quantity still remains in the contract.
List delivery	The system displays a new template with contract and customer main information, and report of delivery list in detail.							The customer and contract has been selected. At least one delivery for contract sale has already existed in the system.
Exit	Return to previous screen							

S3_4: List delivery

Table 4.4.13: Preliminary screen descriptions of S3_4: List delivery

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Contract number	Unique identification number of a contract		x	x	Number	3		Output from selected List Delivery in the previous screen.
Contract date	Signing date of a contract		x	x	Date	-		
Delivery due date	Due date for the last delivery of the product		x	x	Date	-		
Contract total amount	Total contract value		x	x	Number	15		
First name	First and middle name of a customer		x	x	Text	30		
Last name	Last name of a customer		x	x	Text	20		
Customer number	Unique identification number of a customer		x	x	Number	4		
District	District number/name where the customer resides		x	x	Text	15		

Table 4.4.13: Preliminary screen descriptions of S3_4 List delivery (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No.	Number showing the order of delivered product on the list		x	x	Number	2		Output from selected List Delivery in the previous screen.
Delivery date	Date of delivered product to customer		x	x	Date	-		
Receipt No.	Receipt number of the delivery		x	x	Number	4		
Product name	Name of a product		x	x	Text	30		
Contract price								
Product No.	Unique identification number of a product		x	x	Number	4		
Quantity	Delivered quantity of a contract product for the contract sale		x	x	Number	6		

Table 4.4.13: Preliminary screen descriptions of S3_4 List delivery (continue 2)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Total amount	Sum of one delivered product.		x	x	Number	13		Total amount = Contract price * Quantity (A) Output from selected List Delivery in the previous screen.
Delivery sum	The total quantity and sum of total amount of one delivered product		x	x	Number	Quantity column: 6 Total amount column: 15		Quantity column: sum of delivered Quantity of one product (B). Total amount column: sum of (A) in one product (C) Output from selected List Delivery in the previous screen.

Table 4.4.13: Preliminary screen descriptions of S3_4 List delivery (continue 3)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Remain sum	The total remain quantity and sum of a product for delivering		x	x	Number	Quantity column: 6 Total amount column: 15		Quantity column: Remain sum = Contract quantity – (B) Total amount column: Remain sum = One contract product sum – (C) Output from selected List Delivery in the previous screen.
Date__/__/20__	System date		x	x	Date	-		
Descriptions of function keys								
Print	Print out the report							Connect to printer
Exit	Return to previous screen							

S3_5: Handle payment

Table 4.4.14: Preliminary screen descriptions of S3_5: Handle payment

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Contract number	Unique identification number of a contract		x	x	Number	3		Output from selected Handle Paymnet in the previous screen.
Contract date	Signing date of a contract		x	x	Date	-		
Delivery due date	Due date for the last delivery of the product		x	x	Date	-		
Contract total amount	Total contract value		x	x	Number	15		
First name	First and middle name of a customer		x	x	Text	30		
Last name	Last name of a customer		x	x	Text	20		
Customer number	Unique identification number of a customer		x	x	Number	4		
District	District number/name where the customer resides		x	x	Text	15		

Table 4.4.14: Preliminary screen descriptions of S3_5: Handle payment (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Payment Receipt number	Receipt number of the payment	x		x	Number	4		Input for Add payment
Payment date	Date when a customer pays	x		x	Date	-		
Payment sum	Sum of money that customer pays to the company	x		x	Number	13		

Table 4.4.14: Preliminary screen descriptions of S3_5: Handle payment (continue 2)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Add payment	Add payment data to the system.							The customer and contract has been selected.
List payment	The system displays a new template with contract and customer main information, and report of payment list in detail.							The customer and contract has been selected. At least one payment for contract has already existed in the system.
Exit	Return to previous screen							

S3_6: List payment

Table 4.4.15: Preliminary screen descriptions of S3_6: List payment

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
Contract number	Unique identification number of a contract		x	x	Number	3		Output from selected List Payment in the previous screen.
Contract date	Signing date of a contract		x	x	Date	-		
Delivery due date	Due date for the last delivery of the product		x	x	Date	-		
Contract total amount	Total contract value		x	x	Number	15		
First name	First and middle name of a customer		x	x	Text	30		
Last name	Last name of a customer		x	x	Text	20		
Customer number	Unique identification number of a customer		x	x	Number	4		
District	District number/name where the customer resides		x	x	Text	15		

Table 4.4.15: Preliminary screen descriptions of S3_6 List payment (continue 1)

