

106 EEI Project #1



GROUP 2

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INTRODUCTION

This is a start-up company called “TDC”, which is shorted for “**Taiwan Diamond Company**”. TDC was founded by four graduate students in 2017, holding the spirit of **customer first** to serve all the Taiwanese customers. The factory of TDC is located in South Africa, producing high-quality diamond rings (Figure 1-1). Then the finished products will be transported to Taoyuan, and be delivered to three different retail stores: Taipei, Taichung and Kaohsiung (Figure 1-2).

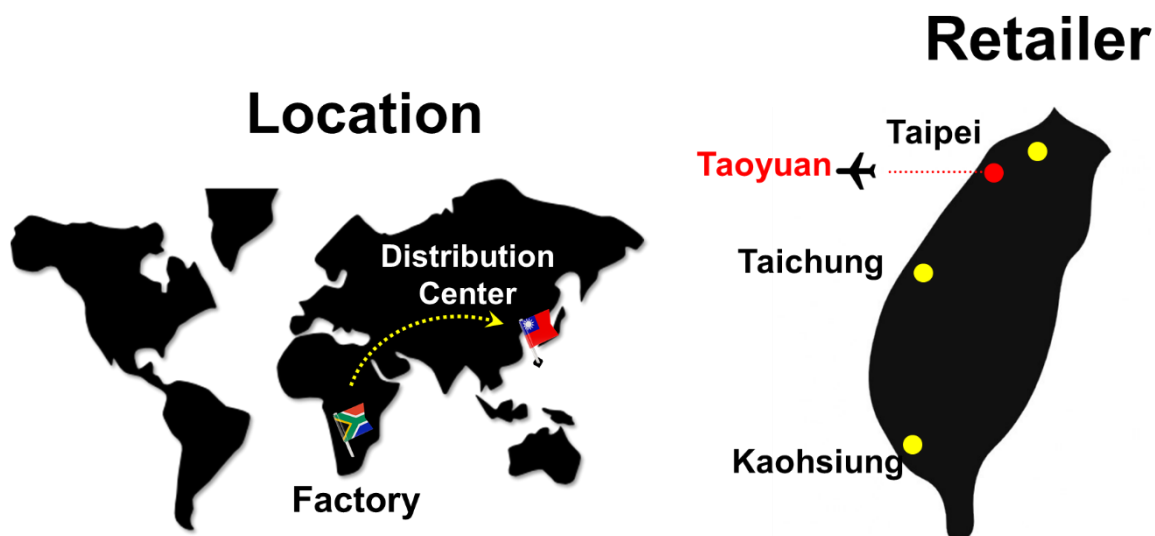


Figure 1-1. Location

Figure 1-2. Retailer

AS-IS MODEL

Behavior Model

In the As-Is Model (Figure 2-1), after the diamond factory in South Africa receive diamonds, the factory will start to process the diamonds into diamond rings. As long as the diamond rings pass the QA, the finished products are completed (Figure 2-2).

In order to equally deliver the finished products to three retail stores, finished products will first be sent to the distribution center in Taoyuan. In the distribution center (Figure 2-3), each product will go through a sorting process according to their destinations. While all the finished products with same destination are packaged, the package will be delivered to the corresponding retail store.

In the last stage (Figure 2-3), each retail store will receive some finished products. The clerk will display those products in the store. If any customer select a product and decide to buy it, the customer will choose a way to pay for the product. After the retail store receive the payment, the diamond ring will be given to the customer.



