

Software Project and Process Management

Course Project Planning Document

——Online Snack Store

Team Member

1853543 黄弋鸥
1852345 毛靖鑫
1853898 谭忠煜
1851350 陈扬森

1. General View of Project

- 1.1 Background
- 1.2 Vision
- 1.3 Requirement
- 1.4 Assumptions
- 1.5 Executive Summary
- 1.6 Analysis of Alternatives

2. Project Initiation and Scope Definition

- 2.1 Requirement Management
 - 2.1.1 Determination and Negotiation
 - 2.1.2 Review and Revision
- 2.2 Feasibility Analysis
 - 2.2.1 Functions
 - 2.2.2 Constraint
 - 2.2.3 Features
- 2.3 Scope

3. Project Planning and Charter

- 3.1 Human Organization
 - 3.1.1 Stakeholders
- 3.2 Activity Planning and Schedules

3.2.1 Work Breakdown Structure (WBS)

3.2.2 Activity List

3.2.3 Critical Path Graph

4. Risk Management

4.1 Risk Management Plan

4.2 Categories of Risk

4.3 Risk Identification

4.4 Risk Analysis, Assessment and Prioritization

4.5 Risk Prevention

4.6 Risk Actions

4.7 Risk Evaluation

4.7.1 PERT Activities Schedule

4.7.2 Project Cycle Activities Network Diagram

5. Resource Allocation

5.1 Resource Category

5.2 Identify Resource Requirement

5.3 Resource Scheduling

6. Monitor and Control

6.1 Project control framework

6.2 Data Collection

6.3 Progress Visualization

6.4 Cost Monitoring

6.5 Earned Value Analysis

6.6 Change Control

7. Project Implementation

7.1 Process Model

7.2 Development Techniques

8. Prototype

9. References

1. General View of Project

1.1 Background

Nowadays, online shopping is very developed, but it will still take two to three days for transportation. We hope to build a snack trading platform between the small snack shops nearby the campus and the students, where students can buy snacks easily in less than one day, therefore students don't have to worry about not being able to easily buy the snacks they want but can't find at any school shop and can choose cheaper snacks online instead of buying more expensive one offline at school. at the same time, businessman can sell their snacks more widely. They don't need to get a storefront in the school to run the snack business, they only need to have a legal business qualification to get the income.

1.2 Vision

A new business of an e-commerce company will be initiated: a virtual Snack Store The system to support it must manage the acquisition and selling processes of the company.

Before our online snack shops appeared, there were two main ways for students to get snacks. One was to buy the snacks they wanted through e-commerce platforms such as Taobao and JingDong, but it usually took two to three days to receive the snacks.

The other way is to buy snacks through takeout in platforms like Eleme and Meituan. However, few merchants sell snacks on these takeout

platforms, and there are not many kinds of snacks. Besides, students can only buy from one merchant at a time, otherwise they will have to bear the freight for many times if they buy from multiple merchants.

1.3 Requirement

Access of the game store for merchants and management of the company must be accomplished through a Web site. The user can access it via PC or mobile device.

The system must allow the customer to search our system for his or her favorite snack and add the snack to the shopping cart or wish list. Players who live in different areas can easily see and buy all the goods that can be delivered to snack shops in one day. Most importantly, they need to confirm the quality of the snacks sold in the stores they visit. To ensure this, the system must maintain an unbiased product rating system where all users can refer to previous reviews by others.

After the purchase of certain snacks, and after the purchase of snacks to convey their personal opinions on the product, such as the freshness of the product, how the product looks, etc.

The system must provide a platform for sellers to add new products and manage information about their products and easily manage orders. The function of product information management belongs only to the seller, ordinary users do not have these rights. In addition, in order to meet the needs of merchants, the system must generate reports on top selling items

and profiles of consumer groups, and recommend buying games based on past customer interests. In addition, the system must have the ability to forecast sales in order to provide better decisions (inventory, reorder products, etc.) on a solid basis. In addition, the system must have a procurement network and procurement time management system, so as to purchase the goods purchased by the user within the specified time within the specified stores. When an order is set to be delivered, the system should be able to make a decision about the most economical method of purchase, provided that the deadline can be met

1.4 Assumptions

1. No pirated snacks are stored or sold.
 2. There are no non-joint venture retailers to join and obtain approval
 3. No retailer too far away to buy joins the sales network
 4. The marketing manager signs the supply contract through E-mail instead of the management system.
 5. All commodities shall be purchased and distributed by our logistics system.
 6. Master customer servSnack store knowledge and skills.
- 7 Customer servSnack store staff are familiar with how to purchase products through the system.
8. Customers use Alipay or WeChat wallet to pay the order.

1.5 Business Case: Executive Summary

1.5.1 Brief description of the problem or opportunity

Problem: In the early stages of platform development, there needs to be enough novel snack content for players to choose, which requires adequate communication with snack wholesalers. At the same time, make sure that the content of the transaction is legal. In the transitional stage of the development of the website platform, the transaction volume increased, and the transaction content increased. It is necessary to control the standardization and security of platform transactions, and at the same time pay attention to the creation of platform atmosphere.

Opportunity: If we can ensure full communication with manufacturers and users, and timely adjust the problems in the early stage of the platform, the transaction mode will be more standardized and safe. With a unique sales style, in the follow-up development, we will strive to create a platform atmosphere, guide the platform culture, and give users a greater sense of belonging, so as to lay a solid foundation for future development.

1.5.2 Brief description of organization's goal and strategy

The strategic goals of Online Snack Store include sustained growth and profitability, as well as increasing visibility and establishing a platform atmosphere. This project is based on the fashionable snack market. We hope to attract users' favor with comprehensive and exquisite snacks, and optimize the work of managers with concise and concise operation

methods. It will improve the ability to serve customers through good early warning and feedback. And gradually build to become the preferred platform for users to buy snacks online, and provide long-term and stable services for our buyers and partners. In order to achieve this goal, it is necessary to ensure sufficient channels for the purchase of snacks, and allow a certain amount of expenditure in the early stage to increase the popularity of the platform and the complete snack purchase experience.

The specific and current goals are:

1. Meet business needs. Online Snack Store must be able to complete the procurement services provided to users and provide administrators with basic business functions such as income and expenditure lists.
2. Improve work efficiency. Online Snack Store needs to respond to some preset scenes and optimize management for administrators to improve work efficiency.
3. Improve profitability. ICE needs to complete the sales report and the summary of inventory information. And so on, so that managers can adjust business strategies in time to obtain greater profits.
4. Strengthen the company's brand. Online Snack Store is committed to improving buyers' buying experience, enhancing platform awareness, strengthening atmosphere building, and improving profitability from the side.

1.5.3 Description of project's MOV and how it ties to the

organizational goal and strategy

MOV:

Area of Impact	The project will be successful if ...
Customer	In 3 months, 60% of customers will visit our website at least once a week.
Strategic	We will become the direct sales contractor for at least 10 kinds of snacks in East China before May 1 next year.
Financial	By the end of the next quarter, our game sales will grow from 3% to 6%.
Operational	By the end of this fiscal year, our inventory turnover rate had increased by 15%.
Social	Next year, the number of accidents on our platform will be reduced to zero

How it ties to the organizational goal and strategy:

Our tailor-made MOV can help us acquire a group of stable and loyal customers, which will ensure the long-term profitability of our platform, and will also increase the platform's visibility and enhance brand charm.

Our MOV formulated according to the strategy can help us improve our business competitiveness, and we need to introduce better talents to improve the efficiency and profitability of the platform.

The MOV we have established in the financial sector can help us increase the sales of games. This is an important way to increase the profitability of the platform, and it is also an effective means to obtain sufficient funds to support the long-term development of the platform.

The MOV we formulated in the social field can ensure that the operation of the platform meets the specifications, and can effectively ensure the security of the property information of employees and users, which is also a great help to promote the development of our company.

1.5.4 Description of each option or alternative analyzed

1. Do nothing. As the business is progressing smoothly, we can continue to operate without this new project.
2. Adopt applications developed by different fields or departments within the organization.
3. Redesign or reengineering the existing system.
4. Purchase off-the-shelf application packages from software vendors.
5. Use internal resources to custom build new applications or outsource development to another company.
6. Use most of the existing hardware and software to design and implement some new functions internally.

1.5.5 Explanation of recommended alternative

Designing and implementing new intranet functions internally using most of the existing hardware and software may be the best choice. On the one hand, making full use of the existing hardware and software can control the development cost. On the other hand, if the design is redesigned and completely outsourced, the progress and quality of the development can

hardly be guaranteed. Purchasing off-the-shelf application packages not only requires a lot of docking work, but also a huge expense. Therefore, designing and implementing new intranet functions internally using most of the existing hardware and software may be the best choice.

1.5.6 Objectives of writing this business case

1. Specify all possible impacts, costs and benefits in detail.
2. Be clear and logical when comparing the cost/benefit impact of each alternative.
3. Reach the goal by including all relevant information.
4. Summarize the research results systematically.

1.6 Business Case: Analysis of Alternatives

1.6.1 Methodology of how alternatives will be analyzed

Data collection methods

1. Stakeholder suggestions: In major decisions that affect the effectiveness of the project, we need to respect the opinions of stakeholders and conduct full discussions with them to ensure that the interests of stakeholders are not harmed to the greatest extent
2. References to similar business cases: We can refer to similar business cases. The methods they have adopted and the results achieved will be a lesson for us. We can learn from what they did well, and learn from what they did not
3. Estimates based on actual conditions: The business case is only of

reference value and cannot be followed blindly. The characteristics and situation of each project are unique. We need to consider our own actual conditions to create our own characteristics

Metrics used and reasons

1. Economic feasibility — Although a cost/benefit analysis will be conducted to look at the alternatives in greater depth, some alternatives may be too costly or simply not provide the benefits envisioned in the problem statement. At this point, an organization may evaluate an alternative in terms of whether funds and resources exist to support the project.
2. Technical feasibility—Technical feasibility focuses on the existing technical infrastructure needed to support an IT solution. Will the current infrastructure support the alternative? Will new technology be needed? Will it be available? Does the current staff have the skills and experience to support the proposed solution? If outsourcing, does the vendor or company have the skills and experience to develop and implement the application?
3. Organizational feasibility—Organizational feasibility considers the impact on the organization. It focuses mainly on how people within the organization will adapt to this planned organizational change. How will people and the way they do their jobs be impacted? Will they accept this change willingly? Will business be disrupted while the proposed solution is implemented?

4. Other feasibilities—Depending on the situation and the organization, a business case may include other issues, such as legal and ethical feasibility.

1.6.2 Presentation of results that compares each alternative

No.	Economic feasibility	Technical feasibility	Organizational feasibility	Sensitivity analysis	Risks	Assumptions
1	None	None	None	None	None	No investment, no return
2	Feasible	Feasible	Not Feasible	Not Sensitive	Low	May adversely affect the work of other people within the organization
3	Not feasible	Not feasible	Feasible	Sensitive	High	May cause serious delays in project progress
4	Not feasible	Feasible	Feasible	Sensitive	Low	May cause large financial expenditures
5	Feasible	Feasible	Feasible	Sensitive	High	Outsourcing cannot guarantee the quality of the software, and also affects the development progress of possible related projects
6	Feasible	Feasible	Feasible	Not Sensitive	Low	A relatively stable choice in all aspects

1.6.3 Proposed recommendation

It is best to use most of the existing hardware and software to design and implement new intranet functions internally. From an economic point of view, this method will not cause too much overhead, and the direct purchase of external software packages will greatly increase development

costs. Technically, this method will not have too high technical requirements, unlike redesigning the system will require a lot of manpower and material resources. In terms of organization, this method can complete the work independently internally, and will not rely on other departments to cause delays in the progress of other projects. From a sensitivity point of view, this method is consistent with conventional methods and does not cause commercial sensitivity. From a risk point of view, the risk of this method is low, and like product outsourcing, it will not be difficult to control and ensure the quality and schedule.