Descriptions of screen fields								
Field name	**Description**	**Input**	**Out-put**	**Mandatory**	**Type**	**Length**	**Initial value**	**Processing rule**
No.	Number showing the order of payment on the list		x	x	Number	2		Output from selected List Payment in the previous screen.
Payment date	Date when a customer pays		x	x	Date	-		
Receipt number	Receipt number of the payment		x	x	Number	6		
Previous debt	Contract total amount or the customer's last debt.		x	x	Number	15		
Payment sum	Sum of money that customer pays to the company		x	x	Number	13		
Current debt	The latest debt owed by the customer from the contract.		x	x	Number	15		
Date__/__/20__	System date		x	x	Date	-		

Table 4.4.15: Preliminary screen descriptions of S3_6 List payment (continue 2)

Descriptions of function keys								
Field name	**Description**			**Mandatory**				**Processing rule**
Print	Print out the report							Connect to printer
Exit	Return to previous screen							

5. Validation

5.1. Test plan

Goals of the testing

The goal of the testing is to ensure that the software model, which is described in the software requirements document, is proper one and sufficient from the view point of the business processes.

The goal is to test the use case model, the interface model and the data access paths to ensure proper functionality of the target software, and the business entity model to ensure proper data storages of the target software.

Time and place

At 14:00, on Tuesday 10.02.2009. Haaga-Helia University of Applied Sciences.

Participants

Jalasoja Kirsti, tester.
Thanh Tang, project manager

Test methods

The test method is a simulation.

The simulation is performed using the given test cases. The validity of the software requirements document must be estimated during the test process.

Test objects

The software model describes in the software requirement.

Test types

1. Functionality of the services
    - a use case diagram in a use case selection
    - the screen structure in a use case selection
    - contents of the screens in a use case selection

2. Usability of business class model
    - all attributes and operations, that are needed during the life cycle of an object are in the classes and described in detail

Test suites

1. Test suite

    Record product: test case P1-P7
2. Test suite

    Record potential customer: test case C1-C4
3. Test suit

    Handle contract sale: test case SC1-SC8

Test cases

See 5.2. Test case

Test environment

The quality assurance review takes place at 6th floor of Haaga-Helia University of Applied Sciences.
No special tools are required except papers and pencils.

Test reporting

The test error should be reported.

Acceptance criteria and methods

Jalasoja Kirsti, tester, is responsible for acceptance.

Thanh Tang, project manager, is responsible for the corrected results and quality of the software requirements document.

5.2. Test case

Record product information

Number	Test case	Expected results
P1	Find one product for view	
P2	Record new product	
P3	Record stock status	
P4	Record product price	
P5	List all products with current stock status	
P6	List all products with retail price	
P7	List all products with wholesale price and wholesale quantity	

Record potential customer information

Number	Test case	Expected results
C1	Find one customer information for view	
C2	Record new customer	
C3	Update customer	
C4	List all customers detail information	

Handle contract sale information

Number	Test case	Expected results
SC1	View a contract	
SC2	Make a contract	
SC3	Update a contract	
SC4	Print a contract	
SC5	Record delivery data for one product for a contract of a selected customer	
SC6	List all deliveries for a contract to a selected customer	
SC7	Record payment data for a contract of a selected customer	
SC8	List all payments in a contract by a selected customer	

Appendix 4

Requirements Engineering Process for Sales Management System Case study: Tin Phong Trading Co., Ltd.

Thanh Duc Tang

Final report

Business Information Technology

10.02.2009

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1. The background

This is a final report for the project Requirements Analysis for Sales Management System of Tin Phong Trading Co., Ltd which started in October of 2008 and ended by this accepted final report.

The Director of Tin Phong Trading Co., Ltd., who was my co-operator, and I had run business of trading motorcycle spare-parts for more than two years when I was in Vietnam. In that period, we managed the sales process by the traditional method to record the customers' information, payments and purchases through MS Excel or on paper. It took times to get expected and accurate information.

At the moment, those method is still using in the company. Combining my previous business experience and current Business Information Technology education background, it was a good opportunity for me to help them to solve their current sales management problems by creating a Sales Management System. From this point of view, Requirements Engineering Process for Sales Management System, which also considered as my thesis project, should be carried out before creating a complete system in use.

2. The results

The objectives of this thesis project were to have complete requirements analysis documentation for the Sales Management System of Tin Phong Trading Co., Ltd. According to the project plan, the following three documents were produced for the Requirements Engineering Process for Sales Management System:

- Feasibility study.
- System requirements analysis for Sales Management System.
- Software requirements analysis for Sales Management System.

