CHARPTER 4
MODELING THE NEW CUSTOMER ORDER PROCESS

Regarding the reengineering Methodology stated in Chapter 1, and the survey results stated in Chapter 3, a new customer order process model has been created. In this case the new model has been created by using a FirstSTEP software, which is a tool selected by the case company to help in any business process improvement project. However, the activity flow of new customer order process model's report from FirstSTEP consists of many pages, and inconvenient to use. Therefore, the functional flow chart stated in Chapter 2 has then been used as another tool to graphically view the new process / activities flow.

As a result, this chapter will firstly present the assumption of the new customer order process model, followed by the concept used to create it, illustrate the step in creating the new model, then show the high-level process, organization and resources modeling, the activity flow diagram and activities' detail, and the process simulation result.

4.1 The Assumptions of the New Customer Order Process Model

The assumptions that have been made in creating this model is as follows:

1. In this case there will not be an additional investment in technology as the company has already invested in the appropriate technology, as mentioned in Chapter 3, that supports the customer order process. Thus, the fixed cost, and time of the same activity is defined with reference to the fixed cost, and time consuming in the existing process as there is no changes in fixed cost. Furthermore, time and cost of the existing process has already been gathered by interviewing, and job observation, by the reengineering team of the case company.

2. Time calculation is based on 24 hours / day as the case company' s ordering center operate 24 hours / day. The resources and organization modeling of

the new customer order process model will be the same as the model of the existing customer order process.

3. Due to the limitation of software, it will run the next simulation after finishing the simulation of the previous order.

4. In this case, the situation will be based on that the product will be delivered from the Central Depot, in Bangkok, and will be distributed to the customer whose factory is located in Bangkok too. This is the same situation run in the existing customer order process model.

4.2 The Concept Used to Create the New Customer Order Process Model

The concept used to create the new customer order process model focuses on the customer satisfaction, and using technology that can reduce cost and satisfies customers. Customers want convenience, quick service, right type of product and on-specification product delivery. As technology surveyed result in Chapter 3, information related to customers, and delivery is shared among related and authorized officers via the computer network. So, using existing technology of the case company should result in the simple processing of customer order.

For the process, time is monitored in two ways: the time required to perform the activity or 'Processing time (hours)', and the time between when the last activity was completed and the time this activity is completed or 'Cycle time' (Harrington, 1991:104). One of the Harrington's study shows that while the total processing time is only 16.5 hours, the total cycle time is 923.0 hours. This means that performing all activities required only 1.8% of the total time that it took to fill the job. Customers do not see processing time; they see only cycle time (response time). So, to meet the organization's needs, the processing time must be reduced which means reducing costs; and to make customers happy, the cycle time must be reduced.

An example of the above statements is occurred in one sales process of IBM, IBM was able to reduce processing time by 30%, thereby reducing costs by 25%. At the same time, IBM reduced cycle time by 75%. The result was that sales increased more than 300%. This indicates that there is a direct correlation between cycle time, customer satisfaction, and increased profits (Harrington, 1991:105).

4.3 The Steps in Creating the New Customer Order Process Model

Refer to modeling the FirstSTEP model mentioned in Chapter 2, to create the new customer order process model, first the high level flow diagram of the process was identified. At this step, the case company can understand how different processes behave in relation to one another. Next, the organization structure and resources will be modeled. Then, process's activity flow will be diagrammed. At this step, the flow of works performed by resources will be represented, followed by modifying activity details by identifying resources used to perform an activity, material input/output, duration (length of time it takes to perform the activity), and fixed cost.

4.4 The High-Level Process of the New Customer Order Process

The high-level flow diagram is shown in Figure 4.1 below.

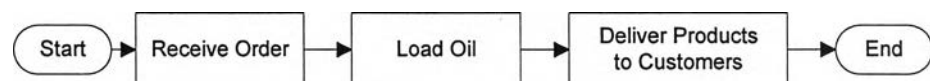Start → Receive Order → Load Oil → Deliver Products to Customers → End

Figure 4.1 High-level process map of the new customer order process

This shows that after customers order, the order will be received and then sent to load oil. After finishing oil loading, oil will be delivered to the customers.

