
STO's

Delivery Process Improvement Project



Group 7

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1 Introduction of STO

Shentong Company is one of the private express delivery companies with the most influence on the national economy and people's lives. It is committed to the construction and development of national brands, and constantly improves the three-dimensional operation system of the terminal network, transit transportation network and information network. The traditional express delivery business has fully entered the field of e-commerce logistics, and promotes the development of China's logistics and express delivery industry with professional services and strict quality management.

The company's current main business is express delivery. The products of the express delivery business are divided into three categories. One is the standard express delivery products: auto transport aging products, including limited time delivery, same day delivery, next morning delivery, 24 hours, 48 hours, etc. Aviation aging products, including 24-hour pieces between key cities; second, value-added service products: launch of commitments, collection of payment, etc. Third, express accessories, providing envelopes, document bags, cartons and other express packaging.

With the development of the Chinese express market, while providing traditional express services, the company is also actively developing new businesses, providing logistics distribution, third-party logistics and warehousing, collection of payment, and valuables channels for large domestic C2C and B2C companies. In the country, it has established a huge business organization of information collection, market development, logistics distribution, and express delivery. At the same time, it has also actively expanded international service, and has become one of the most complete and largest private express delivery companies in China.

2 Delivery Process

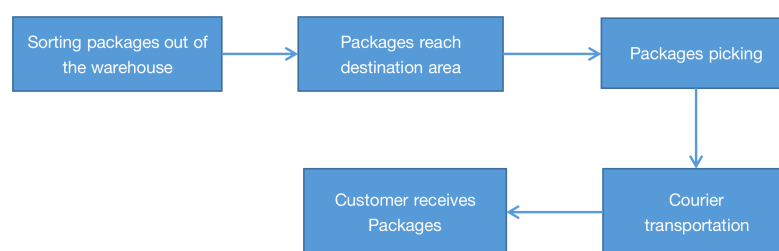


Figure 2-1 Delivery Process

After receiving the order, STO finds the goods in the warehouse according to the order and completes the export process. Then STO need to transport the goods and the transportation ways include trains, cars, planes, and ships. When the goods arrive at the destination, they are sorted into the warehouse according to the destination of the goods and the type of goods. After the processing center completes the sorting and information entry, then the processing center sends them to each outlet, and the delivery staff wait to deliver them. After entering the

local warehouse, the delivery staff started to deliver the goods. Finally, after receiving the goods, the customer completed the entire express delivery process.

3 Project justification

The principal in STO, Sarah Shek want us to improve problem in the delivery process. After discussion with Sarah Shek and analyzing, we find that there are two main problems.

Firstly, Loss of packages. This is the common problem of a majority of express and even STO. A number of customers could not successfully achieve their packages because the packages lose during the delivery.

Secondly, low efficiency. When checking the record of delivery, it is easy to find that our packages are transferred around. This means that when transmission center transmits the packages, they do not design a shortest path for packages. Therefore, we can find that the packages from Sichuan to Guangdong travels to Jiangxi province.

4 Project objectives

4.1 Cost saving and efficiency improvement

The project proposes to optimize the sorting process and the route optimization solution to help STO solve the problem of slow distribution and slow sorting. STO can use this propose to optimize the sorting process to improve the sorting efficiency of goods. What's more, STO are able to reduce the labor costs and allow goods to be sorted more efficiently in a shorter time. Besides, the route optimization scheme can be used to deliver goods to customers as quickly as possible, which cannot be achieved by manual arrangement. Through this program, STO can reduce labor costs to distribute goods, which can bring considerable profits and values to STO.

4.2 Improve customer experience and market competitiveness

In addition to improving the distribution efficiency, the project also reduces the loss of packages through the GPS system, which enhances the customer's experience and accumulates customers for STO. What's more, it also enhances the brand value of STO, creating an innovation point for the express delivery industry, while improving market competitiveness and creating more value.

5 Milestones

Phase	Milestones	Deliverables	Date
1	Set up a project team	WBS	4.29
2	Purchase Automated Guided Vehicle	Automated Guided Vehicle	5.1
	Develop GPS system	GPS & GPS system	5.1
3	Develop optimal path system	Optimal path system	5.5
	Optimize Sorting process	Design drawings	5.6
4	Transfer product to customer	Optimal path system & GPS system & AGV cars & GPS	6.1

Table 5-1 Milestones

In this project, there are six milestones. Firstly, set up a project team and then kick-off the requirements meeting with our project sponsor. We are going to discuss STO's problem and propose the suggestion and produce the WBS.

Secondly, according to the WBS, in the phase 2, we are going to start to purchase automated guided vehicles and develop GPS system. In the phase3, we will optimize the sorting process. At the same time, we also develop optimal path system.

Finally, after completing the above four milestones, we are supposed to transfer product to our customer.