The feasibility study and the system requirements analysis of the Sales Management System has totally done, but the software requirements analysis is still pending in some use cases because of the time limit and unpredictable big load of work. Therefore, the title of the software requirements document has been changed from "Software requirements analysis for Sales Management System" into "Software requirements analysis for Contract Sale Sub System

of Sales Management System". The reason of changing the title was that only three sub systems: Record product, Record potential customer, and Handle contract sale had done. Other use cases such as Handle retail, Handle wholesale, Handle returned product, Record feedback, and Browse report would be analysed later.

Although this project has not produced all results as planned, the main and most difficult parts have done. For instance, the company can easily follow the product and the customer information, and also the contract sale event. Handle contract sale sounds simpler than other sales, because people only see that the salesmen follow the signed contract to carry out its terms and conditions; for the other sales, they have to follow the payment for different deliveries. In reality, contract sale is the most challenged and complicated part not only in business field, but also for the system designers and developers. The contract sale is considered as the most important sale in the company at the moment. If the Handle contract sale management sub system can be solved, other sale sub systems can be followed this logic to develop easily. Therefore, the company could ask the future developers to base on the results of this project to complete the necessity as the company's need. However, this project is very practical, helpful, and important to the sales management process in the company.

Also in the software requirements analysis phase, "Data access" step was left out because of two reasons. First was the big work load under the time limit. Second was that the developer can provide this step later.

Besides the concrete results mentioned above, I have also got other abstract results from this project which is my learning objectives. I can say that I have achieved my learning objectives totally as my plan.

- Clear understanding of the requirements analysis process of software system.
- Improved skills in using of Object-Oriented methods, Business Process Modelling, and UML in system process.
- Applying in real life from the earlier learned skills such as Information Systems and Object Oriented Approach, Information System Requirement Engineering, Developing Information System, Software Project B.
- Getting positive experience of planning and arranging requirements analysis process project more effectively.

3. The process

Applied method was chosen in this thesis project. If the requirements analysis has been done in good results, the database design, and the implementation phase will be developed easier by Simeon Mushimiyimana, who will continue those phase from the results of this project as his thesis topic at Haaga-Helia University of Applied Science.

Necessary tools for this project were MS Office, MS Visio, Adobe Reader, Rational Rose email, or voipcheap for calling through internet.

This project was re-planned totally three times. Therefore, only the general actual project stage is described by the following figure, and the detail for this project stage is shown on the appendix 5.

