Logistics Information System Analysis and Design for Terminal Distribution in Delivery Companies

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Abstract—**With the emergence of electronic commerce enterprises, express delivery industry rapidly developed according to its fast and convenient services. However, it is difficult for users to accurately predict the distribution time, which resulting in problems such as the goods cannot be picked up in time when they are distributed. To solve the information asymmetry problems, this paper designed a set of new distribution process, which helps delivery companies to predict their distribution lead time. Customers can be informed ahead of time to choose their preferred receiving time, which enables the users to accurately predict the goods' arrival time and prepare for this. In this paper, the delivery companies' existing organizational structure and business processes are analyzed and optimized. System requirement is analyzed with the tool UML, which makes clear the functions and relationships for each business modules and provides conditions for further system development.**

Keywords-logistics engineering; logistics information system; terminal distribution; UML

I. INTRODUCTION

In recent years, with the emergence of electronic commerce enterprises, express delivery industry rapidly developed according to its fast distribution. However, sometimes the distribution service is not that convenient for customers to pick up parcels. For example, customers predict that the package will be delivered at weekend, so they leave their house' address for distribution, while in fact the packages are delivered on workday when customers are in the office. These problems exist since the communication between customers and delivery companies is asymmetry, information cannot be shared on time. At present, the distribution process for delivery companies is sorting, delivery, inform customers to pick up, and then wait for customers to pick up. On the one side, this process is concise and easy to operate. While on the other side, this process is lack of communication. To improve this situation, this paper designs a new set of distribution process to help customers communicate with delivery companies.

To solve the information asymmetry problems, this paper designed a set of new distribution process to help delivery companies predict their distribution lead time. Customers can be informed ahead of time to choose their preferred receiving time, which enables the users to accurately predict the goods' arrival time and prepare for this. First, the delivery companies'

existing organizational structure and business processes are analyzed and optimized. Then, the system requirement will be analyzed with the tool UML, which makes clear the functions and relationships for each business modules and provides conditions for further system development.

II. BUSINESS ANALYSIS

A. Organization Structure

The organization structure of the delivery company is displayed is displayed as figure Ⅰ.
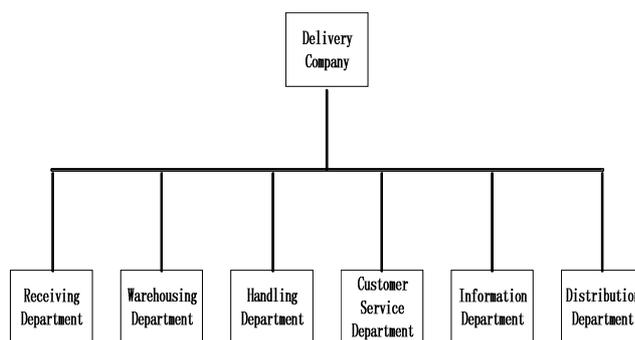
FIGURE I. ORGANIZATION STRUCTURE OF DELIVERY COMPANY

Receiving department is responsible for parcels allocation from customers and other distribution centers. Warehousing department is responsible for goods management in warehouse, including stock management, check inventory list and fill up stock removal forms. Handling department is responsible for handling goods and loading, unloading activities for distribution vehicles. Customer service department can help to contact with customers to inform them with parcels delivery time, and get users' feedback. Information department is mainly responsible for system management and maintenance, and distribution planning arranged by system. Distribution department helps to deliver goods according to distribution planning, inform customers to pick up, and send the distribution status back to information processing department.