6 Project Stakeholders

Name	Roles
Sarah Shek	Sponsor
Lu Yixi	Project manager
Cai Jidong	Team member
Huang Huirong	Team member
Lei Chuyue	Team member
Li Haoqing	Team member
Yang Guang	Team member

Table 6-1 Project Stakeholders

According to our customer, Sarah Shek's requirement, we set up a project team led by our project manager, Lu Yixi, to help STO solve the problem in delivery process, packages loss and low efficiency.

7 Work Breakdown Structure (WBS)

In order to optimize delivery process of Guangzhou's STO, our project team decide to split into three tasks, optimize the sorting process, develop optimal path system and develop GPS system.

7.1 Optimize the sorting process

Firstly, optimize the sorting process. There are three specific tasks in this process, package classification optimization, shelf optimization and package transportation optimization.

7.1.1 Package classification optimization

In package classification optimization, we want to optimize the package classification by package nature and destination.

7.1.1.1 Package nature classification

For package nature, we classify the packages for three kinds, cold shipping packages, insured package and ordinary package. The cold shipping packages and insured packages are special so they will be stored in the specific shelf for postman to deliver them quickly and carefully.

7.1.1.2 Destination classification

For destination, in this project, we are going to help Guangzhou's STO to optimize the delivery process, so in this case, the destinations will be twelve districts, Yuexiu, Tianhe, Baiyun, Liwan, Luogang, Huangpu, Haizhu, Panyu, Huadu, Nansha, Zengcheng, Conghua. For different districts, the packages should be put on the different shelves.

7.1.2 Shelf optimization

After package classification optimization, we are going to optimize shelves that aims to store all the packages. In this case, there are two ways to optimize the shelves, one is shelf location and another is shelf structure.

7.1.2.1 Optimization of shelf location

For shelf location, set up an important space for insured packages that are essential for customer and cannot be lost. According to the number of packages among various districts, we will rearrange the number of shelves of each district.

7.1.2.2 Optimization of shelf structure

For shelf structure, we are going to adjust the height and the width. For example, a majority of packages will be small and medium, it will result in wasting space because small packages will be put in the bottom of one layer, and the space on the top of these packages will be wasted. So adjusting the shelf structure could maximize the space utilization.

7.1.3 Package transportation optimization

After shelf optimization, we should optimize the package transportation. There are two tasks, increasing AGV and optimizing picking path.

7.1.3.1 Increase Automated Guided Vehicle (AGV)

In order to improve the total efficiency, we are going to increase the number of Automated Guided Vehicle which could help STO to shorten time of the sorting process and reduce the labor costs.

7.1.3.2 Optimization of picking path

The S-shaped route is the most efficient route for pickers. In the warehouse, the entrance and exit are on one side. The starting point is the same with end point and each operation does not take a repeated route, which belongs to the most labor-saving route in the warehouse.

We are going to design four “S” shape for STO. The four "S" shapes are the S-shaped placement of shelves, the S-shaped route for picking goods, the S-shaped item numbers, and the S-shaped search sight.

Shelf placement is based on the shelf number, which is odd number on the left and even number on the right, to ensure that the route taken by the picker is also S-shaped.

Each shelf is a multi-layer structure, and the item number are arranged in an S shape from top to bottom.

These four S-shaped designs ensure that the route taken by the picker is the shortest. And the effect is like figure 7-1.

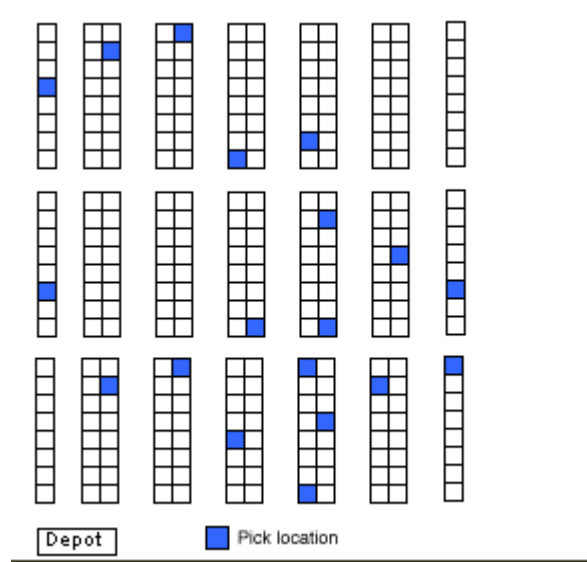


Figure 7-1 S-shaped picking path

7.2 Optimal path system

The second task is to develop optimal path system. We are going to cooperate with the third party to purchase their code to develop by ourselves. In this way, it is the most economical method. There are two steps in this task, cooperate with third party to develop system and test and determine the optimal system.

7.2.1 Cooperate with third party to develop system

When it comes to the optimal path system, it consists of two parts, map system and optimal path system. For the map system, we are going to cooperate with third party to develop.

7.2.1.1 Contact a third-party company

Our project team will contact a third-party company to gain the information of Guangzhou road map, Guangzhou road traffic as well as vehicle restrictions, then to develop our own system.