2. Project Initiation and Scope Definition

2.1 Requirement Management

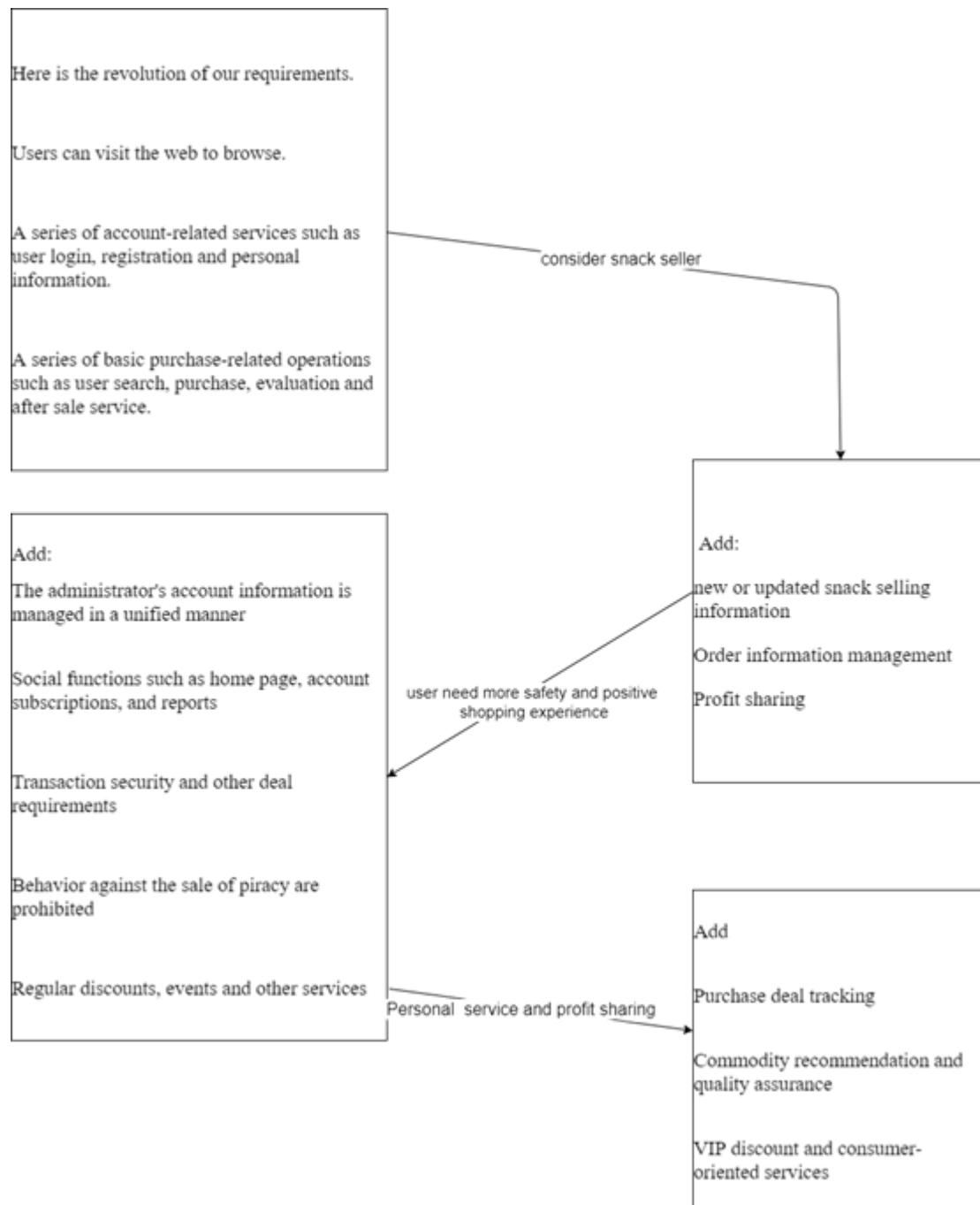
2.1.1 Determination and Negotiation

With the development of platforms such as Taobao T-mall Jindong, today, digital store seems to have become the first choices for people who want to purchase snacks which cannot be found easily in local shops. However, users still tend to purchase snacks simply from online store for stable shopping experience or other purposes, and as more and more players enjoy exploring snacks from everywhere, this market is still booming.

In such a large environment, we decided to create a sales platform specifically for the market, let major snack shops sell their products on the

platform, users can purchase, communicate and other activities on this platform or sharing game purchase experience.

2.1.2 Review and Revision



2.2 Feasibility Analysis

2.2.1 Functions

Functions for users

- The user logs in to Snack Store
- The user searches for snacks in Snack Store
- The user views snacks categories in Snack Store
- The user views snacks sellers in Snack Store
- The user views personal homepage in Snack Store
- The user views order information in Snack Store
- The user views shopping cart information in Snack Store
- The user views snack details information in Snack Store
- The user purchases snacks in Snack Store
- The user adds the snacks to the shopping cart in Snack Store
- The user adds the snacks to the wish list in Snack Store
- The user modifies personal information in Snack Store
- The user adds delivery address in Snack Store
- The user rates the order in Snack Store

Functions for sellers

- The seller logs in to snack store
- The seller views personal information in snack store
- The seller modifies personal information in snack store
- The seller views game list in snack store
- The seller modifies game information in snack store

- The seller removes game in snack store
- The seller adds game in snack store
- The seller views order in snack store
- The seller modifies the order information in snack store
- The seller delivery the game product in snack store

Functions for administrators

- The administrator logs in to snack store.
- The administrator exits from snack store.
- The administrator makes announcement in snack store.
- The administrator manages users' account in snack store.
- The administrator checks users' comments in snack store.
- The administrator handles with report information in snack store.
- The administrator makes recommend information in snack store.

Functions for analysts

- snacks that are better sold in the second quarter than the first quarter
- Which categories of snacks are the most profitable ones?
- What is the average time between the order placed and shipped?
- significant difference between snacks sold by different sellers in terms of profitability?

2.2.2 Constraint

Customers can pay by credit card, Alipay or WeChat.

All transactions should be safe.

You can access the system through PC, mobile devices and other websites.

Users (customers) can discuss and share their opinions on snacks, but our system only pushes information and recommendations of snacks that can be sent to users within a day

2.2.3 Features

1. Performance requirements:

- In 95% of the cases, the response time in the general period does not exceed 1.5 seconds, and the peak period does not exceed 4 seconds.
- The final estimated number of users is 10,000, the number of daily logged-in users is about 3,000, and the network bandwidth is 100M bandwidth.
- The system can satisfy 5,000 user requests at the same time and provide browsing functions for 10,000 concurrent users.

2. Security requirements:

- Strict permission access control, after identity authentication, users can only access data within their permission range and can only perform operations within their permission range.
- Can withstand general malicious attacks from the Internet. Such as virus attacks, password guessing attacks, hacking, etc.
- Different users have different identities and permissions. It is

necessary to provide trusted authorization management services under the premise that the user's identity is true and trustworthy, to protect data from illegal / unauthorized access and tampering, and to ensure data confidentiality and integrity.

3. Reliability requirements:

- There are prompts for input and data are checked to prevent abnormal data.
- The system is robust and should be able to deal with all kinds of abnormal conditions that occur during the operation of the system, such as: human operation errors, illegal data input, and hardware device failure.

The system should be able to handle it properly and avoid it properly.

4. Data confidentiality requirements:

- Network transmission data should be encrypted. It is necessary to ensure that the data is not peeped, stolen, or tampered with during the collection, transmission, and processing. Business data needs to be encrypted during storage to ensure that it cannot be cracked.

5. Ease of use requirements:

- 60% of users can master the use and purchase methods through the experience of other platforms and the description of the platform within 5 seconds of first seeing the platform.

6. Maintainability requirements

- After receiving the modification request, the ordinary modification

should be completed within 1 to 2 days; for the evaluation of the major demand or design modification should be completed within 1 week.

- 90% of the bugs were modified within 1 working day, and others within 2 working days.

2.3 Scope

Our Online Snack Store's strategic goals include continuous growth and profitability, as well as increasing popularity, fame and building a platform atmosphere. This project is based on the snack selling market. It hopes to attract users' favor with high quality, diverse snacks and convenience during purchase and optimize the work of managers with concise and refined operation methods.

Our system can provide users with safe guarantee and traceable commodity quality inspection. In order to achieve this goal, what we need to do is to strictly audit commodity selling institutions, select qualified sales channels, investigate snack wholesale channels, find out novel snacks, and strive to build a snack sharing and communication community culture.

Specific and direct goals are:

1. Meet business needs. Online Snack Store must be able to complete the purchase service provided to users, and provide administrators with basic business functions such as income and expenditure inventory reports.
2. Improve work efficiency. Online Snack Store needs to respond to some preset scenarios and optimize the management of administrators to

improve work efficiency.

3. Improve profitability. Online Snack Store needs to complete the summary of sales reports, inventory information, etc., so that administrators can adjust business strategies in time to obtain greater profits.

4. Enhance corporate brand. Online Snack Store is committed to improving the buying experience of buyers, enhancing the visibility of the platform, strengthening the construction of atmosphere, and improving profitability.

3. Project Planning and Charter

3.1 Human Organization

This part mainly shows the organization of our group members, their character in our project and the way of communication, that's how to compose these people together.

3.1.1 Stakeholders

Role	Name	Responsibility
Sponsor	All of us	Sponsor of this project, give request of requirement and change it during comprehension.
Project Manager	Huang Yiou	Responsible for monitor development progress, make decision on risk control and resource provision, and ensure software quality.

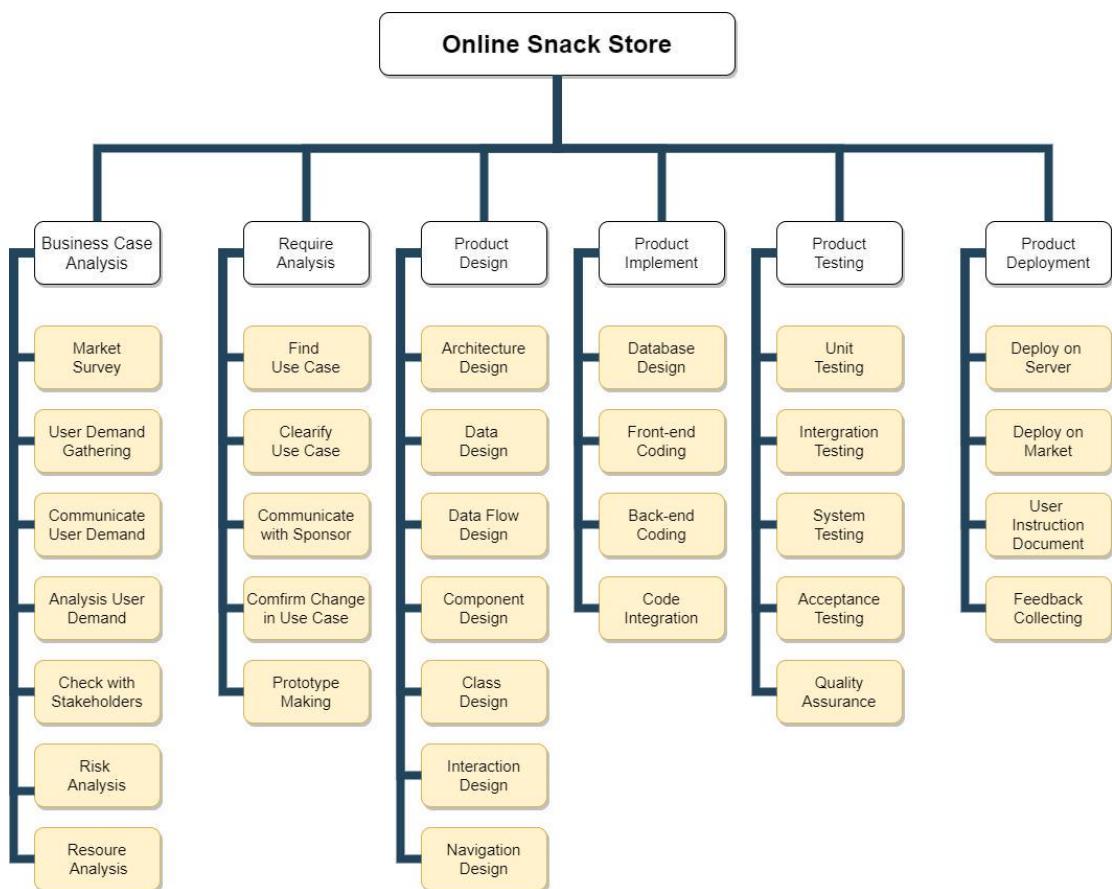
Resource Allocator	Huang Yiou	Responsible for the management of labor, equipment, technical resource.
Business Analyst	Chen Yangsen	Responsible for market survey and analysis of our project business cases.
Requirements Analyst	Chen Yangsen	Responsible for communicating requirements with customers, assisting project manager to control and follow up requirement change.
Product Architect	Mao Jingxin	Responsible for the design of the software part of the system structure and model.
Product Designer	Mao Jingxin	Responsible for the functional requirements of the project and product design part.
Risk Analyst	Tan Zhongyu	Responsible for risk analysis in the process of project.
Team Leader	Mao Jingxin	Responsible monitoring and controlling the progress of the project.
Team Member	All of us	Development team, responsible for the coding and deployment of the project.
Quality Assurance	Tan Zhongyu	Responsible for test cases design, test execution and evaluation of the test execution process.