B. Distribution Process

The distribution process is designed as figure Ⅱ.
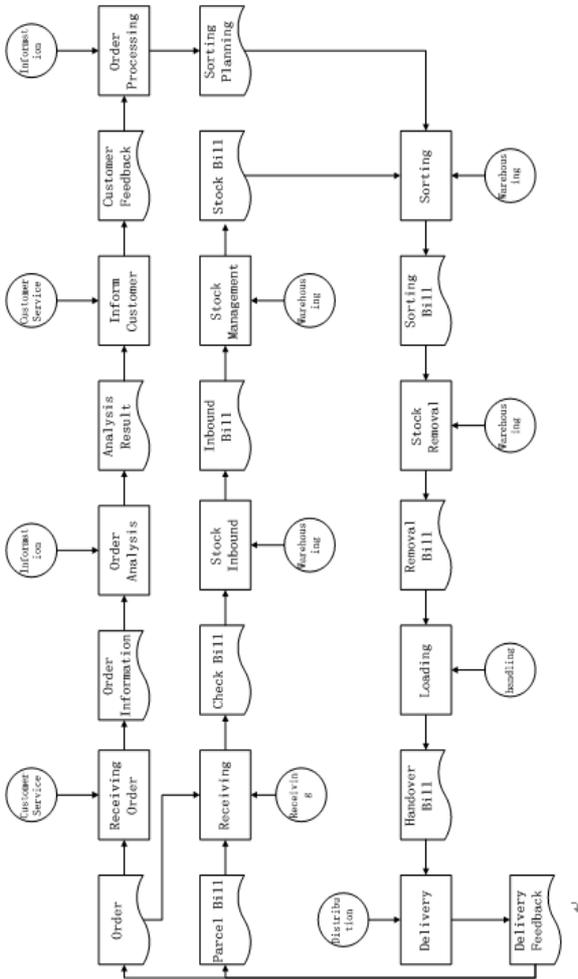
FIGURE II. FIGURE DISTRIBUTION PROCESS

Before receiving department collecting parcels from customers and other distribution center, the customer service department can firstly do processing to orders and get order information. The order information will be input to information department to analyze the distribution time range of parcels. The analysis results will be transformed as several delivery time choices and send to customers by email or message. Customer service department collect available feedbacks from users and send to information department again to deal with orders processing and get the sorting plan.

At the same time, receiving department will do check to the collected parcels. For normal parcels, they will be handover to warehousing department and inbound as stock. According to the sorting plan made by information department, the warehouse department will sort out parcels as requirement of sorting plan and stock bill. The sorted out parcels will be moved out from warehouse and load on trucks by handling department. Then the delivery department will do the distribution activity, contact with customer, inform them to pick up parcels, and finally send feedback to information department about the distribution status.

C. Data Catalog Analysis

Here the data catalog is analyzed by UC Matrix method to estimate the relationship between the company functions and system data. In the UC Matrix figure, the rows stand for process functions, and the columns stand for system data. Letter U stands for data using by process functions, and letter C stands for data creating by functions.

The distribution process is designed as figure Ⅲ.

		Order	Order Information	Analysis Result	Customer Feedback	Sorting Planning	Parcel Bill	Check Bill	Inbound Bill	Stock Bill	Sorting Bill	Removal Bill	Handover Bill	Delivery Feedback
Order	Receiving Order	C	C											U
	Order Analysis	U	U	C										
	Inform Customer			U	C									
	Order Processing				U	C								
Receiving	Receiving	U					C	C						U
	Stock Inbound							U	C					
	Stock Management								U	C				
Delivery	Sorting					U				U	C			
	Stock Removal										U	C		
	Loading											U	C	
	Delivery												U	C

FIGURE III.   UC MATRIX

III. UML Requirement Analysis

UML is an object-oriented modeling language, it use unified and standardized mark to do the object-oriented software system description and modeling. The main content of UML includes kinds of diagrams such as Use Case diagram, Static diagram, Behavior diagram and Interactive diagram. This system will base on UML tools to do requirement analysis to distribution process of delivery company. The following UML diagrams are introduced as part of works during the whole requirement analysis process.

A. Use Case Diagram

Use Case diagram can be used to descript system functions and their relative operators form the perspective of users. In this system, the functions include Order Receiving, Order

Analysis, Inform Customer, Order Processing, Receiving, Stock Inbound, Stock Management, Sorting, Stock Removal, Loading and Delivery. The operators include the departments as Customer Service department, Information department, Receiving department, Warehouse department, Handling department and Delivery department.