7.2.1.2 Develop optimal path system

After gain information from the third party, we will develop optimal path system by using optimal path algorithm in order to reduce transportation time. The system will locate the destination for postman and suggest a relatively shortest route for them to deliver the packages. In this system, all the STO station location in Guangzhou will contain.

7.2.2 Test and determine the optimal path

After the system development, we are going to test the whole system and there are several steps, unit testing, integration testing, system testing and acceptance testing.

7.2.2.1 Unit testing

Unit testing is the smallest test; to test a function or code block. This step will be done by programmers because it requires detailed knowledge of internal programming and coding.

7.2.2.2 Integration testing

Integration testing is a logical extension of unit testing. It combines two tested units into a component, and test the interface between them. The purpose of integration testing is to test whether each component can cooperate with each other and work normally.

7.2.2.3 System Testing

System testing is to assemble the tested subsystem into a complete system to test. It is an effective method to check whether the system can provide the functions specified in the system program specification.

7.2.2.4 Acceptance testing

The acceptance test generally strictly inspects the products according to the product manual to ensure that this system meets the STO's requirements.

7.3 Develop GPS system

Last but not least, in order to ensure the safety of packages, we are going to develop GPS system and combine it into our optimal path system. There are two specific steps in this task, purchase GPS equipment, develop GPS system and assign GPS to the transport vehicle.

7.3.1 Purchase GPS equipment

We are going to consult the GPS equipment among various suppliers and cooperate with the one who has good-quality GPS equipment with suitable price.

7.3.2 Develop GPS system

We are going to develop GPS system that could help STO monitor the location of packages in order to improve the safety of packages. When GPS system completes, we will combine GPS system with optimal path system. Then when the postmen or other related employees in STO use this system, they could know the relatively shorted path to delivery. And GPS system could contribute to get more real-time information of the location of packages in order to prevent the packages loss.

7.3.3 Assign GPS to the transport vehicle

After gaining the GPS equipment from supplier, we will start to install them in our transport vehicles and then complete the whole GPS system.

8 Schedule

Task Name	Duration	Start	Finish	Predecessors
1Start——Set up a project team	8 days	'20 Apr 29	'20 May 8	
1.1Requirements meeting	2 days	'20 Apr 29	'20 Apr 30	
1.2Preliminary sorting system optimization plan	3 days	'20 May 1	'20 May 5	2
1.3Preliminary optimal path design	3 days	'20 May 1	'20 May 5	2
1.4Scheme acceptance	0 days	'20 May 5	'20 May 5	3,4
2Optimize sorting process	9 days	'20 May 6	'20 May 18	3
2.1Empty the part of warehouse	3 days	'20 May 6	'20 May 8	
2.2Shelf reset	3 days	'20 May 11	'20 May 13	7
2.3Staff training	3 days	'20 May 14	'20 May 18	8
2.4System acceptance	0 days	'20 May 13	'20 May 13	8
3AGV cars	5 days	'20 May 1	'20 May 7	2
3.1RFQ (Request For Quotations)	3 days	'20 May 1	'20 May 5	
3.2Place an order	2 days	'20 May 6	'20 May 7	12
3.3Delivery of AGV cars	0 days	'20 May 7	'20 May 7	13
4.Develop optimal path system	17 days	'20 May 5	'20 May 28	4
4.1Technical meeting	0 days	'20 May 5	'20 May 5	
4.2Purchase of third-party software company information	5 days	'20 May 6	'20 May 12	16
4.3System development	14 days	'20 May 6	'20 May 25	16

4.4System test	3 days	'20 May 26	'20 May 28	18
4.5System acceptance	0 days	'20 May 28	'20 May 28	19
5Develop GPS system	22 days	'20 May 1	'20 Jun 1	2
5.1GPS price inquiry	3 days	'20 May 1	'20 May 5	
5.2GPS purchase and receipt	5 days	'20 May 6	'20 May 12	22
5.3GPS installation	3 days	'20 May 13	'20 May 15	23
5.4GPS related personnel training	3 days	'20 May 13	'20 May 15	23
5.5GPS and optimal path system integration	7 days	'20 May 18	'20 May 26	24
5.6System final test	4 days	'20 May 27	'20 Jun 1	26
6.Finish——Transfer product to customer	2 days	'20 Jun 1	'20 Jun 3	6,11,15,21
6.1Customer acceptance meeting	0 days	'20 Jun 1	'20 Jun 1	
6.2Product transfer	2 days	'20 Jun 2	'20 Jun 3	29

Table 8-1 Schedule of this project

8.1 Start—Set up a project team

8.1.1 Requirements meeting

The requirement meeting should be the first step. There are 2 days for communicate with STO sorting canter management.

8.1.2 Preliminary sorting system optimization plan

Three days for us to make a sorting system optimization plan compliance to STO requirements.

8.1.3 Preliminary optimal path design

Three days for us to make a plan of optimal path design compliance to STO requirements.

8.1.4 Scheme acceptance

8.2 Optimize sorting process

8.2.1 Empty the warehouse

After obtaining the sorting system optimization plan, the first is empty the warehouse in order to rearrange the shelves and zones, so we need 3days to do arrangement.