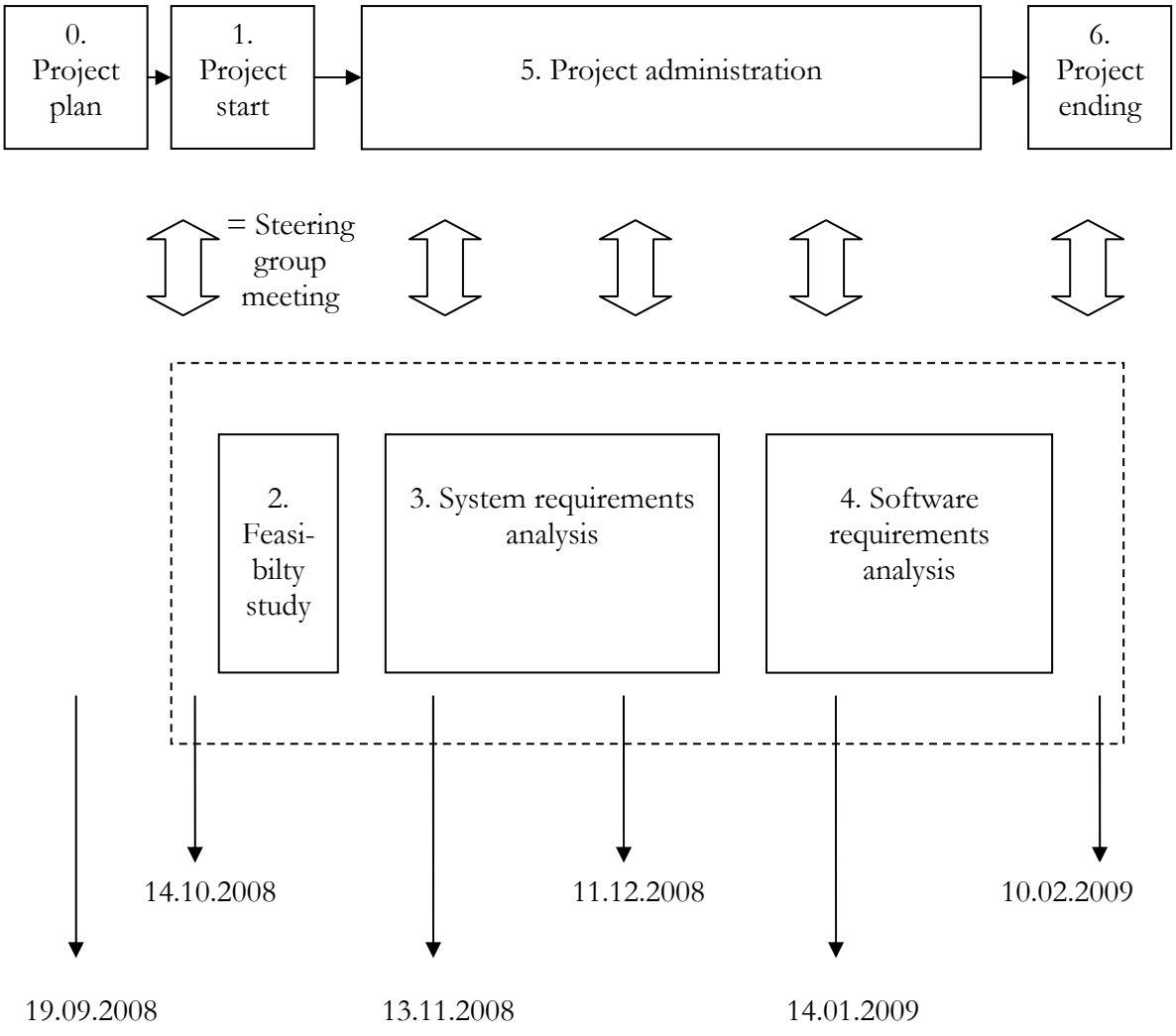

Figure 3: Project stage

The project plan started on 19.09.2009. Because of the different schedule between me and my Thesis Supervisor, this thesis project officially started on 14.10.2008 and ended by this final report dated on 10.02.2009.

This project was preceded a little tough causing by different reasons. The biggest and hardest one was still to estimate and name the coming problems for the project. Obviously, the unpredictable small changes would waste plenty of time for this kind of requirements analysis. This kind of project requires time consumption that I did not have. The time for this project was much less than it should have. The only solution for that was to try to check more often whether the current requirements analysis matched the previous one, and the company's requirements or not to avoid the correction during analysis process. The effect of this situation was that I could learn how to use my time more effectively.

Other reason was difficult to find a book concerning with this similar business analysis. The book is only described in general case. It is more complicated in real life especially the business in this field in Vietnam. Therefore, the main reference in this project was based on Kirsti Jalasoja web page in http://myy.haaga-helia.fi/~jalki/sys8tf060 . In addition, "Learning by doing" is also the solution to get more knowledge.

Further more, the sponsor for this project could not be present. I have applied all my previous business experience for this project. In case I had any questions or problems concerning to the business requirements during my analysis process, the only solution was to contact with my sponsor by phone or email.

Last but not least, I had got sick for couple of days during the Christmas holiday. It influents my project process schedule more or less to complete my task more and in time, because I utilized the whole Christmas holiday to do this thesis project.

However, the result of this project was produced by combining between my previous business experience and all of my information technology knowledge cumulated from different courses at Haaga-Helia University of Applied Science such as Information Systems and Object Oriented Approach, Information System Requirement Engineering, Developing Information System, Software Project B, in addition to the good advice from my Thesis Supervisor Kirsti Jalasoja.

4. The usage of resources

This project did not require any big cost, only a very small sum of money for the international phone call to the sponsor through internet that was less than ten Euros. The only biggest cost was the work hours for this project. Totally I had spent 608 hours in 19 weeks on this project that means 150% comparing with my original plan (406 hours), and 133% comparing with my re-plan (458 hours) (appendix 5). If we divide the work hour by weeks, it seems not very much, because it took time to start this project as I mentioned above and I got sick leave for couple of days after Christmas holiday.

Even though I tried and tried to utilize all my available time to finish whole project in time, finally the result of this project only covers about 80% comparing with the plan.