3.2 Activity Planning and Schedules

This part mainly talks about the activity plan of our project: how to divide our project into part and key activities and how to manage these activities to make best use of our time.

3.2.1 Work Breakdown Structure (WBS)

This part we will divide our project into several main parts and figure out the key activities in it.



3.2.2 Activity List

This part we will figure out the key activities and list them.

No.	Name	Estimated Time (Week)	Dependency
A	Business Case Analysis	1	

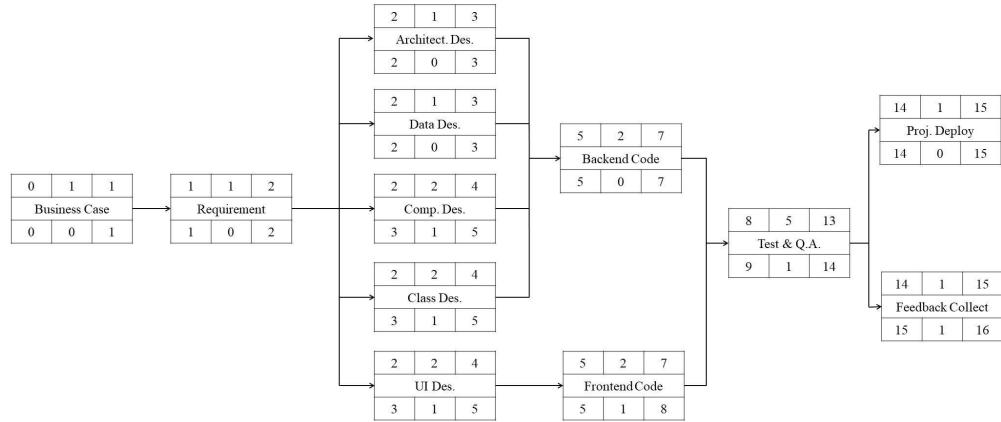
B	Requirement Analysis	1	A
C	Architecture Design	1	B
D	Data Design	1	B
E	Component Design	2	B
F	Class Design	2	B
G	Interaction Design	2	B
H	Back-end Coding	2	C,D,E,F
I	Front-end Coding	2	G
J	Test & Quality Assurance	5	H,I
K	Project Deployment	1	K
L	Feedback Collecting	1	K

3.2.3 Critical Path Graph

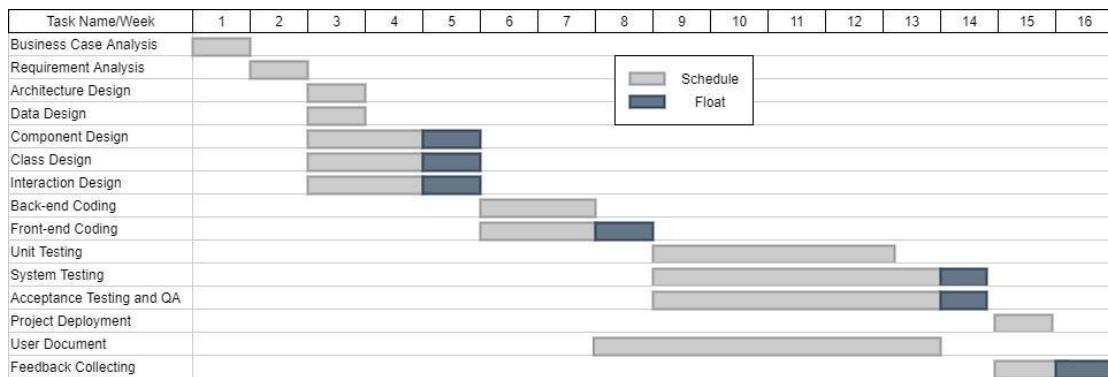
Our project will start at March 5th, and end at June 30th according to

plan. It will take about 16 weeks.

The follow is the correspondent **Critical Path Graph**.



The follow is relevant **Gantt chart**.



4. Risk Management

4.1 Risk Management Plan

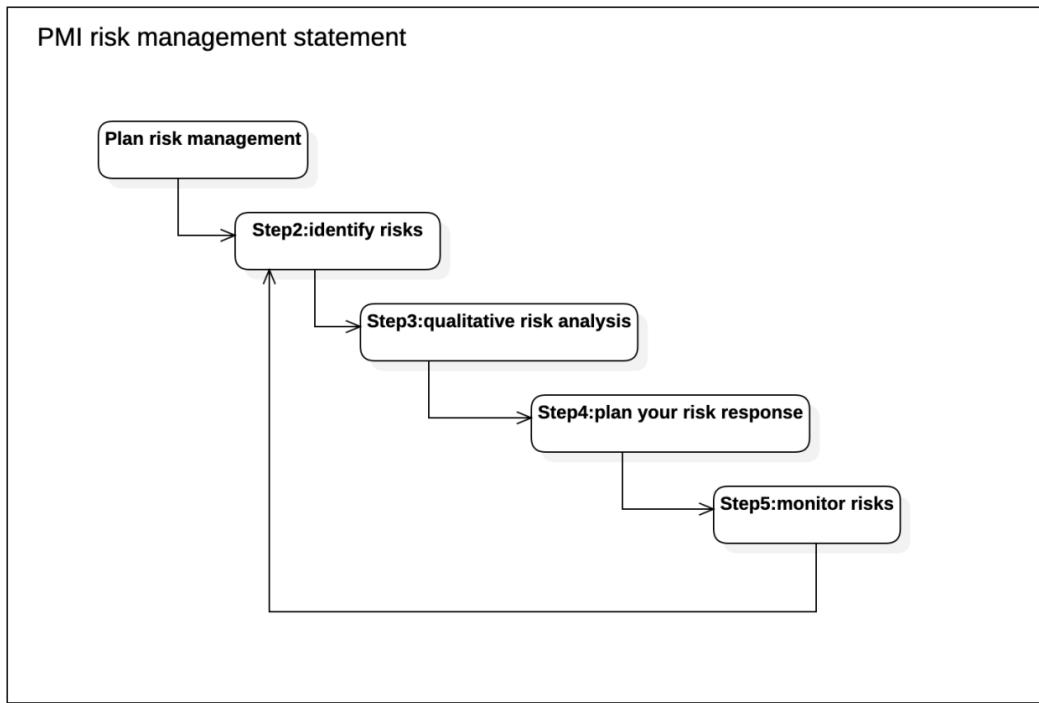
Our team first formulated a risk management plan, based on the risk management steps of [Project Management Institute \(PMI\)](#) risk management. Then the risks are determined from four parts: qualitative risk analysis and quantitative risk analysis. Every effort will be made to

proactively identify risks in advance so that mitigation strategies can be implemented from the beginning of the project.

When analyzing the potential risks in the project, we adopted a risk identification method combining **checklist method** and **brainstorming method** and risk reduction techniques for each potential risk.

We manage risks according to priorities, the most likely and highest impact risks are added to the project schedule to ensure that the assigned risk manager take the necessary steps to implement the mitigation response at the appropriate time during the schedule.

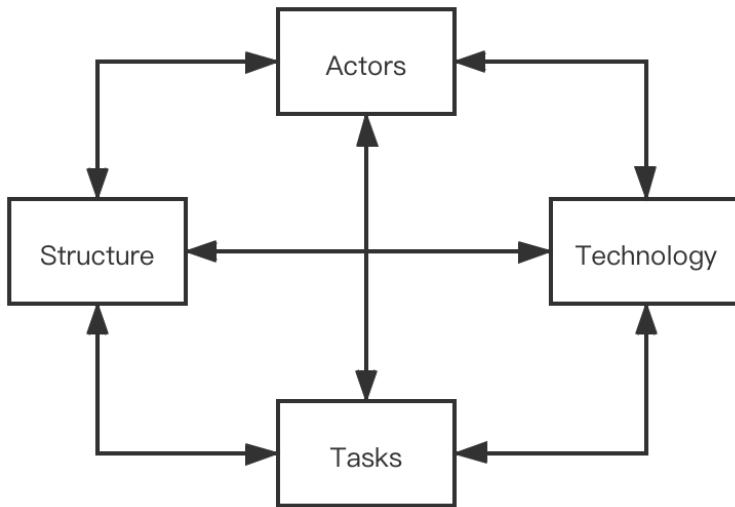
Upon the completion of the project, during the closing process, the project manager will analysis each risk as well as the risk management process. Based on this analusis, the project manager will identify any improvements that could be made to the risk management process for future projects.



4.2 Categories of Risk

Project risks are those that could prevent the achievement of the objectives given to the project manager & team.

In the Software Project and Process Management Course Project “**Online Snack Store**” , we reference to “Lyytinen-Mathiassen-Ropponen” risk framework and we divided the risk factors into four parts.