8.2.2 Shelf reset

The shelf reset part is a key process, and it need almost three days. First, the fresh food should be given top priority because it is a kind of goods need to be delivered as soon as possible. Second, a special zone is for insured goods. Most of these parcels are fragile and expensive goods, so the valuation area is set up to take care of these parcels more carefully to avoid problems such as damage or loss.

8.2.3 Staff training

After reset the shelves, three days are needed to conduct a staff training to ensure that the follow-up business is carried out normally.

8.2.4 System acceptance

8.3 AGV cars

8.3.1 RFQ (Request For Quotations)

After we get the specific AGV cars demand, we need three days to find the manufacturers to provide us with AGV cars, with a suitable quality and price.

8.3.2 Place an order

Then we need about two days to place the order and receive the goods.

8.3.3 Delivery of AGV cars

8.4 Develop optimal path system

8.4.1 Technical meeting

One day for communication between developers to understand specific content and assign tasks.

8.4.2 Purchase of third-party software company information

Five days to find a suitable mapping software development company and purchase basic services.

8.4.3 System development

Two weeks for optimal path system development.

8.4.4 System test

Three days for the technical staff to check the system and detect potential bugs.

8.4.5 System acceptance

8.5 Develop GPS system

8.5.1 GPS price inquiry

Three days to inquire and confirm the manufacturer of purchase.

8.5.2 GPS purchase and receipt

Five days to sign the purchase contract and receive the goods.

8.5.3 GPS installation

Three days to assign a GPS device to each delivery car and complete installation.

8.5.4 GPS related personnel training

Provide 3-days training to ensure related personnel know how to use the GPS.

8.5.5 GPS and optimal path system integration

Link the GPS to the optimal path system using one week.

8.5.6 GPS system final test

Four days to do the final test.

8.6 Finish—Transfer product to customer

8.6.1 Customer acceptance meeting

Meeting and show the final project results to customers.

8.6.2 Product transfer

Two days to deliver project results.

8.7 Project Gantt

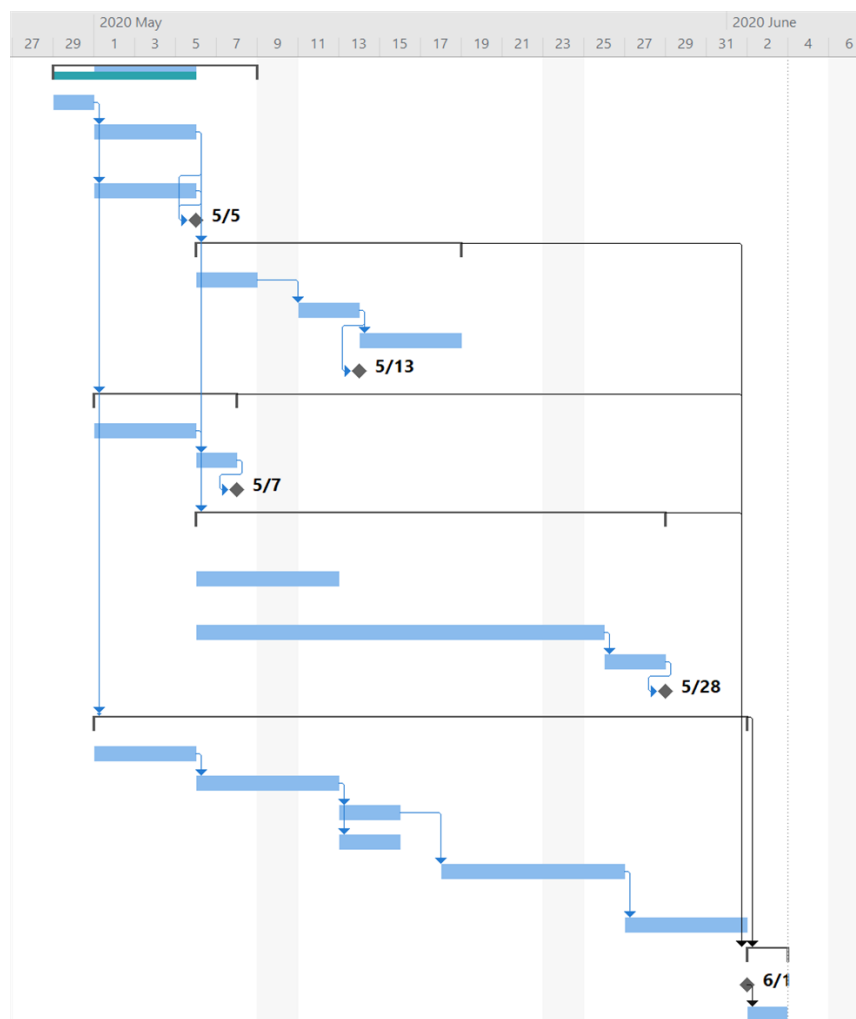


Figure 8-2 Gantt of this project

According to the project schedule, we got the Gantt chart of the whole project. The Gantt visually shows the duration of each task and the dependency relationship between tasks. Therefore, we can track each task more efficiently and clearly know where we are and what to do next.