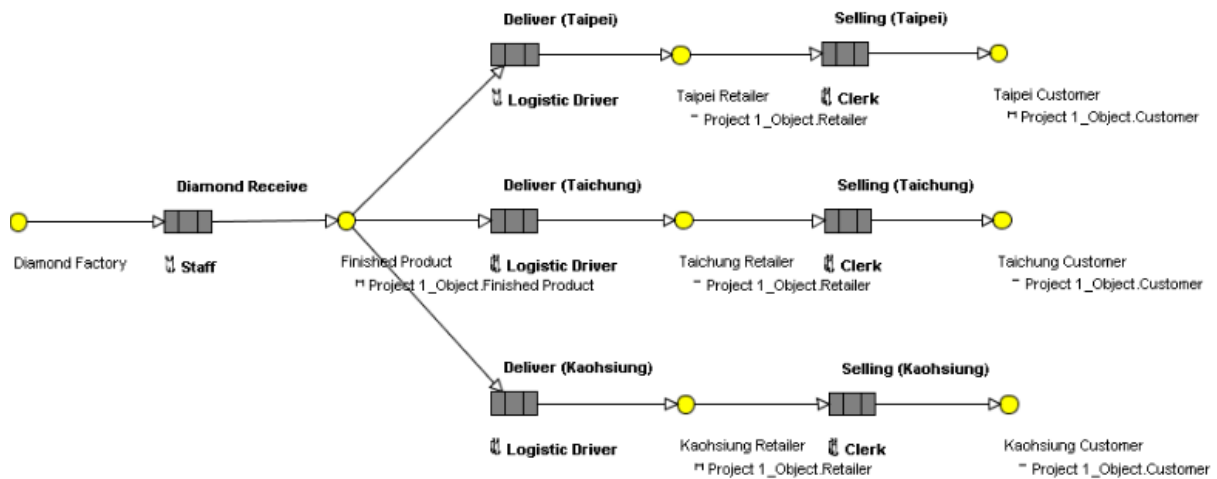


Figure 2-1. Behavior Model

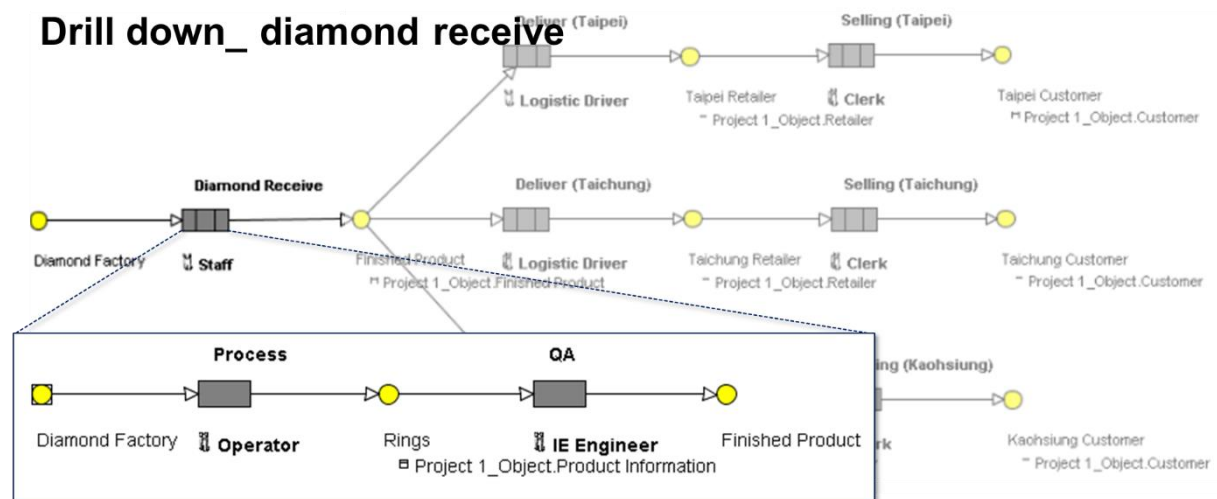


Figure 2-2. Drill Down: Diamond Receive

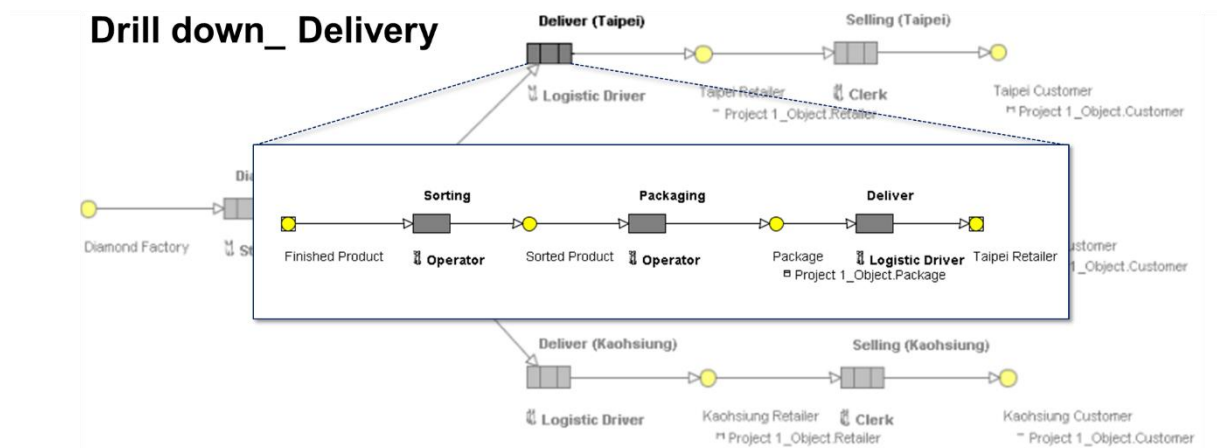


Figure 2-3. Drill Down: Delivery



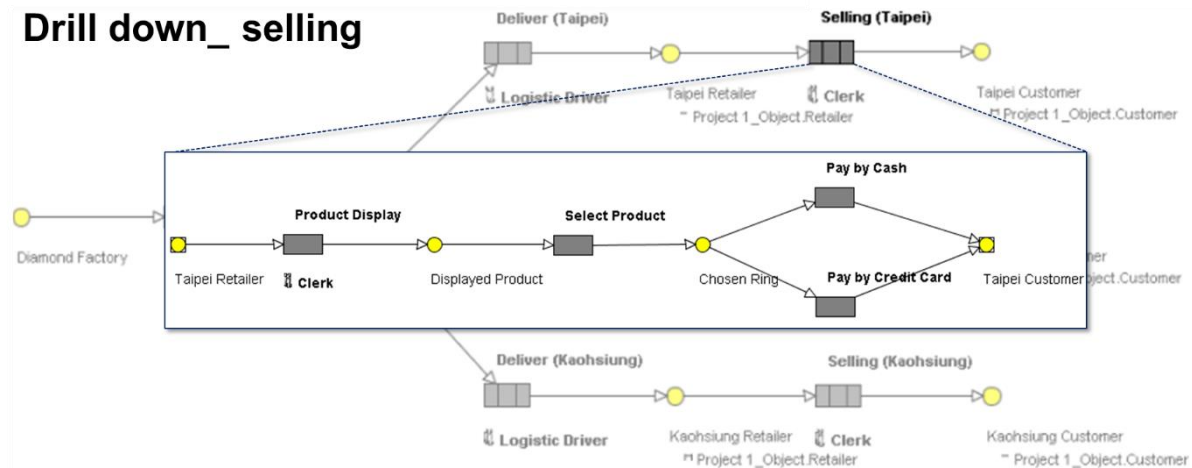


Figure 2-4. Drill Down: Selling

Organization Model

In the Taiwan Diamond Company (Figure 2-5), it has Board of Directors to decide the company's direction of development. Below the Board of Directors is the Management Department, it is in charge of the operation of this company. According to different function, the organization is then divided into four department: Trading, Manufacture, Sales and Finance. In the Manufacture Department, there are Production and Distribution Department; In the Sales Department, there are three retail stores.