The Use Case diagram is displayed as figure Ⅳ. The connective relationships between functions and operators can be shown as the straight lines.
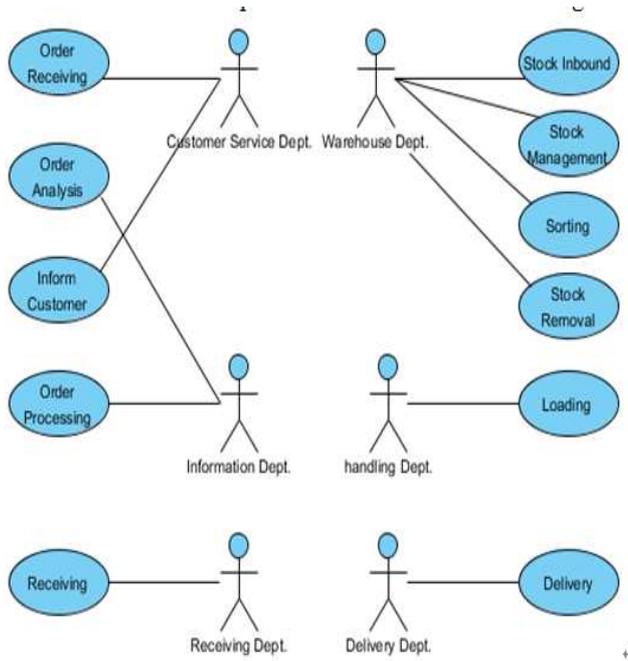

FIGURE IV.　　　　USE CASE DIAGRAM

B. *Sequence Diagram*

The Sequence diagram shows a set of objects and shows the activities to send and receive messages from this group of objects. With the sequence activities, users can show out the whole process in chronological order.

The Sequence diagram is displayed as figure Ⅴ.

IV.　CONCLUSION

At present, the distribution process for delivery companies is sorting, delivery, inform customers to pick up, and then wait for customers to pick up. Distribution service is not that convenient for customers to pick up parcels, since the communication between customers and delivery companies is asymmetry, information cannot be shared on time.
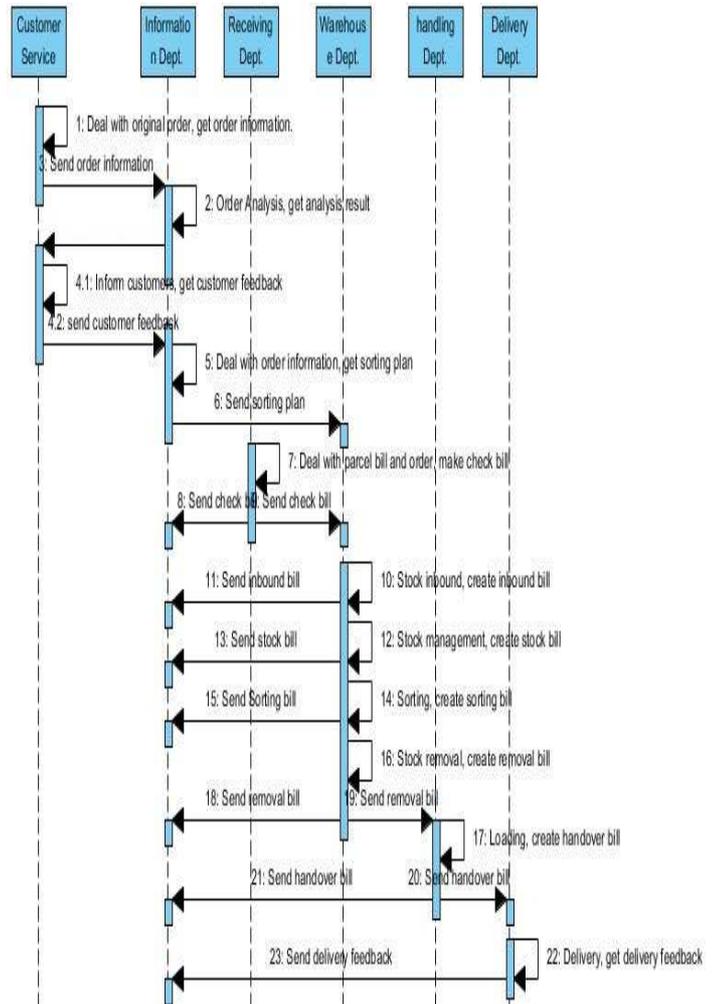

FIGURE V.　FIGURE SEQUERCE DIAGRAM

This paper designed a set of new distribution process to help delivery companies predict their distribution lead time. This system separates the order information flow form the real parcels flow, which support the system to analyze the order information first before the parcels are delivered to company's warehouse. So that customers can be informed ahead of time to choose their preferred receiving time, which enables the users to accurately predict the goods' arrival time and prepare for this.

The system requirement analysis is based on UML tools to do the description and modeling. With UML diagrams, the process functions and relative operators are described clearly, which do support to further develop in the future.

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