4.5 Modeling the Organization and Resources

The organization and resources and their salary must be defined, as it will then be used as a template for detailing the activities, and calculating cost based on the resource usage. The organization and resources modeled in Figured 4.2, is modeled without any changing of the case company organization that is involved with the customer order process. Unfortunately, the salary is not allowed to present here.

Figure 4.2 shows that in Thai-Oil Market, there are 3 groups of people involved with the customer order process of the case company: they are , the customers, the case company, and the truck contractors. For the case company, there are 8 major working units involved with customer order process: they are, accounting unit, central depot, central scheduling, customer credit, legal, ordering center, terminal management, and treasury unit. Some major units are divided into sub-units. The details are as follows.

Accounting unit consists of 3 accountants. Central depot consists of 1 depot operator, and 1 depot supervisor. Under central depot, there is 1 loading product staffs unit, which consists of 7 loading contractors. Central scheduling consists of 1 scheduling clerk. Under central scheduling, there is 1 scheduling staff unit that consists of 3 scheduling staffs.

Customer credit consists of 1 contractor, and 2 credit officers. Under this unit, there are 2 sub-units: collector staff, and credit management. The Collector staff has 12 collectors (contractor), 10 collector staffs, 2 collector supervisors. Credit management has 2 legal officers. Legal unit consists of 1 legal officer.

Ordering center consists of 4 ordering clerks. Under ordering center, there is 1 section manager unit that is composed of 1 ordering center manager, 1 ordering supervisor. Section manager consists of 4 sub-units: data entry group, ordering group, shift group, and verification group. Data entry group consists of 3 contractors, and 2 operators. Ordering group has 4 ordering clerks.

Shift group has 4 shift contractors, and 10 shift staffs. Verification group has 3 verification officers. Treasury unit composes of 2 sub-unit: central depot division, and another division, at head office. Central depot division has 2 treasury officers, and 1 treasury supervisor.
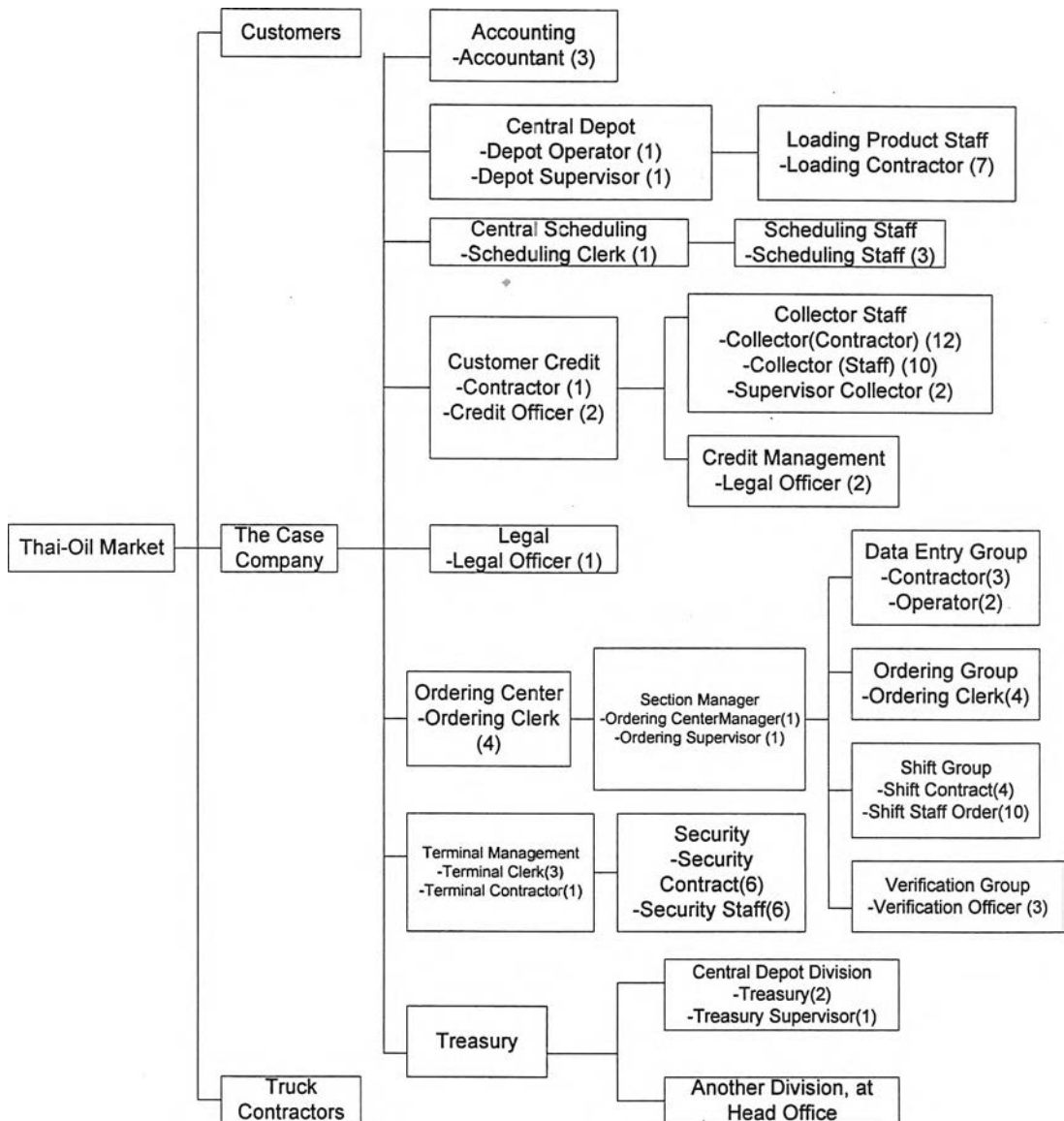