8.8 Timeline

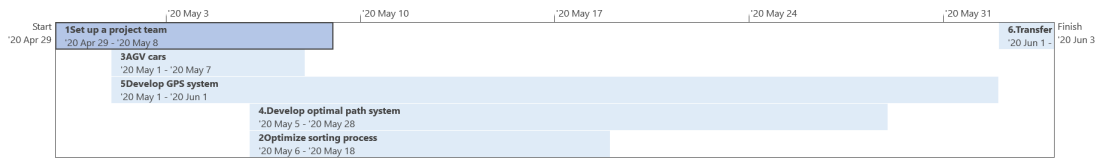


Figure 8-3 Timeline of this project

The timeline displays the start date and end date of each major task. In general, the project that our team has planned for STO will begin on April 29th and will completely finish on June 3th. Assuming no risk occurs, the project will take about one month in total.

9 AON

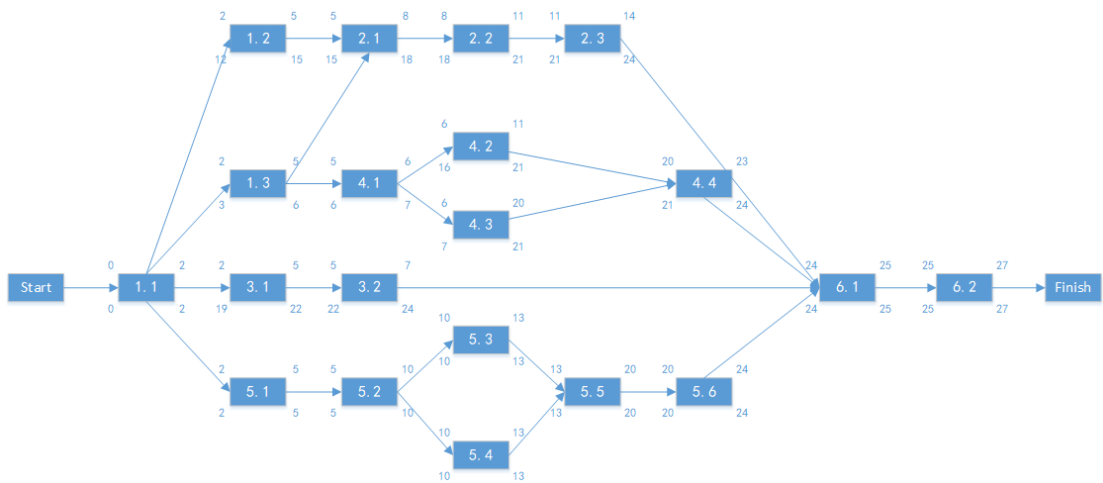


Figure 9-1 AON

According to the AON chart, we can find the critical path. The entire project is expected to work for 27 days, excluding breaks. By calculating the sum of the TE activities on the path being investigated and variance for each path, it is found that the maximum TE value of 4.3 is 14.166, and the time spent is also the most, so we need to pay more attention to this part and invest in this part more energy.

10 Communication Plan

In this project, the final goals are increasing the efficient of STO delivery process, decreasing the excess cost and budget and keep the company service quality.

10.1 Communication Requirements:

The project manager will communicate with each group member and stakeholder in order to determine the way to contact. The feedback and the decision will be maintained by the project manager.

10.2 Roles:

The project Sponsor and key stakeholders, Program manager, Project Team and the technical lead.

STO communicate with	Project Program	Meeting frequency	method	Group stakeholders
STO classify department	Efficient increase P	4 days	AGV Introduction	Li haoqing
Regional manager	Training P	1 week	Training in the central company	Li haoqing
STO company, Technical staff	GPS setting P	1 week	Installing GPS	Yang Guang
Technical staff, Third party company	UI, Apps development	2 weeks	Communicate with third party company to operate that.	Yang Guang

Table 10-1 Communication Plan

11 Resource

STO nowadays, established by 1993, is one of the earliest domestic brands that operate express delivery business. After more than ten years of development, STO express is formed a perfect and smooth self- operated express delivery network

across the country. STO mainly provides cross-regional express delivery services, with about ten percent in market share.

In this part, it is mainly describing the assign resources and the communication plan. Nowadays, STO companied more than 600 first class franchisees and more than 2000 second class franchisees. It has 4000 stores and 50 distribution centers in all provinces China. In Guangzhou, there are also huge net-wave to support forty thousand employees working on the carrier truck and branch network vehicles.

There is a public debate nowadays, STO has some issues which are the base-roots express delivery leads to losing package and inefficient. The project which trying to conquer this issue and divided four parts on the Resource and personnel allocation & Communication Plan.