5. The experiences

My ultimate learning objectives were to get clear understanding of requirements analysis process of software system, and to apply the earlier learned skills such as Information Systems and Object Oriented Approach, Information System Requirement Engineering, Developing Information System, and Software Project B, into real life. After this project, I have really learned plenty of positive experience of analysing a system, improved my skills in using of Object-Oriented methods, Business Process Modelling, and UML in system process.

My main problem in this project was time, because the work load was too big. The solution for that was to try to check more often whether the current requirements analysis matched the previous one, and the company's requirements or not to avoid the correction during analysis process. In addition, I tried to work hard to complete as much as I could. From this point, this project was shown me how much time is necessary to spend for this kind of requirements analysis work later on.

As I mentioned above about the lack of materials as reference for this project, the best solution was "Learning by doing" and search the concerning information from different sources on internet. It was the fastest way to solve the problem when I did not have enough time for this project.

6. Further suggestion

The main and most difficult part Handle contract sale in software requirements analysis has been done. Only the Handle wholesale, Handle retail, Handle returned product, Record feedback, Browse report are pending in this project. It sounds very much, but the Handle wholesale, Handle retail, and Handle returned product parts are simpler than Handle contract sale according the requirements of the company, and the logic of those parts is nearly the same. The Record feedback is the simplest part. So, only the Browse report part may take time. In my opinion, it is good if the requirements analysis for those parts can be completed later for a developer to complete the whole software as the requirements of Tin Phong Trading Co., Ltd. I am sure I will complete them when I could, because the requirements analysis need to do the real work for learning more.

FOLLOW-UP ON WORK HOURS

2008- 2009 WEEK	38	39	41	42	43	44	45	46	47	50	51	52	1	2	3	4	5	6	7	PLAN HOURS	ACTUAL WORK HOURS
PLAN HOURS	*12*	*18*	*10*	*27*	*40*	*34*	*2*	*20*	*40*	*31*	*40*	*24*	*32*	*40*	*25*	*40*	*23*				
ACTUAL WORK HOURS	12	18	13	27	42	42	10	37	38	33	46	12	40	67	38	40	50	36	*7*		
TASK																					
0. Project plan	**12**	**18**	**10**																	***40***	**43**
0.1. Set up the project	12	18																		*30*	30
0.2. Project preparation meeting			3																		3
0.3. Complete project plan			10																	*10*	10
1. Project start				**3**																***3***	**3**
1.1. Project start steering group meeting 1				1,5																*1,5*	1,5
1.2. Minutes of meeting 1				1,5																*1,5*	1,5
2. Feasibility study				**24**	**4**															***8***	**28**
2.1. Elicit bases for the development				16																*3*	16
2.2. Design a vision of system architecture				8	4															*5*	12
3. System requirements analysis					**38**	**42**	**6,5**	**31**	**31**	**20**										***163***	**168,5**
3.1. Analyse business environment					16															*12*	16
3.2. Re-engineer the business process					22	16														*55*	38
3.3. Analyse business entities						26	4	14												*25*	44
3.4. Specify preliminary use case								15	20											*41*	35
3.5. Specify security requirments									4											*8*	4
3.6. Validate the system requirements									7	18										*16*	25
3.7. Review 1, 2, 3							2,5	2		2										*6*	6,5
4. Software requirements analysis										**10**	**46**	**12**	**40**	**62**	**18,5**					***156***	**188,5**
4.1. Re-plan										2										*2*	2
4.2. Specify boundaries of software item										8										*18*	8
4.3. Specify use case, sub use case model											22	8	10	33						*60*	73
4.4. Analyse details of class model											20		17	7						*26*	44
4.5. Design user interface											4	4	13							*12*	21
4.6. Data access														22						*20*	22
4.7. Validate the software requirements															16					*16*	16
4.8. Review 4															2,5					*2*	2,5
5. Project administration							**3,5**	**6**	**7**	**3**				**5**	**3,5**					***18***	**28**
5.1. Progress report 1, 2, 3							3,5	3	7					5						*12*	18,5
5.2. Steering group meeting 2, 3, 4								1		1					1					*2*	3
5.3. Minutes of meeting 2, 3, 4								2		2					2,5					*4*	6,5
6. Project ending															**16**	**40**	**50**	**36**	***7***	***70***	**149**
6.1. Final validation															16	40	40			*33*	96
6.2. Sum-up report																	10			*2*	10
6.3. Thesis report																		36		*29*	36
6.4. Final steering group meeting 5																			1	*1*	1
6.5. Minutes of meeting 5																			1		1
6.6. Deliverable																			5	*5*	5
																				458	**608**
																	Accomplishment				**133 %**