- **Actors:** main participants are the members of the group, among which the typical risks are mention below
 - changing of the staff
 - poor communication within the team leads to loss of valuable information of the project
- **Technology:** technology is the specific knowledge and tools using in the project, typical risk are mention below
 - tools used in the project development and implementation do not meet the project requirements
 - technology used in the project has defects, such as it is not suitable for the project or the team members are not familiar with the technology
- **Structure:** structure contains the planning structure, project structure, management structure and so on, typical risk are mention below
 - project management structure is not clear, which leads to the delay of each team member's timely positioning of their own work
- **Tasks:** tasks involving specific activities of the project, typical risk are mention below
 - risk of requirement change
 - complexity of integration among various project components will delay the progress of the project
 - quality and performance risk of the OSS system;

4.3 Risk Identification

In the risk identification of this project, we adopted the risk identification method combining **Checklist method** and **Brainstorming**

method, referred to checklists models such as **Iyytinen model** and **Barry Boehm model**, and established our own checklists as follows:

Serial Number	Risk	Risk reduction techniques
R1	Development tools need to be replaced during the development process	Carry out sufficient research and analysis on development tools; Use stable development tools
R2	Development technology is too complicated	Develop project technical prototypes; Conduct technical training for employees
R3	Real-time performance defects	Use prototype development; Simulate the operation of the prototype
R4	User interface error	Use prototype development; Perform task analysis; Let users participate in project development
R5	Personnel changes	More than one person participated in the core work of the project in order to familiar with the project process
R6	Team members did not communicate well	Agree on the way of communication; Regular communication of work progress; The minutes of the meeting
R7	Code integration issues	Convention code specification; Incremental development and integration
R8	Technology adopted is flawed	Use familiar technology; Specially-assigned person to study the new technology needed
R9	Change to requirements specification during coding	Stringent change control procedures High change threshold Incremental development(deferring changes) Agree on the requirement change control process in writing and record the change request

4.4 Risk Analysis, Assessment and Prioritization

In this project, we define the risk probability using score from 1 to 10, and we divide them into 4 levels from extra-high to extra-low. **Risk Probability Level Table, Risk Impact Level Table, and Risk Level Decision Table** are shown below:

Risk probability level			
score	probability range	level	description
10	90% ~ 1	High	Almost certainly
9	80% ~ 90%		
8	70% ~ 80%	Significant	Very likely
7	60% ~ 70%		
6	50% ~ 60%	Moderate	Likely
5	40% ~ 50%		
4	30% ~ 40%	Low	Almost impossible
3	20% ~ 30%		
2	10% ~ 20%		
1	0 ~ 10%		

Risk impact level		
score	level	description
10	High	Lead to the failure
9		
8	Significant	Create a big negative impact
7		
6	Moderate	Some influences on the project
5		
4		
3	Low	The negative impact is almost negligible
2		
1		

Risk level decision		
level(cardinal)	level(ordinal)	result
64~100	High	Can't accept
36~64	Significant	Need to make a decision
9~36	Moderate	Need to be reviewed
0~9	Low	Can be neglected

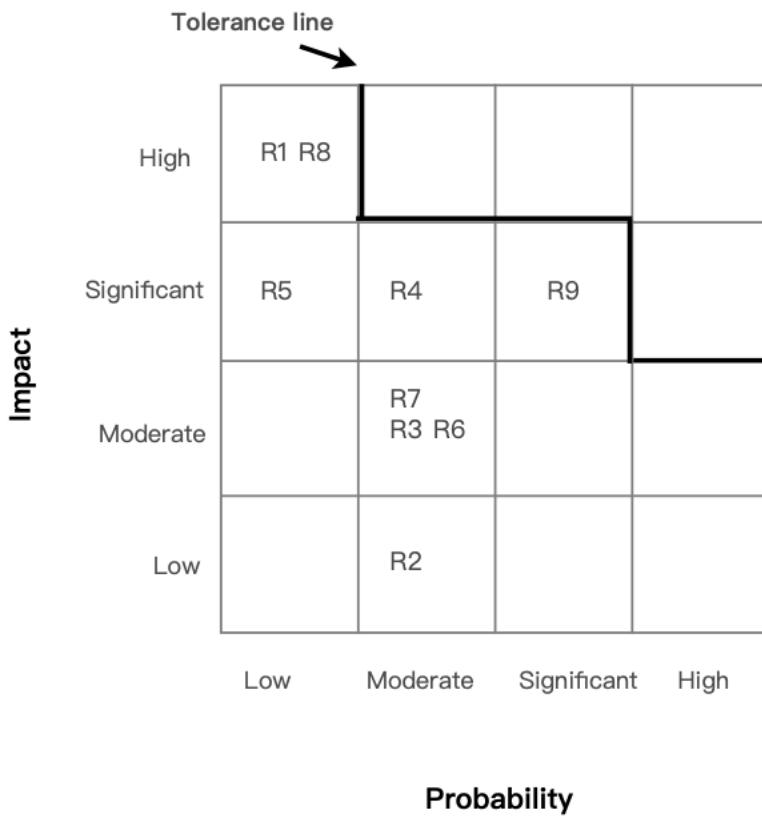
After defining the levels, we analyzed the potential risks in the project from the four aspects mentioned above.

We simulate the risk exposure during our brainstorming, and we use **Barry Boehm's method** for risk exposure assessment. And we use **risk exposure formula** for calculating.

Ref	Hazard	Probability	Impact	Risk
R1	Development tools need to be replaced during the development process	2	10	20
R2	Development technology is too complicated	6	3	18
R3	Real-time performance defects	6	6	36
R4	User interface error	5	8	40
R5	Personnel changes	2	8	16
R6	Team members did not communicate well	5	5	25
R7	Code integration issues	4	5	20
R8	Technology adopted is flawed	3	10	30

R9	Change to requirements specification during coding	8	8	64
----	--	---	---	----

The **probability impact matrix** is as follow:



4.5 Risk Prevention

1. **For risk R1**, Investigate common development tools in the industry at the beginning of the project and generate a survey document
2. **For risk R2**, Provide technical training for employees involved in the implementation of related technologies at the early stage of the project
3. **For risk R3**, Develop the feasibility and real-time performance of the prototype verification technology in the early stage of the project
4. **For risk R4**, Carry out sufficient requirements analysis and prototype design of the user interface in the early stages of the project
5. **For risk R5**, everyone is involved in the core work of the project to ensure that the change of personnel will not make the project unable to proceed normally
6. **For risk R6**, the group shall agree on the communication method at the beginning of the project and regularly communicate the schedule of work progress. If necessary, the meeting minutes shall be taken to minimize the possibility of risk

R7

7. **For risk R7**, to start the project code writing, agree on the development environment and code specification, annotation specification, etc., in the development process, incremental development and intergration to reduce the final workload
8. **For risk R8**, when encountering a risk bottleneck, turn the head and select experienced or familiar technologies. At the same time, a team member can be allowed to study and learn new technologies to pave the way for the implementation of the project
9. **For risk R9**,at the beginning of the project construction, agree on the requirement change control process with the user, record and archive the user's requirement change application

4.6 Risk Actions

According to the formula of **Risk reduction leverage(RRL)**

And we picked out and examined what appear to be the most threatening risks to the project, creating and maintaining our findings in a **Risk Register**.

RISK RECORD					
Risk id	R1	Risk title	Development tools need to be replaced during the development process		
Owner	Jingxin Mao	Data raised	2021/3/1	Status	first update
Risk Description: Due to lack of understanding of development tools, the project needs to be replaced during the development process					
Impact Description: The project environment needs to be reconfigured, and the architecture may also need to be changed according to the tools					
Recommended risk mitigation: Investigate common development tools in the industry at the beginning of the project and generate a survey document					
Probability/impact values: 2 / 10					
	Risk	Impact			
		Cost	Duratioin	Quality	
Pre-mitigation	20	8	5	8	
Post-mitigation	5	3	2	3	
Incident/action history					
Date	Incident/action	Actor	Outcome/comment		
2021/3/3	Analyzed common development and deployment tools, and finally chose Microsoft Visual Studio 2019 as the back-end development IDE, Visual Studio Code as the front-end development IDE, MySQL Workbench 8.0.23 as the database client, and AliYun as the deployment platform	Jingxin Mao	a development tool analysis document		

RISK RECORD					
Risk id	R3	Risk title	Real-time performance defects		
Owner	Yiou Huang	Data raised	2021/3/9	Status	first update
Risk Description: The actual operating performance of the application cannot meet the expected standard					
Impact Description: The application cannot achieve the expected function					
Recommended risk mitigation: Develop the feasibility and real-time performance of the prototype verification technology in the early stage of the project					
Probability/impact values: 6 / 6					
		Risk	Impact		
			Cost	Duration	Quality
Pre-mitigation		36	8	3	9
Post-mitigation		12	4	2	4
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2021/3/9	Review the technology and test the prototype		Jingxin Mao	/	

RISK RECORD					
Risk id	R2	Risk title	Development technology is too complicated		
Owner	Jingxin Mao	Data raised	2021/3/5	Status	second update
Risk Description: There may be too complex technical difficulties in project development					
Impact Description: The progress of the project has slowed down, difficulties cannot be broken, and the final results of the project may not meet expectations					
Recommended risk mitigation: — Provide technical training for employees involved in the implementation of related technologies at the early stage of the project					
Probability/impact values: 6 / 3					
	Risk	Impact			
		Cost	Duration	Quality	
Pre-mitigation	18	4	4	7	
Post-mitigation	8	2	3	3	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2021/3/6	Using ASP.NET MVC framework for back-end; Using Mysql for database		Jingxin Mao	/	

RISK RECORD					
Risk id	R4	Risk title	User interface error		
Owner	Yangsen Chen	Data raised	2021/3/7	Status	second update
Risk Description: The design of the user interface and the description in the requirements document do not match					
Impact Description: The user interaction interface needs to be redesigned according to the requirements document, which affects the progress of the project					
Recommended risk mitigation: Carry out sufficient requirements analysis and prototype design of the user interface in the early stages of the project					
Probability/impact values: 5 / 8					
		Risk	Impact		
			Cost	Duration	Quality
Pre-mitigation		40	6	6	8
Post-mitigation		15	3	2	4
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2021/3/13	Prototyped the front end		Jingxin Mao	Front end prototype	

RISK RECORD					
Risk id	R5	Risk title	Personnel changes		
Owner	Yiou Huang	Data raised	2021/3/9	Status	third update
Risk Description: A condition in which a group member cannot continue to work for some reason, resulting in the absence of a member.					
Impact Description: It can affect the project schedule and delay the progress, and it can cause the project to be unable to continue or even die.					
Recommended risk mitigation: Get everyone involved in the core of the project and make sure that changes in people don't derail the project.					
Probability/impact values: 2 / 8					
		Probability	Impact		
Pre-mitigation		16	Cost	Duration	Quality
Post-mitigation		/	/	/	/
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
/	/		/	/	

RISK RECORD					
Risk id	R6	Risk title	Team members did not communicate well		
Owner	Yiou Huang	Data raised	2021/3/1	Status	first update
Risk Description: Due to the low enthusiasm or participation among members, the communication is not in place.					
Impact Description: Project progress is slow, which drags down the progress of the project.					
Recommended risk mitigation: Agree on the way of communication at the beginning of the project and regularly communicate the schedule of work progress. If necessary, take minutes of the meeting to reduce the possibility of it.					
Probability/impact values: 5 / 5					
		Risk	Impact		
			Cost	Duratioin	Quality
Pre-mitigation		25	2	7	5
Post-mitigation		10	1	3	3
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2021/3/5	Agree that every Saturday night is the regular meeting time, need to summarize the work of the week		All team members	If necessary, a written record should be made	

RISK RECORD						
Risk id	R7	Risk title	Code integration issues			
Owner	Yiou Huang	Data raised	2021/3/9	Status	second update	
Risk Description: Because of the differences between the code module division and the coding habits of the members, the final code integration lags behind.						
Impact Description: The project process is controlled and a lot of time is spent dealing with coding differences.						
Recommended risk mitigation: To start the project code before the writing of a good agreement on the development environment and code specification, annotation specification, etc., the development process, incremental development and integration, reduce the final workload.						
Probability/impact values: 4 / 5						
		Risk	Impact			
			Cost	Duration	Quality	
Pre-mitigation		20	3	3	2	
Post-mitigation		8	1	1	1	
Incident/action history						
Date	Incident/action			Actor		Outcome/comment
2021/3/10	Integrate currently code for personal responsibility			All team member	Decrease work for later code integration	

RISK RECORD					
Risk id	R8	Risk title	Technology adopted is flawed		
Owner	Jingxin Mao	Data raised	2021/3/3	Status	second update
Risk Description: There are technical flaws in the programming techniques or frameworks used during the project.					
Impact Description: The project is in trouble and may not be able to proceed, requiring an alternative approach.					
Recommended risk mitigation: When it comes to the risk bottleneck, turn the head and select the experienced or familiar technology. At the same time, a team member can study and learn the new technology, which lays the foundation for the project implementation.					
Probability/impact values: 3 / 10					
		Probability	Impact		
			Cost	Duratioin	Quality
Pre-mitigation		30	6	6	7
Post-mitigation		8	2	3	3
Incident/action history					
Date	Incident/action			Actor	Outcome/comment
2021/3/8	Using .Net MVC framework for back-end;			Jingxin Mao	/

RISK RECORD					
Risk id	R9	Risk title	Change to requirements specification during coding		
Owner	Yangsen Chen	Data raised	2021/3/9	Status	second update
Risk Description: Users may frequently propose new requirements or modify existing requirements.					
Impact Description: At the very least, new work needs to be added, and at the very least, the whole project may have to be overhauled.					
Recommended risk mitigation: Identify and implement the source of the tools at the start of the project, while finding the necessary alternative tools, and implement the tools in place before they need to be used.					
Probability/impact values: 8 / 8					
		Probability	Impact		
Pre-mitigation		64	Cost	Duratioin	Quality
Post-mitigation		8	2	2	2
Incident/action history					
Date	Incident/action			Actor	Outcome/comment
2021/3/16	Requirement changing			Yiou Huang	/

4.7 Risk Evaluation

We use **PERT(Program Evaluation and Review Technique)** for risk evaluation. PERT was developed to deal with the uncertainty surrounding estimates of task durations.