Figure 4.2 The organization and resources modeling

(Source: The case company's organization report of customer order process model, 1999)

4.6 The Activity Flow Diagram and Activities' Detail of the New Customer Order Process Model

After defining the organization and resources, the new process should be modeled in regard to two things. First, the new process should be modeled in regarding to what customers require (convenience when order, truck status checking, and quickly inform the customer if the order can not be completed while they are waiting for the products, the right type of product, and product on specification when they receive the product).

Second, it should be modeled in regard to what the organization requires (cost reduction, focusing on customer satisfaction, using technology that can support cost reduction and customer satisfaction). Hence, the new customer order process model is modeled as shown in Figure 4.3.

Figure 4.3 shows that the new customer order process model consists of 18 activities. Each activity consists of activities' details including resource used in the activity, processing time (duration), material input, material output, and fixed cost. All activities including responsible area or allocated resource, and processing time are listed in Table 4.1, while fixed cost, material input, and material output related to each activity is listed in Table 4.2.

Activity number 1 to 8 are activities under the high-level process of 'Receive Order'. Activity number 9 to 12 are activities under the high-level process of 'Load Oil'. Activity number 13 to 18 are activities under the high-level process of ' Deliver Products to Customer'.

Ordering Clerk	Depot Operator	Security Staff	Security Contract	Truck Owner	Customer

Start

1. Receive Order and Key It in Database

2. Check Financail Status? —No→ 3. Solve Problem —No→ 4. Cancel Order

Yes

Yes (from Solve Problem)