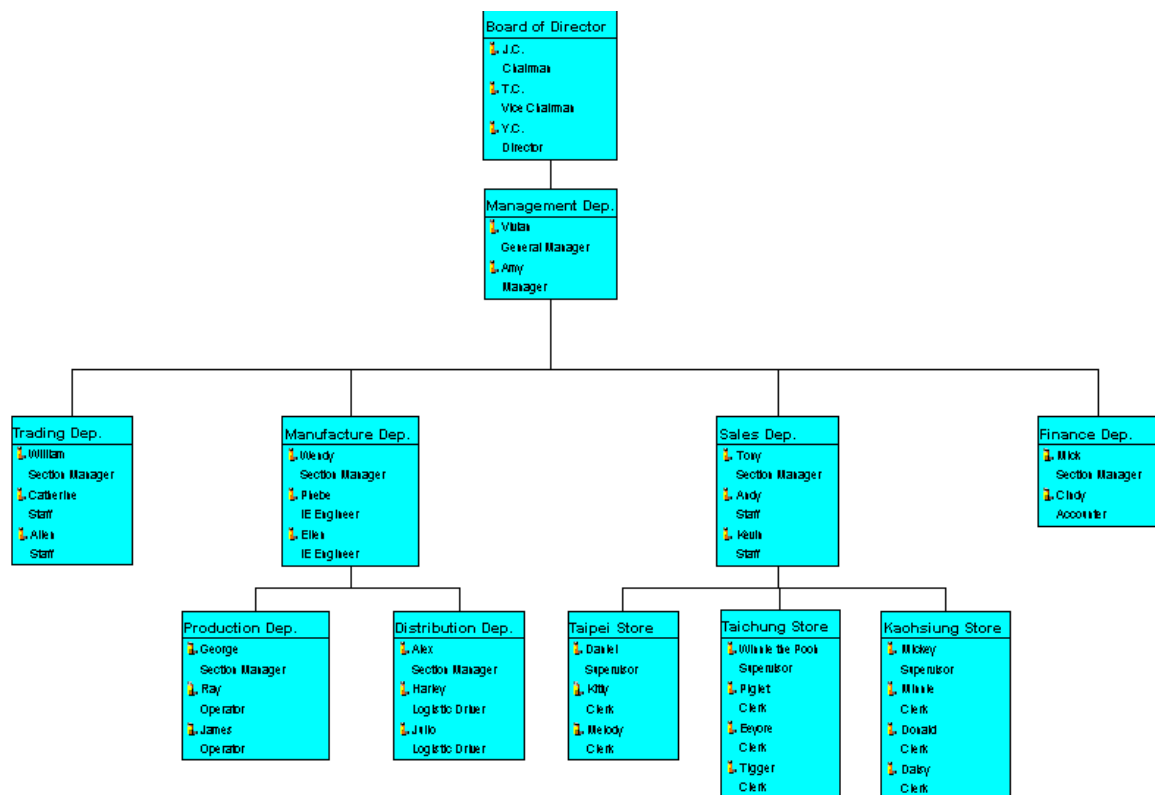


Figure 2-5. Organization Model



Object Model

In the Object Model (Figure 2-6), it has retailer information, including the corresponding manager, product information and deliver information. In the product information, it reveals the designer and the product type. When a customer buy an item, we can acquire the customer information. In addition, with the receipt, we can know the product information of the customer.

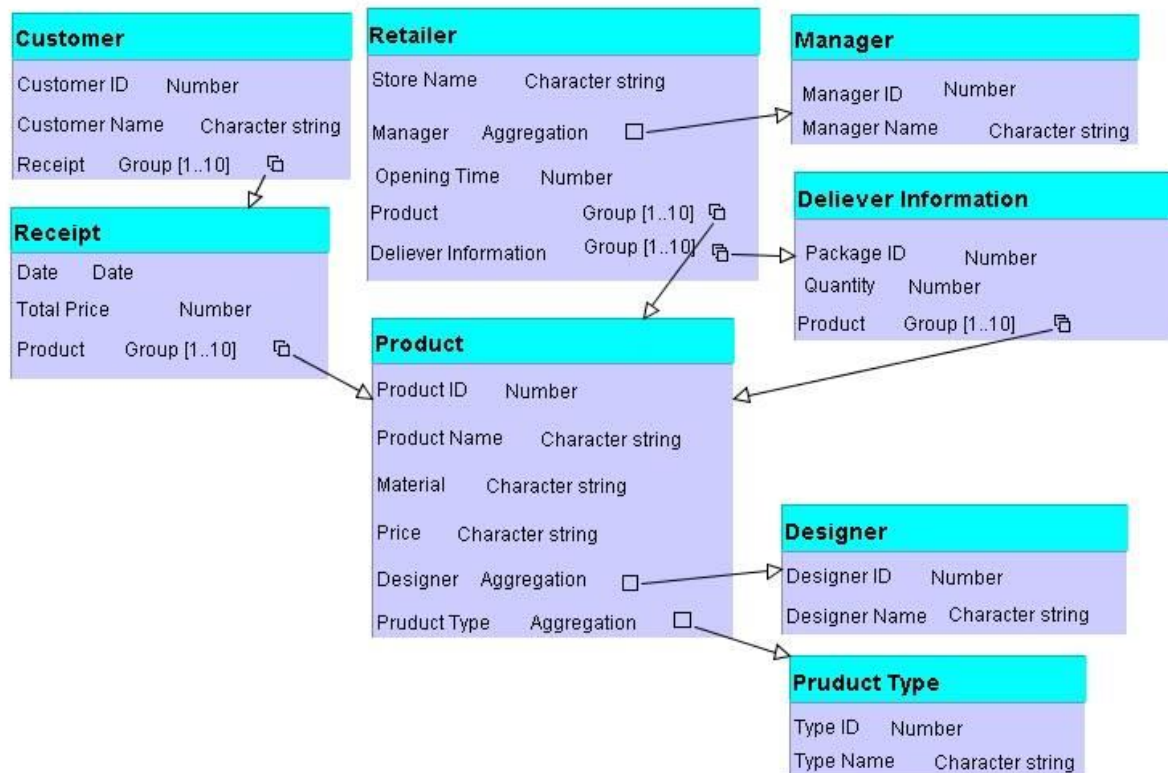


Figure 2-6. Object Model

Simulation Result

Before running the simulation, we set up the cost per unit, price per unit, and the demands from different location are as follow:

- Cost: NTD\$ 60,061/unit
- Price: NTD\$ 80,000/unit
- Demand from Taipei Customer: 80 units
- Demand from Taichung Customer: 15 units
- Demand from Kaohsiung Customer: 5 units

Finally, we acquired the result from the simulation (Figure 2-7, 2-8). The demand from the Taipei customers are not satisfied. The cost is NTD\$ 6,006,100 with the use of 0.354 year simulation time.