First we divided the global task into sub-task, and estimating for three

times, **Most likely time(a)**, **Optimistic time(m)** and **Pessimistic time(b)**, then using formula to calculating **Expected Duration** and **Activity Standard Deviations**

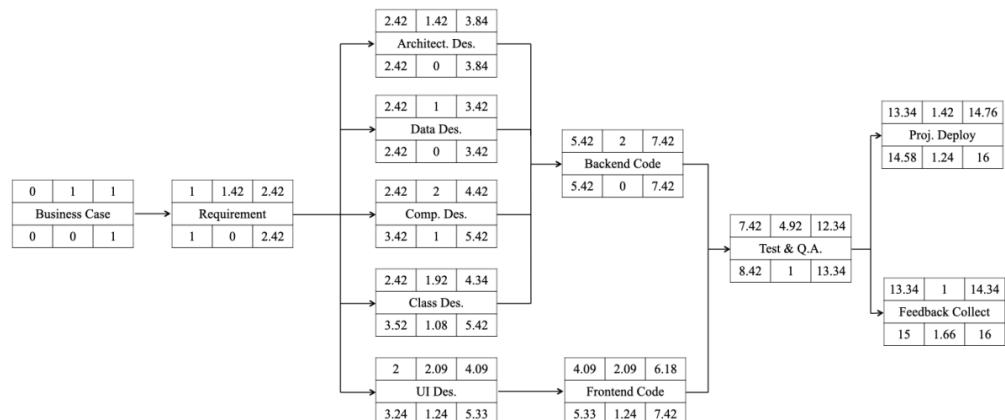
$$t_e = (a+4m+b)/6$$

$$s = (b-a)/6$$

4.7.1 PERT Activities Schedule

Serial Number	Activity	Optimistic Time	Most Likely Time	Pessimistic time	Expected Duration	Standard Deviations
A	Business Case	0.5	1	1.5	1	0.25
B	Requirement	0.5	1	2	1.42	0.25
C	Data Design	0.5	1	1.5	1	0.25
D	Architecture Design	0.5	1	2	1.42	0.25
E	UI Design	1.5	2	3	2.09	0.25
F	Class Design	1	2	2.5	1.92	0.25
G	Component Design	1	2	3	2	0.33
H	Backend Code	1	2	3	2	0.33
I	Frontend Code	1.5	2	3	2.09	0.25
J	Test&Q.A	3.5	5	6	4.92	0.42
K	Project Deployment	0.5	1	2	1.42	0.25
L	Feedback Collect	0.5	1	1.5	1	0.25

4.7.2 Project Cycle Activities Network Diagram



5. Resource Allocation

5.1 Resource Category

At the first stage of resource allocation part, we should make a resource allocation plan to list all the resources that will be required along with their expected level of demand.

The following table shows the **resource category**.

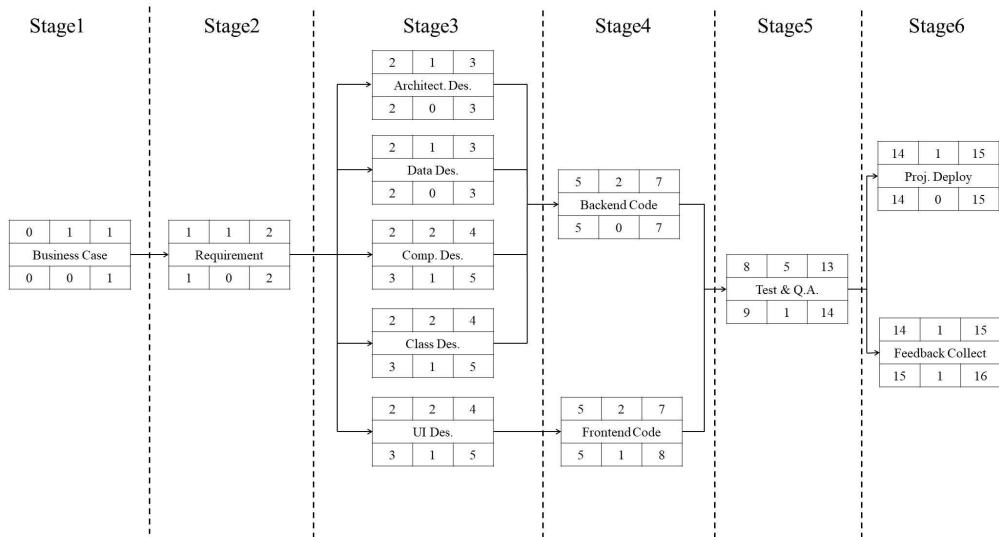
Res. Category	Details	Available Resource
Labor	The most important category. It means members of the development project team such as the PM, systems analysts, developers and so on.	Project Manager Business Analyst Analyst Architect Designer Team Leader Team Member Tester
Time	Time is also important and may be short if there are some emergency in our project.	Our project will start at March 5th, and end at June 30th according to plan. It will take about 16 weeks.
Space	Space is already available, we conduct our work in our own space when separated and in a public meeting when together.	Our own workspace A public meeting room, sometime work online, need one online meeting room

Facilities	All basic equipment should be considered.	Laptop Tables Chairs Server to deploy our product
Materials	Items that are consumed, rather than equipment that is used.	Disks Paper
Services	Needed service provided by other service developers.	Ali cloud service Online meeting service
Money	Secondary resource, used to buy other resources.	Money for employee, buying equipment, materials and services

5.2 Identify Resource Requirement

The allocation of resources to activities will lead us to review and modify the ideal activity plan. We should revise our project plan after resource allocation.

Firstly we divided our **activity network analysis** into several stages.



The resource needed in every stage shows in the following **Resource Requirement List.**

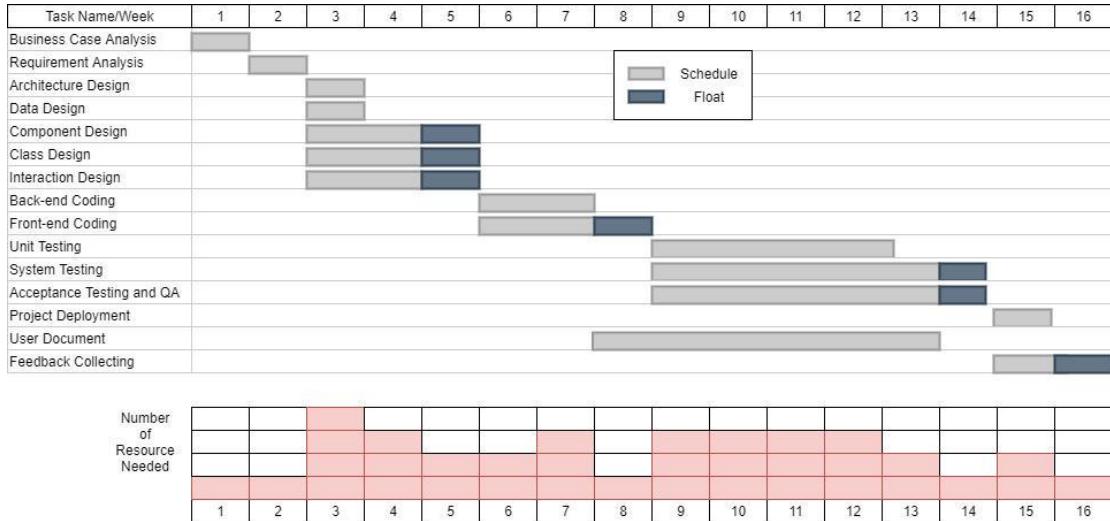
Stage	Activities	Resource	Time	Details
1	Business case analysis	PM Business analyst	1 week	Check business cases.
2	Requirement analysis	PM Requirement analyst	1 week	Analysis of use cases
3	Architecture design Data design Component design Class design Interface design	Architect Team leader Team member Meeting room	3 weeks	Mainly use Analyst/Designer
4	Backend coding	Team leader	3 weeks	most of materials

	Frontend coding	Team member Laptops Work tables & chairs Meeting room		and facilities
5	Quality Assurance	Tester Team leader Team member Laptops Work tables & chairs	5 weeks	mainly test team
6	Project deployment Feedback collecting	Team member Server	2 weeks	mainly develop team

5.3 Resource Scheduling

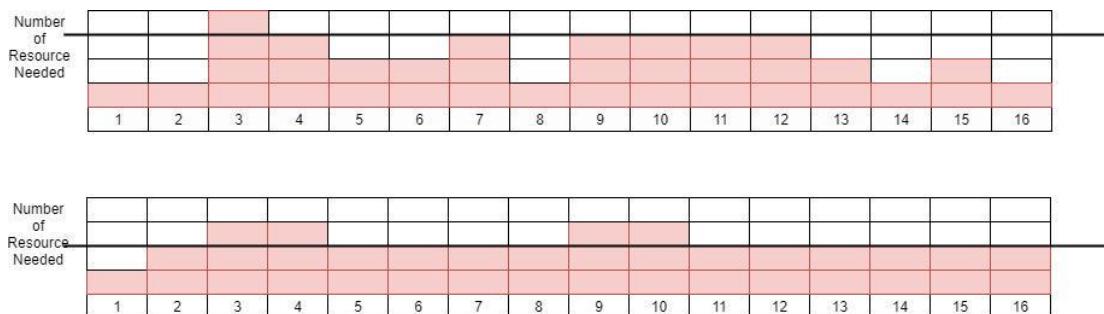
The resource schedule shows the dates when each resource will be required and the degree of requirement. It will mainly consider human resource.

The following is the **resource histogram** exported by Gantt chart.