5. Check Truck Service? —No→ 6. Ask for Payment → 7. Issue Receipt&Print Pick Slip

Yes

8. Send Electronic Pick Slip to Depot → 9. Print Pick Slip, Issue Magnetic Card & Seal

10. Send to Contractor's Driver

11. Load Oil → 12. Gate Pass Out → 13. Print Invoice

14. Collect Pink Pick Slip → 15. Deliver Product to Customer → 16. Sign Invoice

17. Collect Copy of Signed Invoice

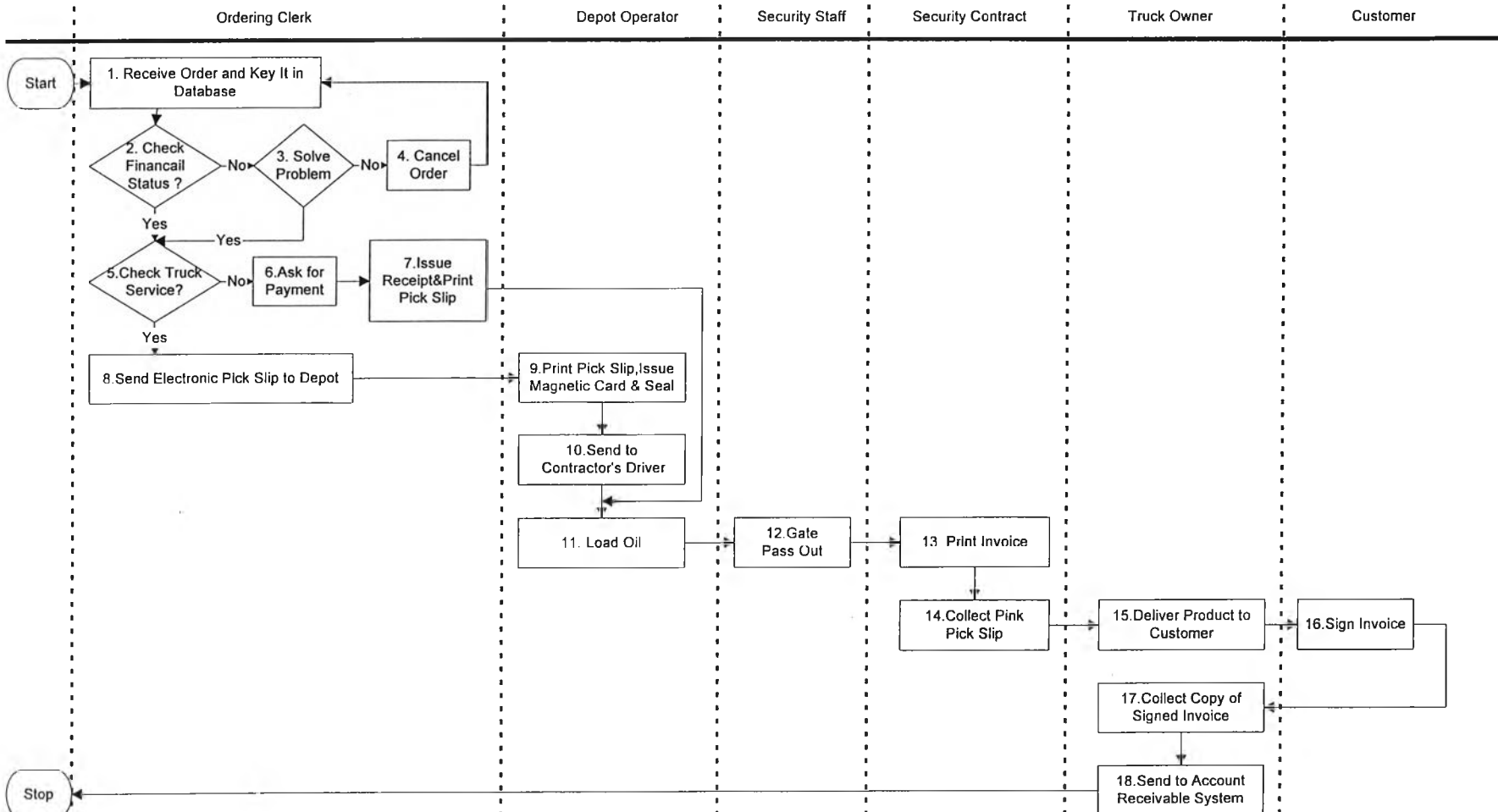18. Send to Account Receivable System

Stop

Figure 4.3 Functional flowchart of the new customer order process

Table 4.1 The new customer order process 's activities with resources, and processing time