Behavior model

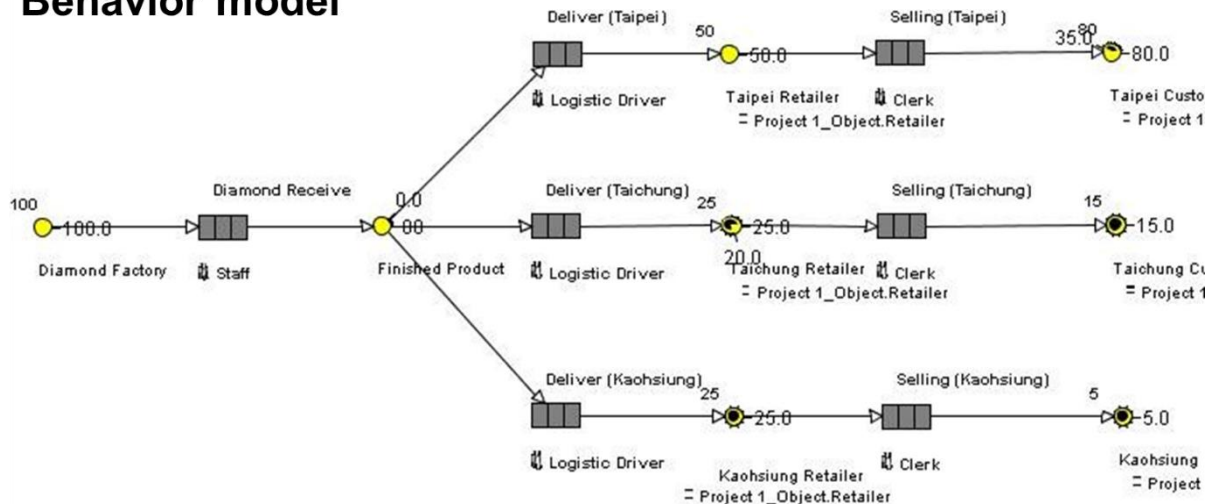


Figure 2-7. Result of Behavior Model

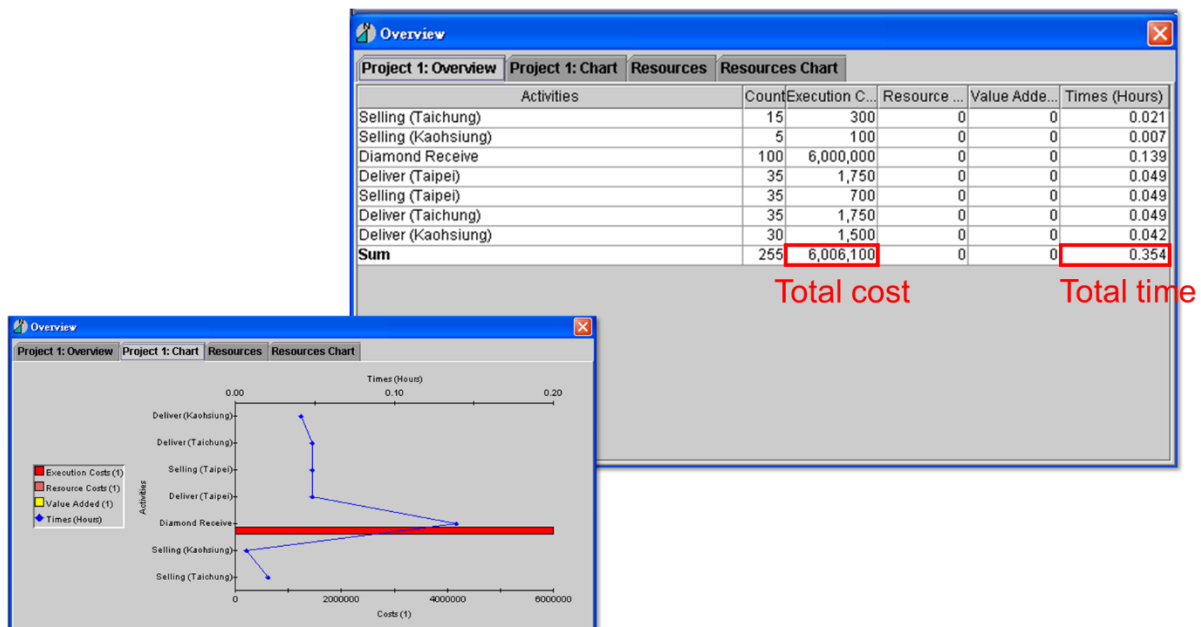


Figure 2-8. Result of Cost and Time

BPR: THEORY OF CONSTRAINTS (TOC)

When we first start to improve processes, the situation is daunting: we can see so much that can be improved. Where do we start? What will have the biggest effect? And when we've done that, what do we do next?

In this case, our group use "Theory of Constraints" to give a simple and powerful framework to guide our process improvement. Let's go through the following "Five Focusing Steps" and see what results we get in the end.



Step 1: Where is the bottleneck?

- (1) Unsatisfied service level
- (2) Negative net profit:

$$\frac{(\text{Total Price} - \text{Total Cost}) / \text{Total Time Consumption}}{= (\text{NTD\$ } 80,000 \times 55 - \text{NTD\$ } 60,061 \times 100) / 0.354 = \text{NTD\$ } -4,537,005 \text{ dollars/year}}$$

Step 2: Exploit the bottleneck: Remove (limit) interruptions or impediments

- Improve the service level to 100%, and satisfy each customer's demands

Step 3: Subordinate every other decision to the bottleneck: Non-bottlenecks ensure that only high quality work in progress handed to the bottleneck

- In logistics part, we distribute what the customers' want to meet their demands in anytime and anywhere

Step 4: Elevate the bottleneck: Switching to a different technology

- To achieve our purpose, we decided to build a "Website" to replace the role of "Retailer". In this way, our customers can receive their personalized products in shorter time.

Step 5: And again!

- Where's the bottleneck? We now need to focus our attention on the new bottleneck.

TO-BE MODEL

Behavior Model

In the To-Be Model (Figure 3-1), we decided to replace the retailers by building a website. The new business model after the replacement keeps the same price with a slightly higher cost, but changes the delivering activity. First, the finished products from the factory are all delivered to the distribution center. When customers order online, the product will be delivered to them from the distribution center.

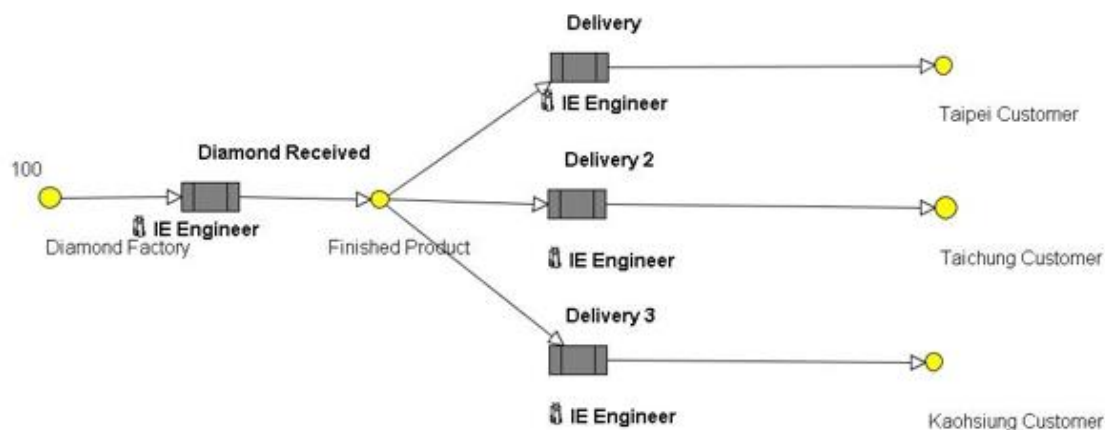


Figure 3-1. Behavior Model



In the behavior model, the part from the Diamond factory to the finished products is the same as the As-Is Model. What the different is that the Delivery activity from the finished product to the customer.