The first part project described is the solution to classify objects. Nowadays, Guangzhou has normally 20billion packages delivery for all Chinese EXPRESS delivery company in each year. This part is a huge budget and time cost if the company doing labor costs. From this project, it is support STO using Sorting Robot (AGV) to replace the labor workers.

AGV (Automated Guided Vehicles), available to shuttle on the ground arbitrarily and they carry a tray for each robot. This AI express sorting robot was independently developed, and it can complete the highly efficient requirement and the task. The labor workers can only need to operate the terminal on workbench it can realize the accurate storage and deliver of packages. It takes no more than one second to scan the QR code and it is running speed can over 3m/s. It can complete the sorting of 18000 parcels per hour, including scanning, loading and sorting. In this project, we only need to recruit vendors develop and test the AGV and purchase the raw materials then it can reduce 70 percent by labor and reduce that mistake happened by the labor workers.

The second part is classifying the area, STO nowadays, using the Joining system to company the whole area in China. Even this way can reduce the budget cost and increasing the business volume, however, those lack the systematic management training and official service quality. That's make STO decreasing the customer satisfaction and lose some order by that points. The suggestion in this project, it could keep that joining system to maintain the high business volume and the center company should increasing the budget to training each area department managers three days project and ask those department managers training each employees and outsourced couriers, and makes block division each express delivery in various region, which increasing local area express delivery efficiency.

Third one, traditional Express company needed for transfer positioning for express delivery comes from various transfer sites. It is inaccurate and can easily cause complaints. Real-time positioning requires the installation of GPS positioning devices and this project could scientific distribution technical staff install the GPS positioning on the carrier truck. The GPS devices would be sharing each truck real-time positioning and STO could sharing those data information to shipper and consignee when their packages in this truck. Then the project needs outsourcing company operate GPS database and number of technical staff to install the GPS to making those devices work.

In STO, it is Express delivery company, the technical staff only has 2.24 percent in this company [1], less in Guangzhou also. It is hard to make the technical precision and running the big courier Network. Then the third-party software would be used by local STO employees and it is more efficient than recruit high-level technical staff work in a new area tech- knowledge. Staff in STO only need be trained by third-party instructions, for example, Android & IOS apps development and AI package searching system and list will go on. After that, the technical staff can do like works on data source classification support, product operation support and GPS operation support, etc. The result is making staff more efficiently to manage and distribute the process of express

delivery. The group need to contact and offer the third-party software used in STO apps online, technical staff should self-learn this part and operate that.

12 Budget

The budget planning plays an important role in obtaining and allocating project resources, and in ensuring the smooth progress of the entire project. According to the schedule, the budget planning is mainly divided into the following phases:

- Phase 1 Set up a project team
- Phase 2 Purchase Automated Guided Vehicle
 - Optimize Sorting process
- Phase 3 Develop GPS system
 - Optimal path system
- Phase 4 Transfer product to customer

12.1 Set up a project team

Regarding the formation of a project team, human resources and meetings are the main expenses. For conference budget expenditure, it can be divided into three main conferences:

- Requirement meeting
- Internal technical meeting
- Customer acceptance meeting

The members participating in the meeting mainly include the following main personnel: different managers, engineers, lawyers, designers, and technical personnel.

12.2 Optimize Sorting process

The first is the expense of emptying the warehouse, including the cost of transferring the original packages, the handling of old shelves, the cleaning of the warehouse, the placement of new shelves, the installation of other equipment, etc.

Second, the expenditure is mainly related to the purchase of related products: shelves and AGV.

Different shelves have different prices and need to be configured according to business volume. The shelves are placed according to different packages, which are roughly divided into Cold Shipping Package, Ordinary Package, Insured Package, etc. Automated Guided Vehicle (AGV for short) is an industrial transport vehicle that uses electromagnetic or optical guidance devices. This project uses a large number of advanced AGV vehicles to optimize the distribution of parcels in the warehouse.

Finally, the cost of AGV's track design and layout needs to be solved by hiring technical personnel. At the same time, it is necessary to hire other technical personnel to carry out project training for the employees of the

warehouse in order to adapt to the new process in time, and also include the proficient operation of AGV and the new sorting system.

12.3 Optimal path system

This part of the expenditure structure is a little simpler than the sorting system, mainly including GPS and optimal path system.

First of all, STO need to hire a third-party professional to develop and design the optimal path system. At the same time, hire testers to test the accuracy and timeliness of information such as vehicle positioning, package information and other logistics aspects, focusing on possible vulnerabilities and multiple debugging, etc., and finally achieve efficient and safe operation of the process.

The second is the selection and purchase of GPS, then the cost of GPS installation, and accuracy testing. After completing this part, STO need to carry out integrated development of GPS and optimal path system, rent precision equipment to test and debug the system, and finally need to train employees professionally. By the way, AGV also needs to do related tests.

12.4 Transfer product to customer

This part of the budget is mainly to do a realistic test for the entire sorting and optimal path system before delivering the STO project, and carry out the final commissioning, and also including the delivery ceremony and meeting costs.