Activity No.	Activity Name / Activity Description	Allocated Resource	Processing Time
1	**Receive order and key in database.** Ask for a customer code. Key in the database and select items that customer requires from the database. [Customer name and other information : type of payment, type of carrier, available vehicle/driver, product code, product name, product quantity, price , discount, delivery destination, dispensing depot/ loading office, type of payment, and etc. can be viewed automatically from database]	Ordering Clerk	3 +/- 2 minutes
2	**Check financial status.** Financial status such as credit limit and etc. can be viewed from database. If financial status is o.k., check if customer wants the case company's truck service. If not, solve problem.	Ordering Clerk	3 seconds
3.	**Solve problem.** Contact customer. If the problem can be solved, then check if customer wants the case company's truck service. If the problem can not be solved at all, cancel order with customer.	Ordering Clerk	80%: 10 minutes 5% : 24 hours 15%: 1 hour
4.	**Cancel order.** Cancel order with customer that has financial problem. (The customer will order again later)	Ordering Clerk	-
5.	**Check if customer wants the case company's truck service.** If yes, send electronic pick slip that is completely filled in activity 1, to Depot Operator. If no, start activity 6, ask for payment.	Ordering Clerk	3 seconds
6.	**Ask for payment.** Customer who does not want the company service has its own vehicles. Normally, they will have their own driver deliver oil. They will have the driver carry the financial document for the payment.	Ordering Clerk	1 minute
7.	**Issue receipt and print pick slip.** This is for the driver of customer who does not want the company service. (Driver will then go to the depot for oil loading)	Ordering Clerk	-
8.	**Send electronic pick slip.** Send from the database to Depot Operator.	Ordering Clerk	1 second

Table 4.1(continued) The new customer order process 's activities with resources, and processing time

Activity No.	Activity Name / Activity Description	Allocated Resource	Processing Time
9.	**Print the pick slip.** Print pick slip. Issue magnetic card, and seal. Key in the detail of carrier / delivery. Schedule is automatically managed as shown in database. [Available vehicle and driver can be known from the database as when the drivers and vehicles arrive at the gate, magnetic card will be wiped to record the driver and vehicle information, and Time In.]	Depot Operator	10 minutes
10.	**Send pick slip, magnetic card, and seal to driver.** At the depot, the driver of delivery contractor company will stand by for the delivery.	Depot Operator	5 minutes
11.	**Load oil.** (If customer has its own carrier, the customer's driver will go to the depot for oil loading) Magnetic card will be wiped. At this step, in formation loaded in magnetic card will be sent to record in database. Such information included all delivery detail e.g., vehicle number, driver name, type and amount of product loaded, and etc. After loading, driver will drive to the gate.	Depot Operator	40 +/- 10 minutes
12.	**Gate pass out.** Check seal and whip magnetic card again to record the Time Out.	Security Staff	90%: 5 minutes 10%: 10 minutes
13.	**Print invoice.** For the case company, invoice means tax invoice, delivery receipt, and invoice.	Security Contract	30 seconds
14.	**Collect pink pick slip.** This is for a dispensing depot, and for legal evidence.	Security Contract	20 seconds
15.	**Deliver oil to customer.** At this stage the driver will keep a blue pick slip to use during the trip.	Truck Owner	-
16.	**Sign invoice.** Invoice and delivery receipt is set in the same document.	Customer	30 minutes
17.	**Collect copy of signed invoice.**	Truck Owner	-
18.	**Send copy of signed invoice to Account Receivable system**	Truck Owner	-