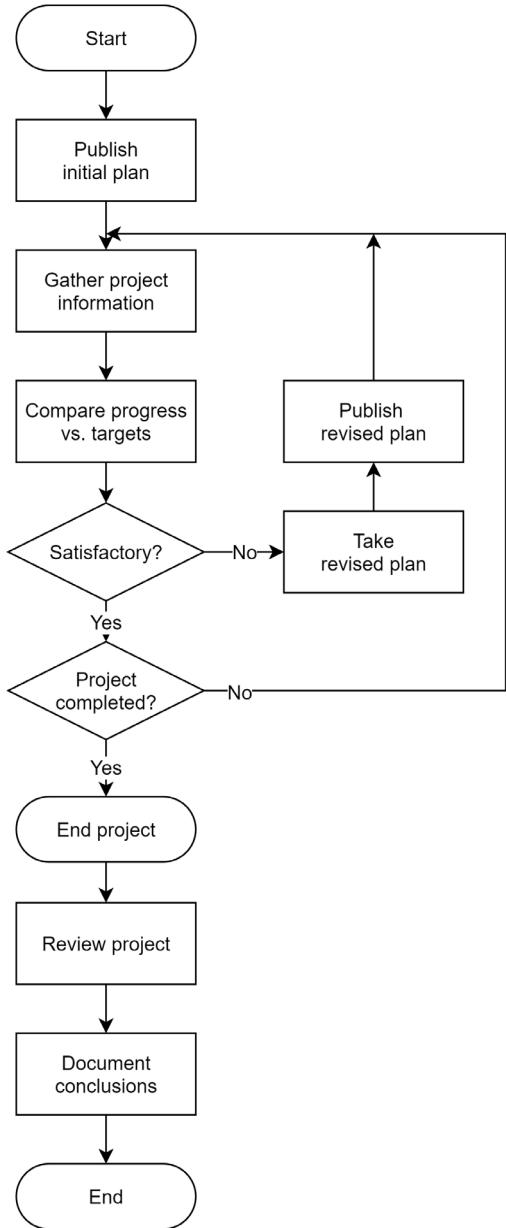
From the above we know every activity has been scheduled to start at its earliest start date, and we assign some float to it. But there is also a question: this scheduling method frequently creates **resource histograms** that start with a peak and then tail off, which is not equal.

So we can adjust the start date of some activities and split others, our **resource histogram** can be smoothed to contain resource demand at available levels. Updated smoothing resource histogram chart is shown below.



6. Monitor and Control

6.1 Project control framework



Controlling projects to ensure that their goals are met is a common monitoring problem, so that the actual situation can be ascertained and compared with current goals. If the actual situation does not match the plan, the plan needs to be reformulated to avoid deviation from the target, or the target needs to be changed. The above figure illustrates the project control cycle model, and illustrates that once the initial project plan is announced, the project control will be a process of continuously monitoring the

progress according to the plan, considering deviations, and modifying the plan when necessary. The diagram also illustrates some important steps that must be taken after the project is completed, in order to apply the experience gained in any project to the planning stage of future projects and learn from past mistakes.

We monitor the progress of the project, compare the difference between the actual progress and the plan, and modify the plan so that the project can return to the expected track. The product manager in charge of the business pays attention to the progress of the project every day, and the project manager executes a project report once a week. Require hard-working team members to be effective, or allocate other resources to adjust the resources on the non-critical path to the critical path. Of course, other members of the team also need to provide reports in different ways and frequencies.

6.2 Data Collection

Everyone should collect partially completed tasks. In the process of collecting data, there are two methods: partial completion report and risk report. Considering that partial completion of the report will reduce the attention of employees and may cause delays, the task of partially completing the report is left to the product manager for production and analysis. Every employee must confirm the risk report once a week. The

two reports are as follows. Since there is no actual process reference, the textbook has been appropriately modified to accommodate the sample report.

Time Sheet

Staff JingxinMao

Week ending 8/4/2021

Rechargeable hours

Project	Activity code	Description	Hours this week	% complete	Scheduled completion	Estimated completion
P25	A216	Code mod A3	16	60	20/4/2021	13/4/2021
P31	D431	Document take-on	11	20	6/5/2021	6/5/2021

Total recharged hours	27
-----------------------	----

Non-rechargeable hours

Code	Description	Hours this week	Comment and authorization
Z67	To deal with emergencies	6	Authorized by RB
Z98	Work to help others	4	Authorized by RB

Total non-recharged hours	10
---------------------------	----

Activity Assessment Sheet

Staff JingxinMao

Ref:OSS/4

Activity:Frontend design and coding 2

Week number	13	14	15	16	17	18	
Activity summary	G	A	A	R			

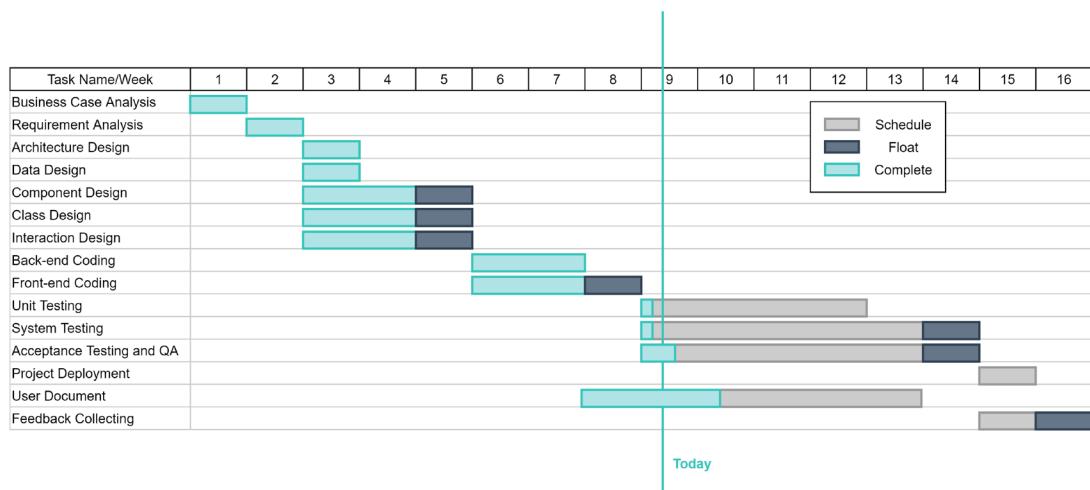
Component

Comments

Screen handling procedures	G	A	A	G			
File update procedures	G	G	R	A			
Housekeeping procedures	G	G	G	A			
Compilation	G	G	G	R			
Test data runs	G	G	G	A			
Program documentation	G	G	A	R			

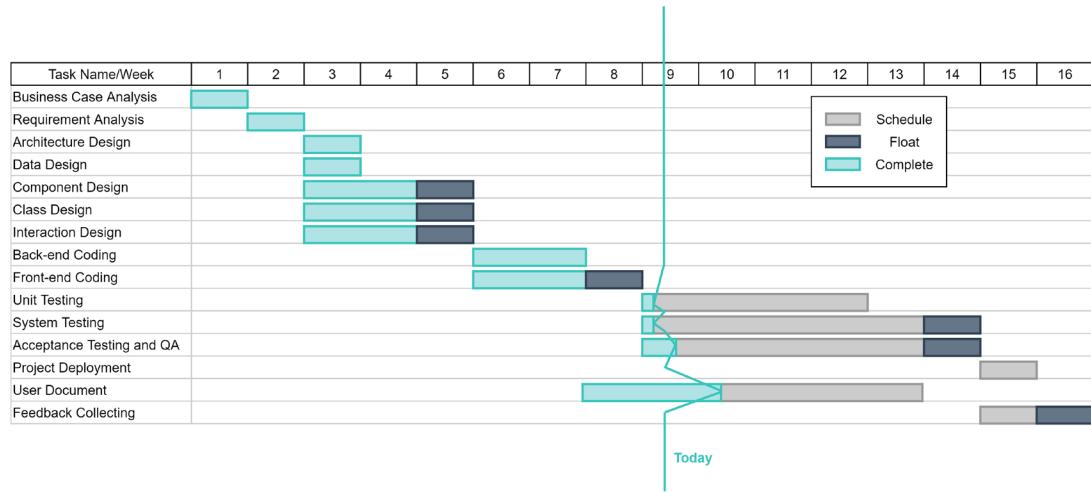
6.3 Progress Visualization

If data on the progress of the project is collected, the manager needs to use some method to present the best data. After the activity is completed, the project manager can modify the Gantt chart and should provide visual effects to all objects members. The figure below shows a Gantt chart of OSS.



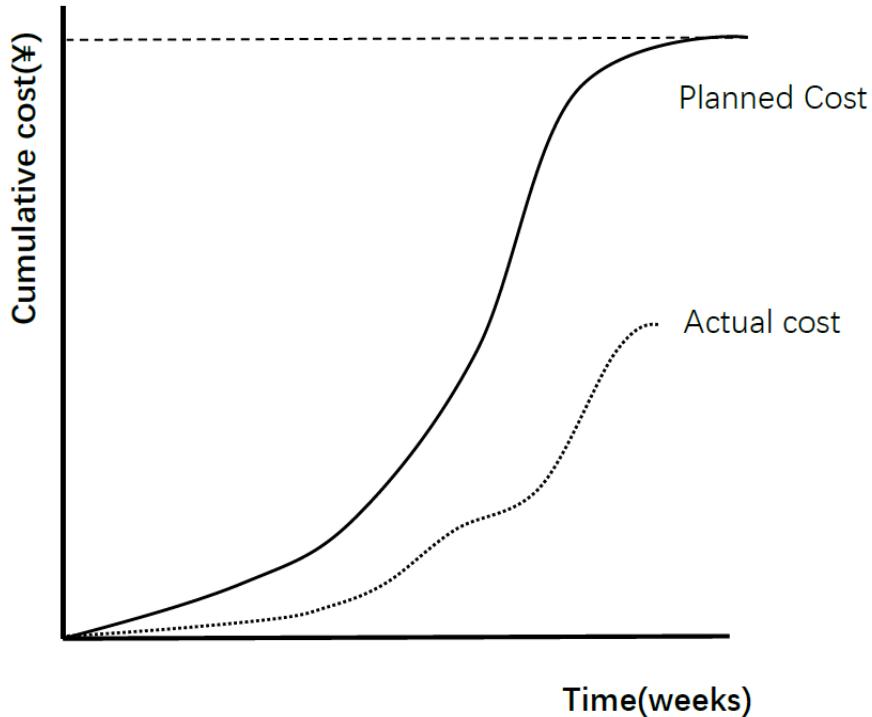
The delay diagram is another very similar diagram. This diagram

provides more eye-catching visual indications for activities that are not progressing as planned: the more curved the delay line, the greater the deviation from the plan. The following figure shows a delay graph of OSS.

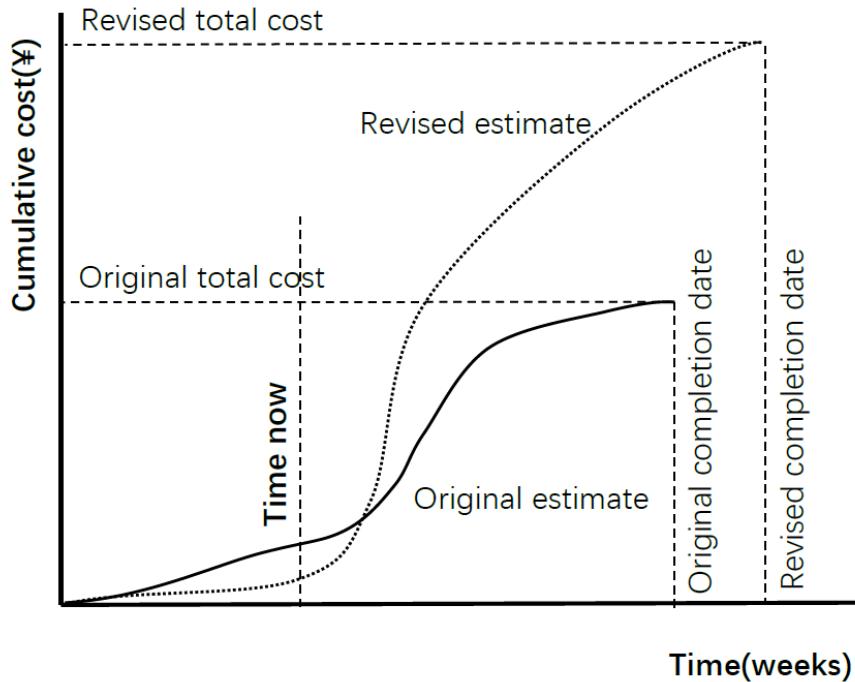


6.4 Cost Monitoring

Expenditure monitoring is an important part of project control. It indicates the effort we have made in the OSS project. Our OSS project may be completed on time, but this is because the money spent on activities exceeded the initial budget. Our cumulative expenditure table is shown below, which provides a simple way to compare actual expenditures and planned expenditures. In addition, before attempting to explain the meaning of recorded expenditures, we also need to consider the current status of OSS project activities.