12.5 Special costs

One is the maintenance costs of later systems, including hardware servers, network equipment, etc. Problems such as changes in temperature and the environment, etc. In this case, the cost of maintaining system stability., as well as software update and repair costs. Another is seasonal issues need to be considered, such as extra budgets for activities such as the Double 11 event, temporary increase in system maintenance and personnel budget, etc.

Phase no.	Main tasks	Branches	Details	Budget(HKD)
Phase 1	Set up a project team	Meetings	Requirement meeting	3,500
			Internal technical meeting	1,000
		Human resources	Technical staffs	90,000
			Basic labors	15,000
Phase 2	Optimize Sorting process	emptying the warehouse	Transfer packages	2,000
			the handling of old shelves	2,000
			cleaning	2,000
			the placement of new shelves,	2,000
			the installation of other equipment	4,000

			Trainers		70,000
			new shelves	Cold Shipping Package	50,000
				Ordinary Package	20,000
				Insured Package	50,000
			AGV	Purchase	330,000
				Install	20,000
				Tests	30,000
				Trainers	35,000
		optimal path system	develop and design		1,200,000
			Tests		100,000
Phase 3	Optimal path system	GPS	Trainers		70,000
			Purchase		50,000
			Install		20,000
			Tests		30,000
			Integrate two parts		80,000
			Trainers		70,000
			realistic test		50,000
			Customer acceptance meeting		2,000
Phase 4	Transfer product to customer	Activities	Final meeting		3,500
			delivery ceremony		20,000
special costs			maintenance costs of later systems		200,000
			seasonal issues		100,000

Table 12-1 Budget and details of each part

Budget	Phase no.		Total
	Phase 1		119,500
	Phase 2		605,000
	Phase 3		1,620,000
	Phase 4		75,500
	special costs		30,0000
	Total		2,720,000

Table 12-2 Total budget

13 Risk and Control

13.1 Risk analysis

FMEA analyzes the severity, probability and detection ability of this project during the project initiation phase, finds potential risks which may lead to project failure. Therefore we will propose corresponding solutions

based on it as well as try to find loopholes in the project to improve project feasibility and security and ensure the smooth operation of the project.

NO.		Threat	Severity	Probability	Detection	Risk Priority Number (RPN)	Rank
1	Demand	Customer changing needs	4	8	5	160	1
2	Budget	Client cut budget	7	5	4	140	3
3		AGV / GPS equipment prices are too high	6	8	3	144	2
4		Over budget	8	6	2	96	4
5	Time	Customer cuts duration	7	3	3	63	9
6		The schedule is behind schedule	7	4	3	84	6
7	Human Resource	Key staff are ill or resign	6	2	6	72	7
8	Technique	Key technical problems in the optimal path system cannot be quickly overcome	8	2	6	96	5
9		Many system bugs affect the use	2	4	4	32	10
10		System performance does not meet requirements and rework is required	9	1	2	18	11
11	Equipment	Equipment damage	3	3	8	72	8

Table 13-1 Risk analysis

13.2Emergency plan

In project initiation phase of STO improvement project, we mainly consider risks of Demand, Budget, Time, Human Resource, Technique and Equipment and find corresponding solutions to make a emergency plan. In the process of project execution, staff will solve problems in time according to the emergency plan and project progress monitoring.

13.2.1 Risks of demand

13.2.1.1 Customer changing needs

It is a common risk for customers to change demand, because STO's internal opinions on improvement project are not uniform. However, changes in demand inevitably lead to increased costs and duration, and may even affect the quality of the project's deliverables. Therefore, following measures can be taken:

- (1) During the project initiation phase, we need to reach agreement with the STO project manager on project-related details and determine it by contract. For example, determine project requirements (What needs to be done), boundary (what cannot be changed / can be changed) and project change process (what mechanism, process to implement change).

(2) During the project, change requirements are executed only after analysis and reviewing. To be specific, inviting relevant staff such as the demander, technical expert, designer and testing staff to analyze how the needs affect the project, so as to determine whether to accept changes and prioritize changes.

(3) Making a complete requirement change document with all proposed change requests, regardless of whether they are implemented.

13.2.2 Risks of Budget

The budget is only the estimated cost in project initiation phase. In the project execution phase, the actual cost often exceeds the budget. In general, there are three cases, including budget cuts, excessive purchase prices, and over budget. Below are corresponding measures.

13.2.2.1 Client cut budget

(1) Identify core tasks and impact on final deliverables to calculate the task priority. After that reduce secondary tasks' budget according to the task priority.

(2) Choose lower-cost alternatives.

13.2.2.2 AGV / GPS equipment prices are too high

(1) Project Initiation phase, prepare purchase plan of AGV / GPS equipment at different price levels so that purchasing staff have alternative procurement plans

(2) Depending on the budget sufficiency, choose high-quality or cheaper AGV / GPS equipment.

13.2.2.3 Over budget

(1) Adopting the iterative development model and set budget limits in stages. If the budget limit is exceeded in the previous stage, the expenditure will be reduced in the later stage.