First, the finished product is sent to the distribution center as inventory then it goes through an order process and delivery activity (Figure 3-2, 3-3).

Drill down_ diamond receive

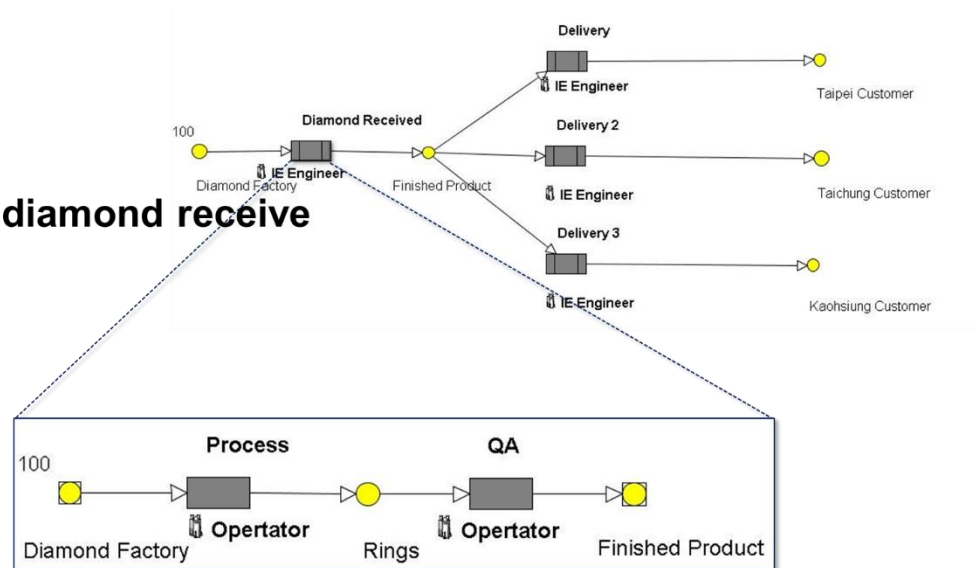


Figure 3-2. Drill Down: Diamond Receive

Drill down_ delivery

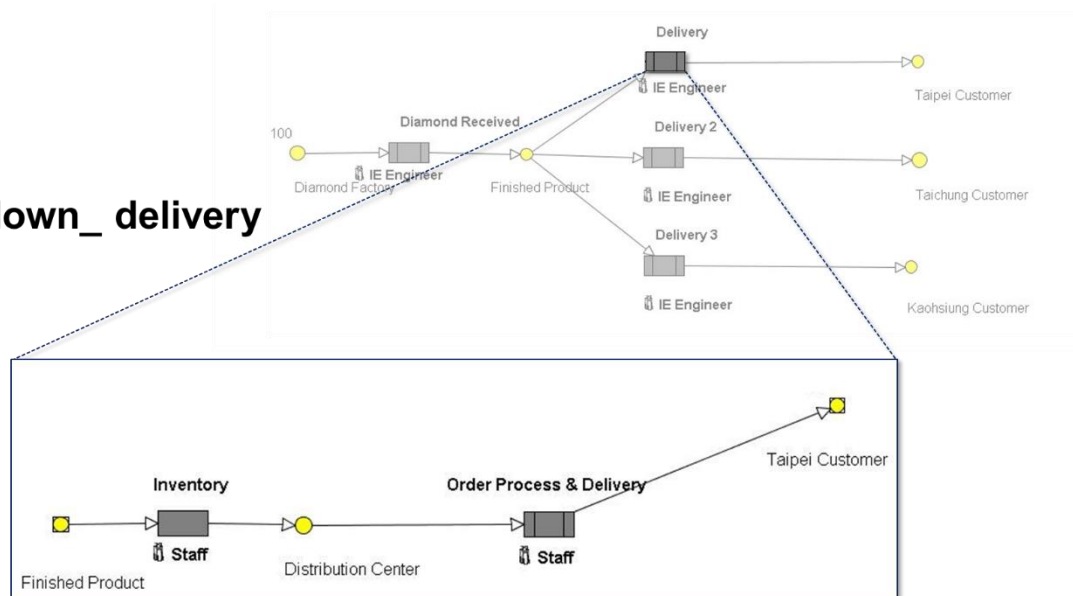


Figure 3-3. Drill Down: Delivery



In the drill down of the order process and delivery (Figure 3-4), order is received first, then the operators start picking. Finally, the package will be delivered either to home directly or delivered to convenience store.

Drill down_ order process & Delivery

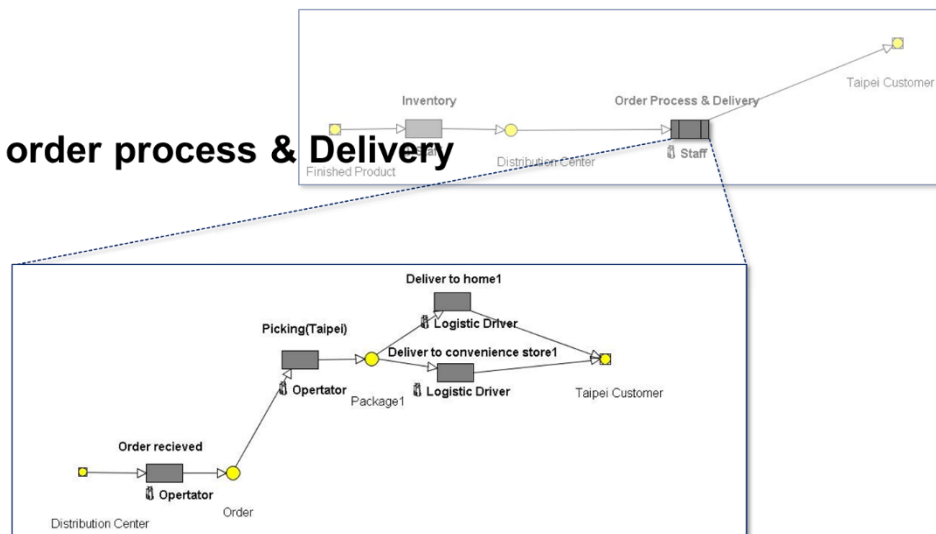


Figure 3-4. Drill Down: Order Process & Delivery

Organization Model

In the Organization Model, while reducing the retailer store, we start up a logistics department to deal with the complex delivering process and hired an IT staff to assure the website well functioned.