Table 4.2 The new customer order process 's activities with fixed cost, and material inputs /material

outputs

Activity No.	Activity Name	Material Inputs	Material Outputs	Fixed Cost (Baht)
1.	Receive Order and Key in database.	A client order.	A set of electronic pick slip. An electronic data of order.	0.00
2.	Check financial status.	A set of electronic pick slip. An electronic data of order.	3%: An over limited credit. 97%: An available credit.	5.00
3.	Solve problem.	An over limited credit	50%: An available credit. 50%: An over limited credit.	0.00
4.	Cancel order.	An over credit	-	-
5.	Check if customer want the case company's truck service.	An available credit.	20%: Data of not using the case company's service. 80%: Data of using the case company's service.	0.00
6.	Ask for payment.	Data of not using the case company's service.	A cash. A cheque.	0.00
7.	Issue receipt and print pick slip.	A cash. A cheque.	-	-
8.	Send electronic pick slip.	Data of using the case company's service.	A set of pick slip	5.00
9.	Print the pick slip. Issue magnetic card, and seal.	A set of pick slip	A magnetic card. A pick slip.	4.50
10.	Send pick slip, magnetic card, and seal to driver.	A magnetic card. A pick slip.	A magnetic card. A pick slip.	0.00
11.	Load oil.	A magnetic card. A pick slip.	A magnetic card. A pick slip. A loading instruction. A loaded product.	450.00

Table 4.2 (continued) The new customer order process 's activities with fixed cost, and material inputs /material outputs

Activity No.	Activity Name	Material Inputs	Material Outputs	Fixed Cost (Baht)
12.	Gate pass out.	A magnetic card. A pick slip. A loading instruction. A loaded product.	A magnetic card. A pick slip. A loading instruction. A loaded product.	0.00
13.	Print invoice.	A magnetic card. A pick slip. A loading instruction. A loaded product.	A copy of invoice. A loaded product.	1.00
14.	Collect pink pick slip	A copy of invoice. A loaded product.	A blue pick slip for delivery trip. A loaded product.	0.00
15.	Deliver oil to customer.	A blue pick slip for delivery trip. A loaded product.	An invoice.	0.00
16.	Sign invoice	An invoice.	A signed invoice.	0.00
17.	Collect copy of signed invoice	A signed invoice.	A copy of signed invoice.	0.00
18.	Send copy of signed invoice to Account Receivable system	A copy of signed invoice.	-	0.00

4.7 The New Customer Order Process Simulation Result

The simulation produces a database of statistical results which if saved can be used to generate reports. In addition, simulation dynamic report shows an ongoing resource utilization and resource status. Observing the simulation and analyzing the statistical and dynamic report data provide valuable insight into enterprise performance and behavior and start the process of identifying renewal or improvement opportunity (Interfacing Technologies Corporation, 1998: 82).

4.7.1 The Simulation Configuration

After detailing resources, processing time, material inputs,/ outputs, and fixed costs into the activities, the model will then be analyzed and simulated. The simulation configuration specified for this model was as follow:

- Simulation length: 30 Days 0:00:00 hours

- Volume of orders was set to 12000+/-1600 per 30 days

4.7.2 Average Cost of The New Customer Order Process

The cost of the activity / process comprises of the fixed cost and any variable cost. The activity-total cost report is calculated from the simple mathematical equations which are closely resemble the actual algorithms used by the software (Interfacing Technologies Corporation, 2000:70-73). These equations are:

$$C_{ACT,TOT} = \sum_{i=1}^{o} [C_{ACT,VAR} + C_{ACT,FIX}]$$

where:

$$C_{ACT,VAR} = \sum_{i=1}^{o} [P_{ACT} * R_{C/UTi}]$$

when:

$C_{ACT,TOT}$ = Activity-Total cost

$C_{ACT,VAR}$ = Activity variable cost

$C_{ACT,FIX}$ = Activity fixed cost

P_{ACT} = Activity processing time (Duration)

$R_{C/UTi}$ = Resource cost per unit time

O = Number of occurrences which are the number of times the activity will be created within the specified time period.