If you add planned future costs to the graph, the cost curve graph will be more useful. By adding the estimated cost of unfinished work to the cost already paid, the estimated future cost can be derived. Where computer-based planning tools are used, under normal circumstances, once the actual cost is recorded, the revision of the cost schedule is automatically given. The figure below illustrates that additional information is available once the revised cost schedule is included (if so, obviously the project has been delayed and exceeded the budget).



6.5 Earned Value Analysis

➤ **Plan Value (PV, Plan Value):** Budgeted cost for planned workload (**BCWS**, Budgeted Cost for Work Scheduled). Refers to the budgeted man-hours (or expenses) required for the amount of work required to be completed in a certain stage of the project implementation process. The calculation formula is:

- **PV = BCWS = planned workload × planned unit price**
- PV mainly reflects the amount of work that should be completed in the schedule, rather than reflecting the man-hours or expenses that should be consumed.

➤ **Actual cost (AC, Actual Cost):** Actual cost of completed work (**ACWP**, Actual Cost for Work Performed). Refers to the man-hours (or expenses) consumed in the actual completion of

the workload at a certain stage of the project implementation process, and is the actual consumption indicator for project implementation. The calculation formula is:

- **$AC = ACWP = \text{Work completed} \times \text{actual unit price}$**

- **Earned Value (EV, Earned Value):** Budgeted Cost for Work Performed (BCWP, Budgeted Cost for Work Performed). Refers to the actual amount of work completed at a certain stage of the project implementation process and the working hours (or expenses) calculated according to the budget quota. The calculation formula is:

- **$EV = BCWP = \text{completed work} \times \text{planned unit price}$**

- Combining these three values can determine whether the work is completed as planned at that point in time. The most commonly used metric is cost variance:

- Cost variance(**CV**) :

- $CV = EV - AC$

- A negative CV means over cost.

- Schedule variance(**SV**):

- $SV = EV - PV$

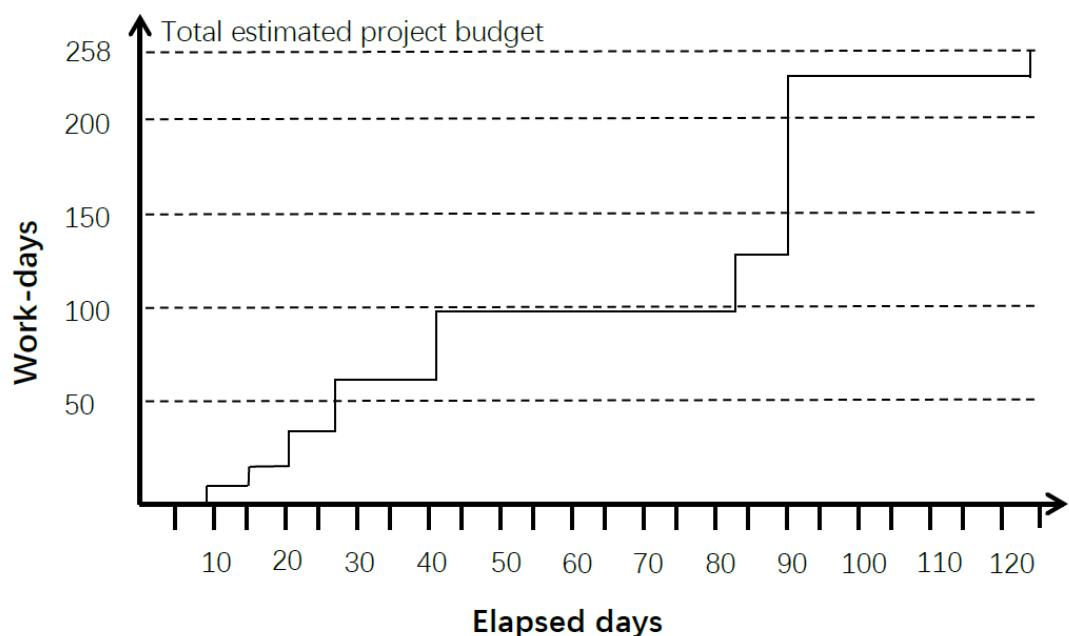
- A negative SV means behind schedule.
- Time variance(**TV**):
- difference between EV time and now.

- For performance ratios, we generally track two ratios.
 - **CPI**(Cost Performance Index) = EV / AC
 - **SPI**(Schedule Performance Index) = EV / PV

The performance ratio can be regarded as a kind of "monetary value" index. If the value is greater than 1, it means that the completed work is better than planned. If the value is less than 1, it means that the cost of work is greater than expected and/or The work progressed more slowly than planned.

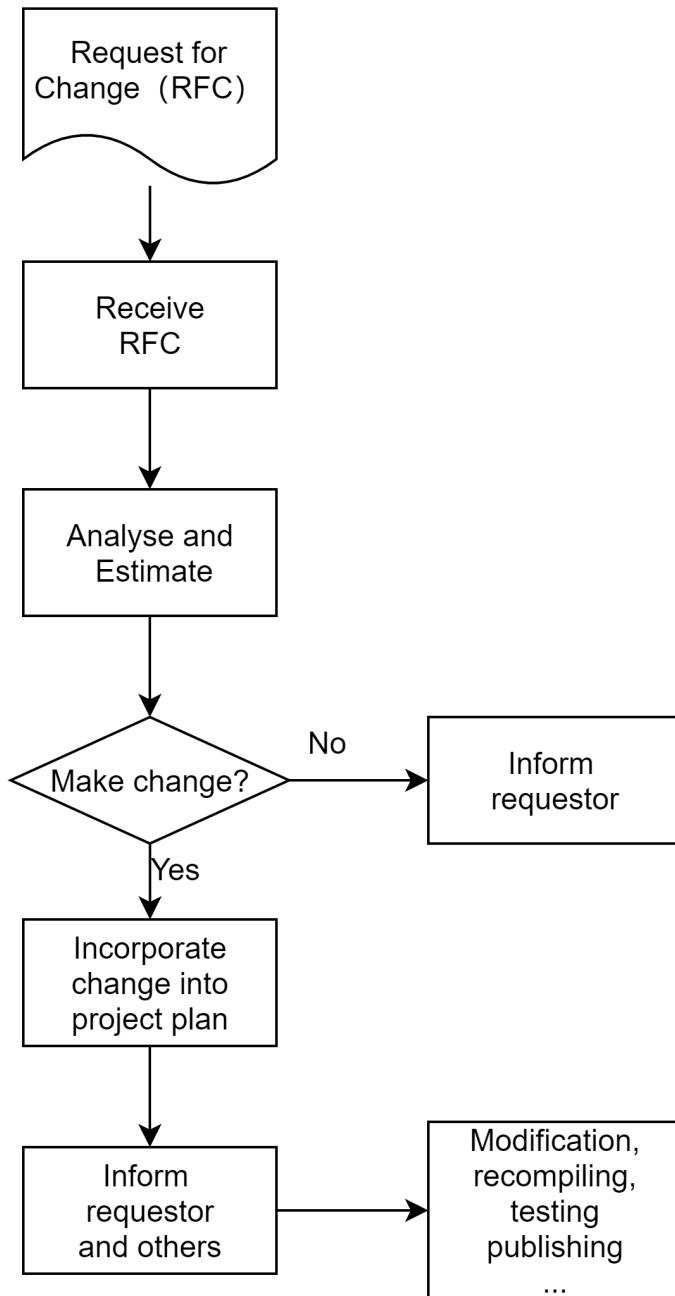
We combine the **Baseline Budget** and **0/100 technology**, assign 0 to unfinished tasks, and 100% to tasks that have completed the budget.

Task	Budgeted workdays	Scheduled completion	Cumulative workdays	% cumulative earned value
Business Case Analysis	7	7	7	2.71%
Requirement Analysis	7	14	14	5.43%
Architecture Design	7	21	28	10.85%
Data Design	7	21		
Component Design	14	28	70	27.13%
Class Design	14	28		
Interaction Design	14	28		
Back-end Coding	14	42	98	37.98%
Front-end Coding	14	42		
Unit Testing	28	84	126	48.84%
System Testing	35	91	244	94.57%
Acceptance Testing and QA	35	91		
User Document	48	91		
Project Deployment	7	125	258	100.00%
Feedback Collecting	7	125		



6.6 Change Control

Because changes including requirements changes and personnel changes cannot be avoided in the software management process, we must control and manage changes. The change control management process is shown in the figure below:



The most important is to plan the change in advance, and then we estimate the risk of controlling the change and include successful verification. The change must be tested to ensure that we can control the change. Finally, we assign employees to take on new responsibilities to solve the problems caused by the change.

7. Project Implementation

7.1 Process Model

Incremental model

The incremental model is a synthesis of the waterfall model and the prototype evolution model. Its consideration of the software process is: as a whole, implement project development in accordance with the waterfall model process to facilitate project management; but in the actual creation of the software, it will be decomposed into many incremental components according to functions, and the components are created and delivered one by one until all the incremental components are created and integrated into the system and delivered to users.

Each member of the team plays different roles in incremental development.

Role	Name	Responsibility and Tasks
Sponsor (Client or Project Owner)	All of us play the role.	1. Control the determination of the functional requirement of

		<p>the project.</p> <p>2. For each development increment, adjust requirement according to actual situation if needed.</p> <p>3. Check work process with the development team.</p>
Development Team Leader	Mao Jingxin	<p>1. Be responsible for monitoring and controlling the progress of the project.</p> <p>2. Communicate between team and sponsor, link them together.</p> <p>3. Construct good communication and collaboration between members. Try to avoid or</p>

		solve obstacles in team as possible
Development Team Member	Huang Yiou, Chen Yangsen, Mao Jingxin, Tan Zhongyu	<p>1. Be responsible for the coding and deployment of the project.</p> <p>2. Report own process on time.</p> <p>3. Participate in team meeting and communicate to get best team cooperation.</p>

Meetings are an important part of incremental development. During the meeting, the product owner informs the development team of the feedback on the previous increments and the newly generated increments to be developed. He needs to decide which existing increments to modify and which new ones to develop. The development team decided that they could guarantee the completion of several sub-items before the next incremental

delivery.