(2) Monitoring and predicting budget usage according to CV/CPI chart, and then reallocate resources.

(3) Minimizing demand changes, as demand changes consume unexpected duration and human resources expenditure.

(4) Establishing Project Management System (PMIS). It integrates the current information of the project, analyzes and predicts the future situation, and provides strong support for the project manager to track the project dynamics and adjust the project.

13.2.3 Risks of Time

Various unexpected situations in the project will affect the completion of the project on time. Once overdue, it will increase the overall cost of unexpected human resources and equipment use costs. Therefore, it is necessary to consider the time risk.

13.2.3.1 Customer cuts duration

(1) Adopting an iterative development model, complete in stages and adjust the time allocation.

- (2) Strengthening team communication, raise problems and discuss solutions as soon as possible.
- (3) According to the critical path, calculating the feasibility and cost of catching up.
- (4) According to SV/TV/SPI chart, predicting the progress of the construction period.
- (5) Hiring more staff.
- (6) Working overtime.

13.2.3.2 The schedule is behind schedule

- (1) According to SV/TV/SPI chart, predicting the progress of the construction period, then adjust the time allocation;
- (2) According to the critical path, calculating the feasibility and cost of catching up, then adjust the time allocation;
- (3) Strengthening team communication, raise problems and discuss solutions as soon as possible
- (4) Hiring more staff;
- (5) Working overtime

13.2.4 Risks of Human Resource

13.2.4.1 Key staff are ill or resign

The lack of key people will cause the project to stall. It needs to prepare an alternative plan based on the missing time of key staff.

- (1) If the illness period is short, other staff will substitute him to work firstly.
- (2) If the illness period is long or resignation: call the replacement of staff from the branch or other staff substitutes him to work while HR staff do emergency recruitment immediately.

13.2.5 Risks of Technique

In the project, technicians need to develop two systems: intelligent sorting system and optimal path planning system. Therefore, the final effect of the system is crucial to the success of the project.

13.2.5.1 Key technical problems in the optimal path system cannot be quickly overcome

- (1) Finding a feasible alternative algorithm solution.
- (2) Seeking help from the research institute or other technical expert like GaoDe map technical expert.
- (3) Urgently recruiting more technical personnel (algorithm experts) to solve technical problems.

13.2.5.2 Many system bugs affect the use

- (1) Calculating the resolution priority based on the impact of the bug on the system, and give priority to the resolution of bugs with high priority.
- (2) Preparing response manual and train users.

13.2.5.3 System performance does not meet requirements and rework is required

- (1) Project Initiation phase, leaving time slack for the rework of the system module, and then predicting potential rework system modules with solutions
- (2) Training developers and standardize operations
- (3) Performing feasibility analysis on the system plan and specify the details
- (4) Adopting an iterative development model to monitor the quality of results at each stage of the system development process

13.2.6 Risks of Equipment

AGV trolley transportation is an indispensable part of the project sorting process. If they fail to work and reduce the efficiency of the sorting process, it will greatly affect the results of the sorting system.

13.2.6.1 Equipment damage

- (1) Maintenance staff repair AGV / GPS equipment
- (2) Increasing the number of slack in order in purchase plan to replace AGV / GPS equipment in time

14 Success Criteria

STO project success criteria based on income, cost and service. After executing the improving project, STO's sorting and transportation time will be significantly shortened due to increased efficiency, and thus save operating costs. Meanwhile, the security of parcels will also be significantly strengthened to improve quality of express services, and thus win the trust of express customers. Ultimately, with advantages of cost and service quality, STO will win more market share to increase revenue.

14.1 Cost

The integration of the sorting system and the optimal path system will greatly reduce the time and expense of STO due to inefficiency in the sorting and transportation process, improve the efficiency of sorting and transportation, and save unnecessary expenses.

Therefore, success criteria of cost is that single ticket transportation cost reduced to 0.5 RMB and single ticket distribution cost reduced to 0.28 RMB.

14.2 Service

For express service, abnormal parcel rate and customer complaint rate are significant issues that the STO company must figure out first. To be specific, Users hate losing packages, especially if the items in the package are very important and it is difficult to find alternatives. Therefore, it will improve the security service quality of STO packages. Furthermore, as the efficiency of sorting and transportation is improved, reducing the overall delivery time, customers will not waste time waiting for packages. It reduces the possibility of customers complaining because of the long waiting time, and effectively reduces the customer complaint rate.

Therefore, success criteria of service is that abnormal parcel rate reduce to 10% and customer complaint rate reduced to 0.3%.

14.3 Income

Increased efficiency causes rising single ticket profit, as single ticket unit price is the same while unit cost declines. Then, the increased customer satisfaction not only maintaining existing customers using STO products, but also attracting new customers who are not satisfied with the services of other competitors, expanding market share and increasing total income.

Therefore, success criteria of income is that new user's growth rate to 15% and market share growth rate increased to 2%

15 Reference

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