A new process consists of many activities. Each activity has different number of occurrences created in the specified simulation time period (30 days). Therefore, cost incurred in each activity is different. The average cost of each activity can be calculated from the equation below:

$$C_{ACT,AVG} = C_{ACT,TOT} / O$$

when:

$C_{ACT,AVG}$ = Activity- Average cost

$C_{ACT,TOT}$ = Activity-Total cost

O = Number of occurrences

As a consequence, to calculate average cost of the new customer order process is to sum up the average cost of each activity. The average cost, of each activity, incurred in the specified simulation time period (30 days) is shown in Table 4.3 below.

Table 4.3 Average processing time and cost of each activity of the new customer order process

Activity No.	Activity Name	No. of occurrences	Activity-Average Processing Time (hour:minute:second)	Activity-Average Cost (Baht)
1.	Receive Order.	1,788	0:03:04	7.78
2.	Check financial status.	1,437	0:00:03	5.13
3.	Solve problem.	27	2:56:18	445.23
4.	Cancel order.	10	0:00:00	0.00
5.	Check if customer want the case company's truck service.	1,025	0:00:03	0.13
6.	Ask for payment.	154	0:01:00	2.53

Table 4.3 (continued) Average processing time and cost of each activity of the new customer

order process

Activity No.	Activity Name	No. of occurrences	Activity-Average Processing Time (hour:minute:second)	Activity-Average Cost (Baht)
7.	Issue receipt and print pick slip to the driver of customer who does not want the company service.	139	0:00:00	0.00
8.	Send electronic pick slip from the database to Depot Operator.	610	0:00:01	5.04
9.	Print out the pick slip. Issue magnetic card, and seal.	418	0:10:00	26.15
10.	Send pick slip, magnetic card, and seal to driver.	227	0:05:00	10.82
11.	Load oil.	124	0:42:14	541.44
12.	Gate pass out.	120	0:05:26	9.93
13.	Print invoice.	120	0:00:30	1.28
14.	Collect pink pick slip	120	0:00:20	0.19
15.	Deliver oil to customer.	117	0:00:00	0.00
16.	Sign invoice	117	0:30:00	0.00
17.	Collect copy of signed invoice	117	0:00:00	0.00
18.	Send copy of signed invoice to Account Receivable system	117	0:00:00	0.00

Therefore, the average cost of the new customer order process is 1,055.65 Baht.

4.7.3 Average Processing Time of the New Customer Order Process

As mentioned earlier that a new process consists of many activities, and each activity has different number of occurrences created in the specified simulation time period (30 days). Therefore, processing time spent in each activity is different. The average processing time of each activity can be calculated from the equation below:

$$P_{ACT,AVG} = P_{ACT,TOT} / O$$

when:

$P_{ACT,AVG}$ = Activity- Average processing time

$P_{ACT,TOT}$ = Activity-Total processing time

O   = Number of occurrences

where:

$$P_{ACT,TOT} = \sum_{i=1}^{o} P_{ACT}$$

when:

P_{ACT} = Activity processing time (Duration)

O   = Number of occurrences

The processing time of a process is the sum of all activity processing time. The average processing time, of each activities, spent in the specified simulation time period (30 days) is shown in Table 4.3. Hence, average processing time of the new customer order process is 4 hours, 33 minutes, and 59 seconds.

4.7.4 Average Elapsed Time of the New Customer Order Process

The elapsed time or a cycle time of a process is the total length of time required to complete the entire process. It includes not only the time taken to perform the work but also the time spent moving documents, waiting, storing, reviewing, and reworking. Reducing total cycle time frees resources, reduces cost, improves the quality of the output, and can increase sales. As shown in the equations below, the average of the process elapsed time is:

$$E_{PRC,AVG} = \sum_{i=1}^{o} E_{ACT,AVG}$$

when:

$E_{PRC, AVG}$ = Process-Average Elapsed Time

$E_{ACT, AVG}$ = Activity-Average Elapsed Time

where:

$$E_{ACT, AVG} = [\sum_{i=1}^{O} MWT + DFR_i + DRR_i + P_{ACT, AVG}] / O$$

when:

MWT = Material Waiting Time

DFR = Free Resource Delay

DRR = Reserved Resource Delay

$P_{ACT, AVG}$ = Activity-Average Processing Time

O = Number of occurrences

Table 4.4 Average elapsed time of each activity in the new customer order process

Activity No.	Activity Name	No. of occurrences	Activity-Average Elapsed Time (day: hour:minute:second)
1.	Receive Order.	1,788	2:05:21:48
2.	Check financial status.	1,437	2:03:55:00
3.	Solve problem.	27	2:01:42:54
4.	Cancel order.	10	1:01:54:03
5.	Check if customer wants the case company's truck service.	1,025	2:02:19:00
6.	Ask for payment.	154	1:03:02:17
7.	Issue receipt and print pick slip to the driver of customer who does not want the company service.	139	1:00:57:39
8.	Send electronic pick slip from the database to Depot Operator.	610	1:04:07:09
9.	Print out the pick slip. Issue magnetic card, and seal.	418	8:06:11:07

Table 4.4 (continued) Average elapsed time of each activity in the new customer order process

Activity No.	Activity Name	No. of occurrences	Activity-Average Elapsed Time (day: hour:minute:second)
10.	Send pick slip, magnetic card, and seal to driver.	227	5:05:16:18
11.	Load oil.	124	5:05:52:55
12.	Gate pass out.	120	1:00:37:57
13.	Print invoice.	120	1:02:59
14.	Collect pink pick slip	120	0:00:24
15.	Deliver oil to customer.	117	1:00:34:43
16.	Sign invoice	117	0:59:00
17.	Collect copy of signed invoice	117	0:00:00
18.	Send copy of signed invoice to Account Receivable system	117	0:00:00

The average elapsed time of each activity in a process is shown in Table 4.4. Therefore, average elapsed time of the process is 33 days, 19 hour, 48 minutes, and 13 hours.

4.7.5 Resources Use Summary

Table 4.5 represents the percentage of busy and idle of resources used in the process, reported by the simulation result.

Table 4.5 Resource use summary of the new customer order process

No. of Resources	Resource Name	Activities Executed	Busy %	Idle %
1	Security Contract4	-	0.00%	100.00%
2	Security Staff6	-	0.00%	100.00%
3	Security Staff5	-	0.00%	100.00%
4	Truck Owner	Send to Account Receivable System Deliver product to customer Collect copy of signed invoice	0.00%	100.00%
5	Security Contract5	-	0.00%	100.00%
6	Security Staff4	Gate pass out	0.07%	99.93%
7	Security Staff3	Gate pass out	0.07%	99.93%
8	Security Contract3	Gate pass out	0.07%	99.93%

Table 4.5 (continued) Resource use summary of the new customer order process

No. of Resources	Resource Name	Activities Executed	Busy %	Idle %
9	Security Contract2	Gate pass out	0.10%	99.90%
10	Security Contract	Gate pass out Collect pink pick slip Print invoice to driver	0.73%	99.27%
11	Security Contract1	Gate pass out	1.39%	98.61%
12	Security Staff2	Gate pass out	1.39%	98.61%
13	Security Staff1	Gate pass out	1.39%	98.61%
14	Customer	Order Sign invoice	33.24%	66.76%
15	Ordering Clerk1	Cancel order Issue receipt and print pick slip to the driver of customer who does not want the company service. Ask for payment Receive order and Key it in database Send electronic pick slip to Depot Check if truck service required Check financial status Solve problem	99.94%	0.06%
16	Depot Operator	Load oil Send pick slip, magnetic card, and seal to driver. Print out the pick slip. Issue magnetic card, and seal.	99.97%	0.03%

Form Table 4.5, most percentage of idle occur in many resources: security contract, security staff, while ordering clerk and depot operator is very busy.