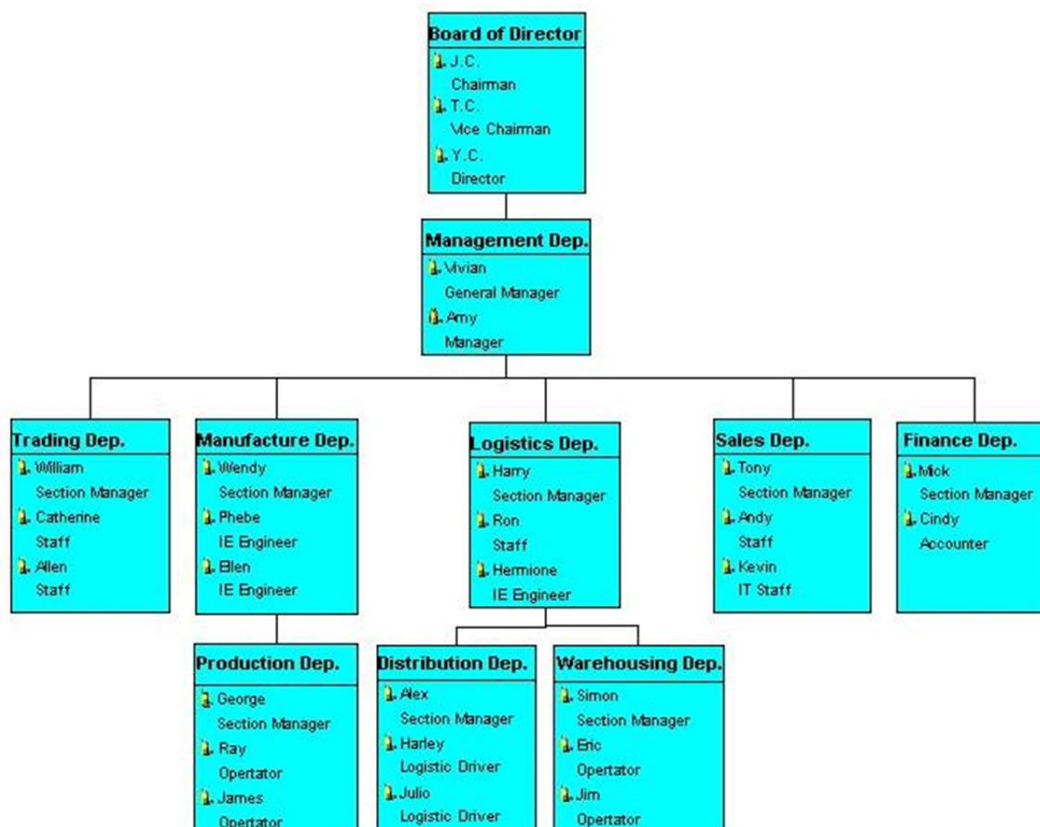


Figure 3-5. Organization Model



Object Model

In the Object Model (Figure 3-6), we start from the customer who gave an order then the order contains delivery type, payment type and the order details. With the order details we can find out what product it is and what product type it belongs to and who designed it.

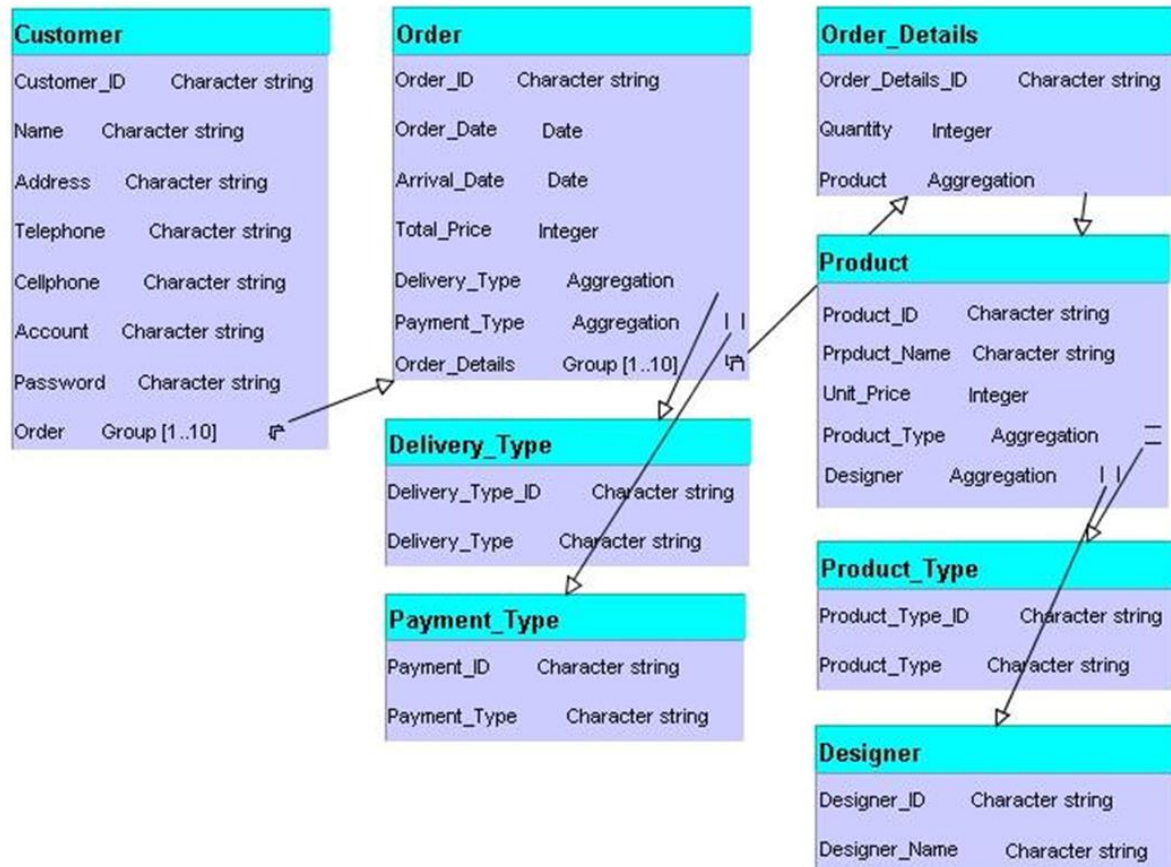


Figure 3-6. Object Model

Simulation Result

In the simulation result (Figure 3-7, 3-8), all the demand from the customer are satisfied. The total revenue is NTD\$ 8,000,000, while the cost is NTD\$ 6,010,000 with the use of 0.278 year simulation time.



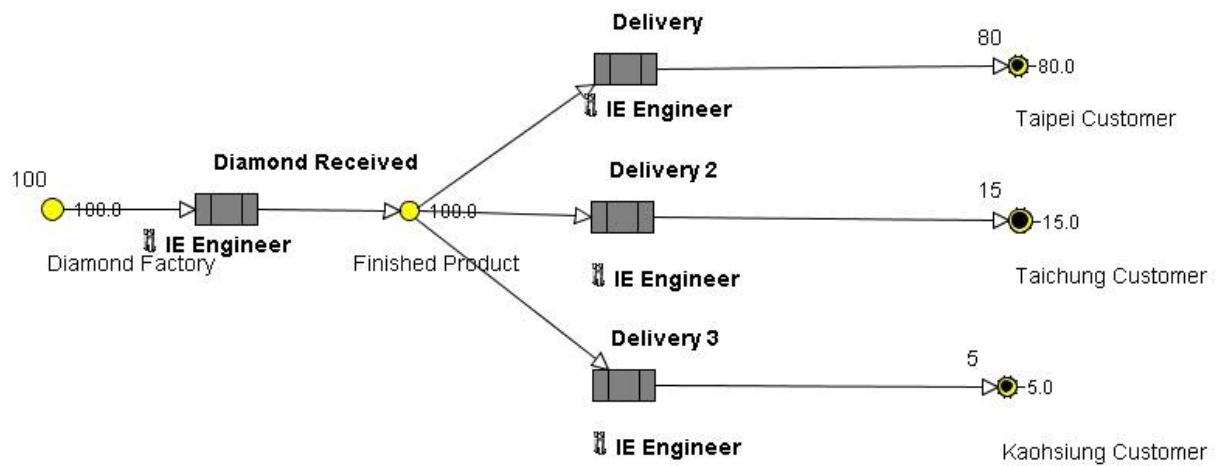


Figure 3-7. Result of Behavior Model

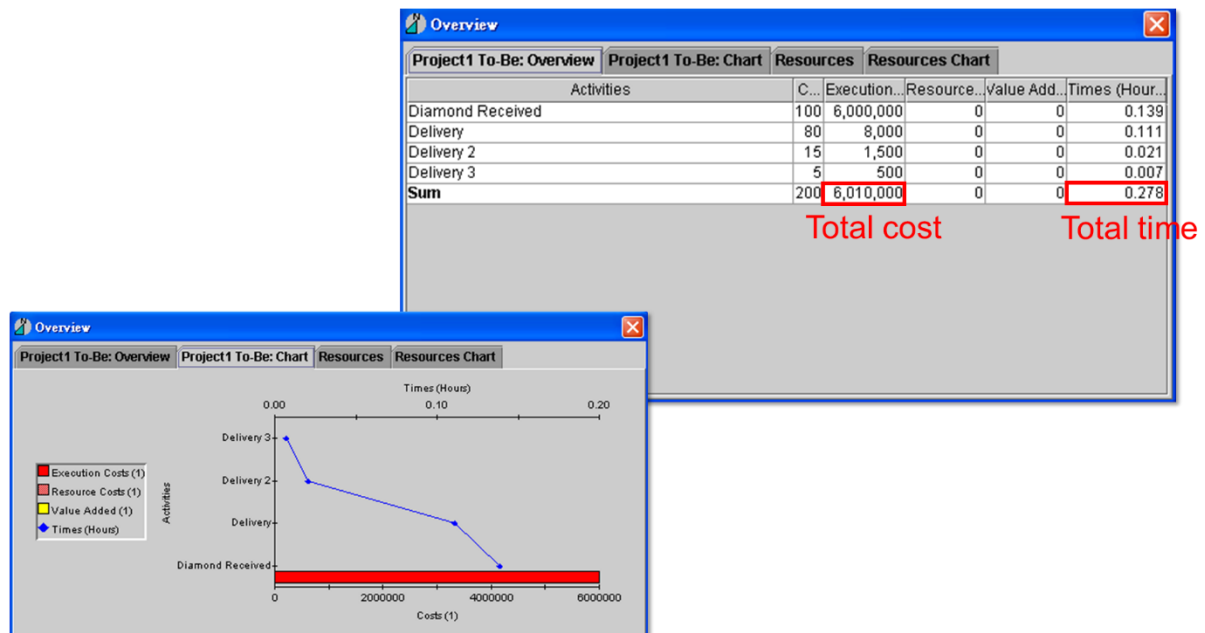


Figure 3-8. Result of Cost and Time

RESULT COMPARISON

The figures below are the simulation results (Figure 4-1, 4-2). As shown in figure 4-1, the total cost in As-Is Model is NTD\$ 6,006,100, and the total time is 0.354 year. In the To-Be Model, a new business process is adopted. After introducing an online shopping platform to Taiwan Diamond Company, we can acquire a higher cost but lower time consumption process. As shown in figure 4-2, the total cost of To-Be Model is NTD\$ 6,010,000, and it takes 0.278 year to finish the whole process.



Overview						
Project 1: Overview						
Project 1: Chart						
Resources						
Resources Chart						
Activities	Count	Execution C...	Resource ...	Value Adde...	Times (Hours)	
Selling (Taichung)	15	300	0	0	0.021	
Selling (Kaohsiung)	5	100	0	0	0.007	
Diamond Receive	100	6,000,000	0	0	0.139	
Deliver (Taipei)	35	1,750	0	0	0.049	
Selling (Taipei)	35	700	0	0	0.049	
Deliver (Taichung)	35	1,750	0	0	0.049	
Deliver (Kaohsiung)	30	1,500	0	0	0.042	
Sum	255	6,006,100	0	0	0.354	

Total cost Total time

Figure 4-1. Result of As-Is Model

Overview						
Project1 To-Be: Overview						
Project1 To-Be: Chart						
Resources						
Resources Chart						
Activities	C...	Execution...	Resource...	Value Add...	Times (Hour...	
Diamond Received	100	6,000,000	0	0	0.139	
Delivery	80	8,000	0	0	0.111	
Delivery 2	15	1,500	0	0	0.021	
Delivery 3	5	500	0	0	0.007	
Sum	200	6,010,000	0	0	0.278	

Total cost Total time

Figure 4-2. Result of To-Be Model

The reason for the higher total cost and the lower total time of To-Be Model is that although the process is simplified by using the online shopping website, more delivery cost but less delivery time has to be spent to deliver the products to customers.

CONCLUSION

The formula below is used to calculate the profit earned by As-Is Model and To-Be Model. As the calculation result shows us (Figure 5-1), if we adopt the As-Is Model, we will lose NTD\$ 4,537,005 per year. However, if we adopt the new process, we will earn NTD\$ 7,172,302 per year. As a result, using a website to substitute for virtual retailer is a good idea (fulfil all the customer's needs).

AS-IS MODEL PROFIT	
$\frac{(\text{Total Price} - \text{Total Cost})}{\text{Total Time Consumption}} = \frac{(\text{NTD\$ } 80,000 \times 55 - \text{NTD\$ } 60,061 \times 100)}{0.354} = \text{NTD\$ } -4,537,005 \text{ dollars/yr}$	
TO-BE MODEL PROFIT	
$\frac{(\text{Total Price} - \text{Total Cost})}{\text{Total Time Consumption}} = \frac{(\text{NTD\$ } 80,000 \times 100 - \text{NTD\$ } 60,061 \times 100)}{0.278} = \text{NTD\$ } 7,172,302 \text{ dollars/yr}$	

Figure 5-1. Calculation Result



Web Page

ER Model

Before designing the website, we drew an ER Model to create a structure for the website (Figure 6-1). In the ER Model, it includes *user*, *orders*, *order details* and *product*.

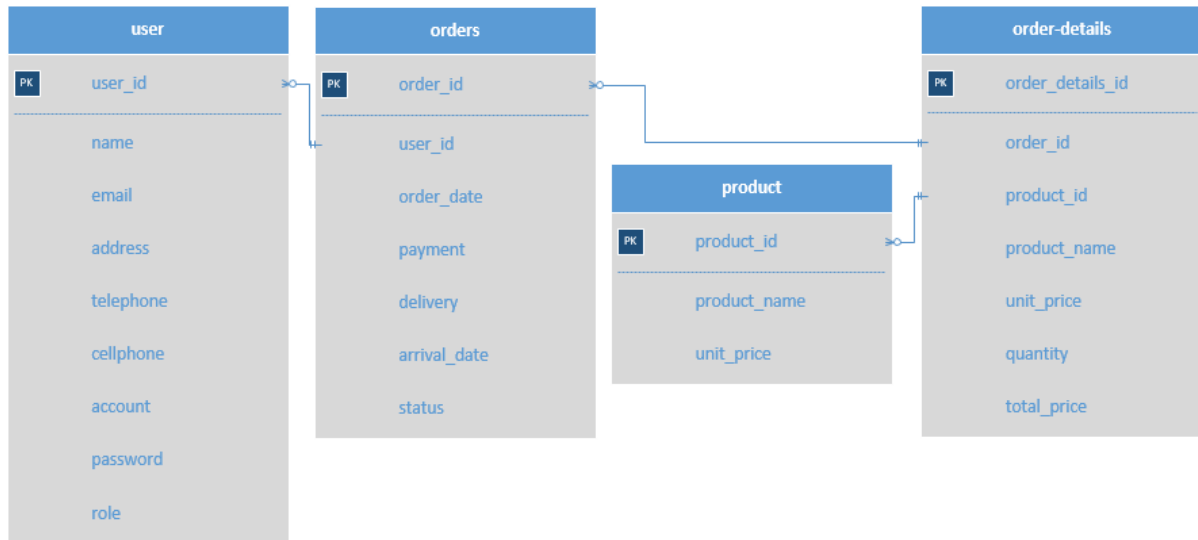


Figure 6-1. ER Model

Web Design

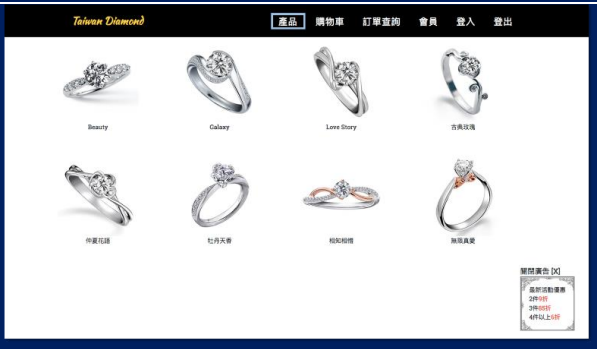
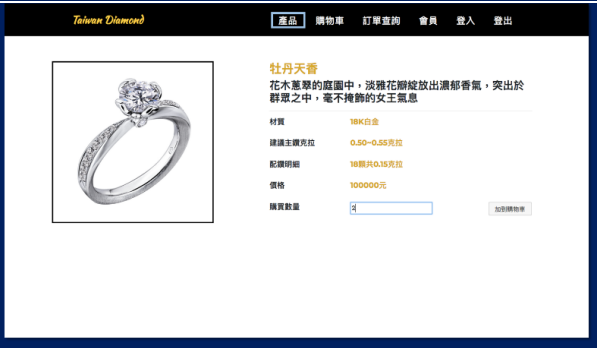
In the web page designed for Taiwan Diamond Company, the interface can be divided into two parts. One is for the customers, and the other is for the administrator. The functions are separately listed below.

To celebrate the foundation of Taiwan Diamond Company, we have provided a promotion activity. Any customer who purchased on our website can get 10% off with two items; 15% off with three items; and 40% off with four items or above.

Table 6-1. Customer

Sign Up	Taiwan Diamond 產品 購物車 訂單查詢 會員 登入 登出 註冊會員 姓名 信箱 地址 電話 手機 帳號 密碼 提交資料	



Log In	
Homepage	
Production Information	
Shopping Cart	
Order Information	



Order Details

Taiwan Diamond

產品 購物車 訂單查詢 會員 登入 登出

我的訂單內頁

訂單內容

訂單編號	8	下單日期	2017-11-14
付款方式	轉帳	宅配方式	宅配到府
到貨日期		訂單狀態	
訂單總價	200000	折後總價	180000

訂單詳細資訊

產品編號	品名	單位	數量	總價
8	12分F色	300000	2	200000

Table 6-2. Administrator

Log In

Taiwan Diamond

管理員登入

帳號

密碼

登入

Order Status

Taiwan Diamond

登出

修改訂單狀態

請輸入訂單編號

查詢

訂單列表

訂單編號	下單日期	付款方式	配送方式	到貨日期	訂單狀態	
7	2017-11-14 11:13:05	貨到付款	超商取貨			修正修改

November 2017

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