The following is a list of the types of meetings we have held:

Meeting	Time and Task
Planning Meeting	Every Saturday at 14:00. Arrange next week's task Daily Meeting
Retrospective Meeting	Every Saturday at 14:00, review last week's accomplishments before the planning meeting and dynamically adjust the tasks for the next week

7.2 Development Techniques

- Development Tools

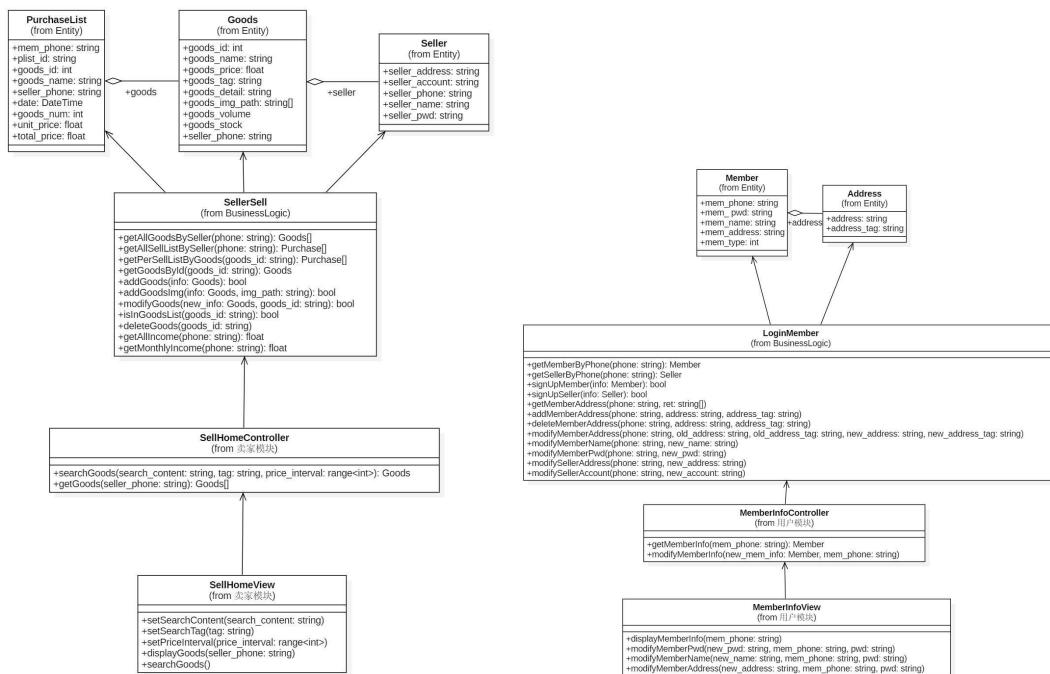
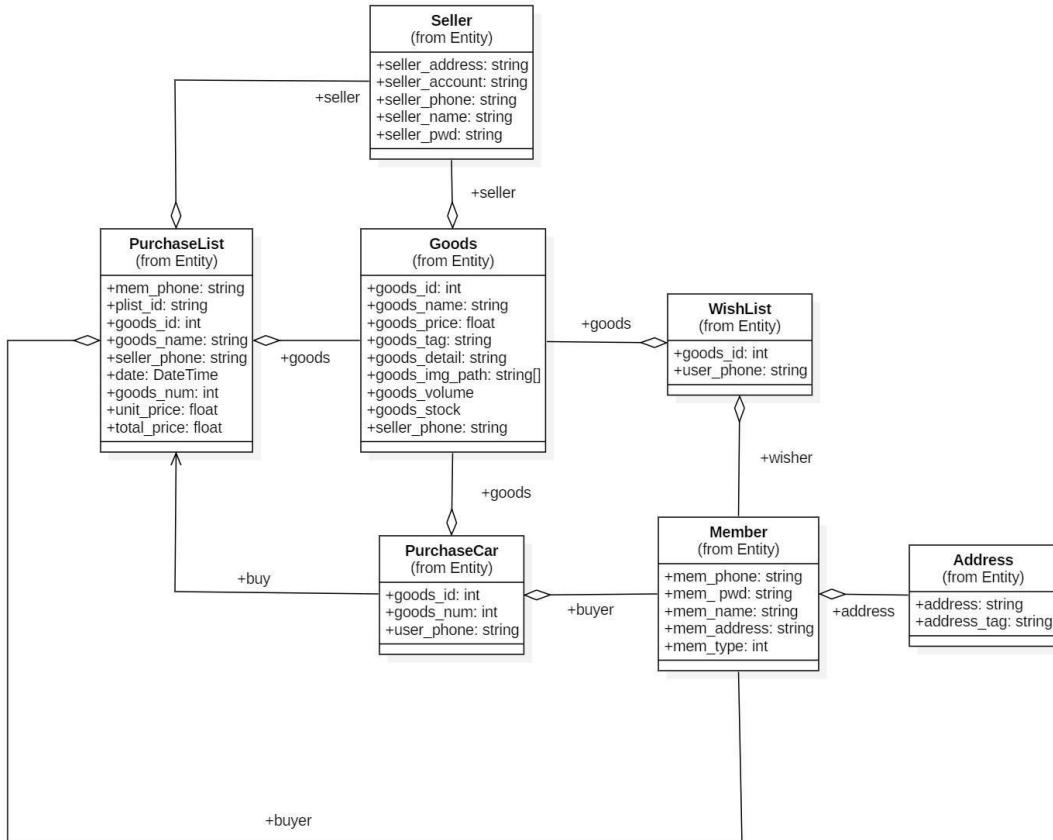
Tool	Illustration	Offical Web
Microsoft Visual Studio 2019	IDE	https://www.microsoftstore.com.cn/software/visual-studio
Visual Studio	IDE	https://code.visualstudio.com/

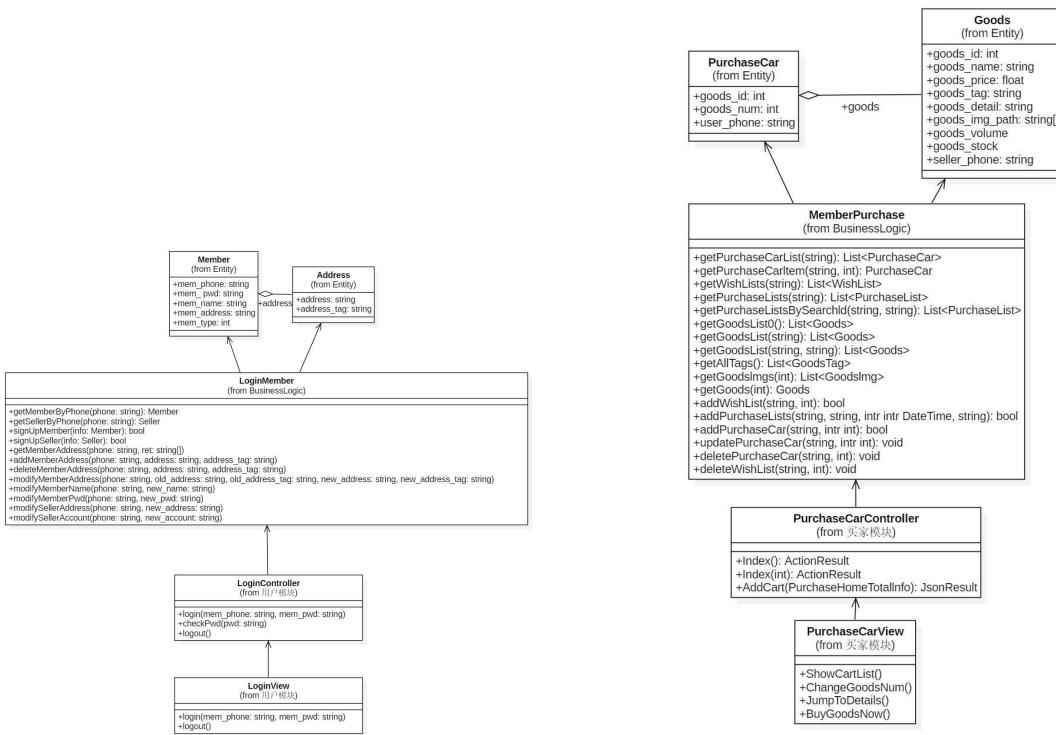
Code		
MySQL Workbench 8.0.23	Database design tool	https://dev.mysql.com/downloads/workbench/
AliYun	Deployment platform	https://cn.aliyun.com/

➤ Development Environment

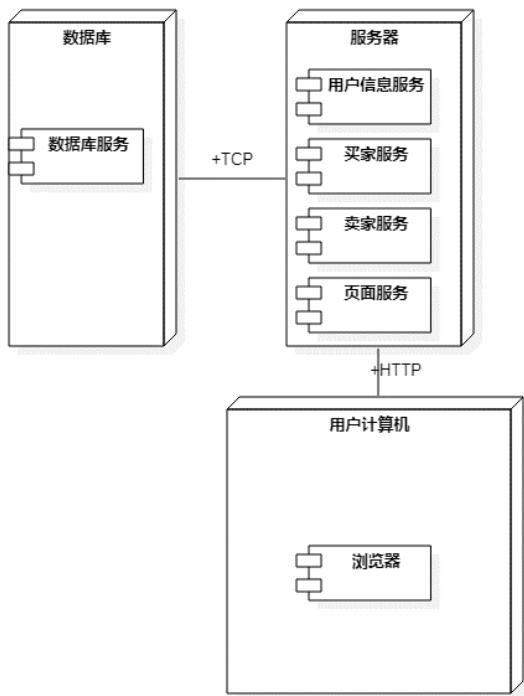
Environment	Version	Download Url
ASP.NET MVC	3	https://dotnet.microsoft.com/apps/aspnet
Mysql	5.7.30-winx64	https://downloads.mysql.com/archives/community/

➤ Design Elements

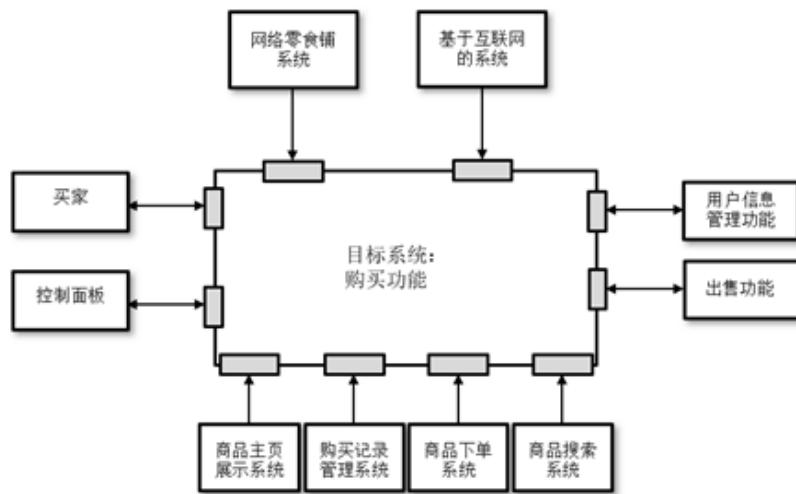




➤ Deployment Diagram



➤ Design Architecture



8. Prototype

8.1 Registration interface



Figure 8.1.1

◀ 主页

The registration form for buyers is titled "注册成为会员" (Register as a Member). It features four input fields: "请输入您的手机号码" (Please enter your mobile phone number), "请输入您的用户名" (Please enter your username), "请输入您的密码" (Please enter your password), and "请再次输入密码" (Please re-enter your password). Below these fields are two buttons: an orange "注册" (Register) button and a red "已有账户? - 登录" (Already have an account? - Log in) button.

Figure 8.1.2

◀ 主页

The registration form for sellers is titled "注册店铺" (Register Shop). It includes six input fields: "请输入您的手机号码" (Please enter your mobile phone number), "请输入您的用户名" (Please enter your username), "请输入您的密码" (Please enter your password), "请再次输入密码" (Please re-enter your password), "请绑定您的收款账户" (Please bind your payment account), and "请输入您的发货地址" (Please enter your shipping address). At the bottom are two buttons: an orange "注册" (Register) button and a red "已有账户? - 登录" (Already have an account? - Log in) button.

Figure 8.1.3

When visiting this website, users can choose to register as an official user (8.1.1) of this website, that is, choose to register as a buyer (Figure 8.1.2) and a seller (Figure 8.1.3). To register as a buyer, you can use the shopping cart on this website, check purchase records, add wishlists, add or change the delivery address, etc., and register as a seller directly, not only will you automatically become a buyer, but you can also add and drop products and check sales. Record, conduct flow query and other operations.

8.2 HomePage

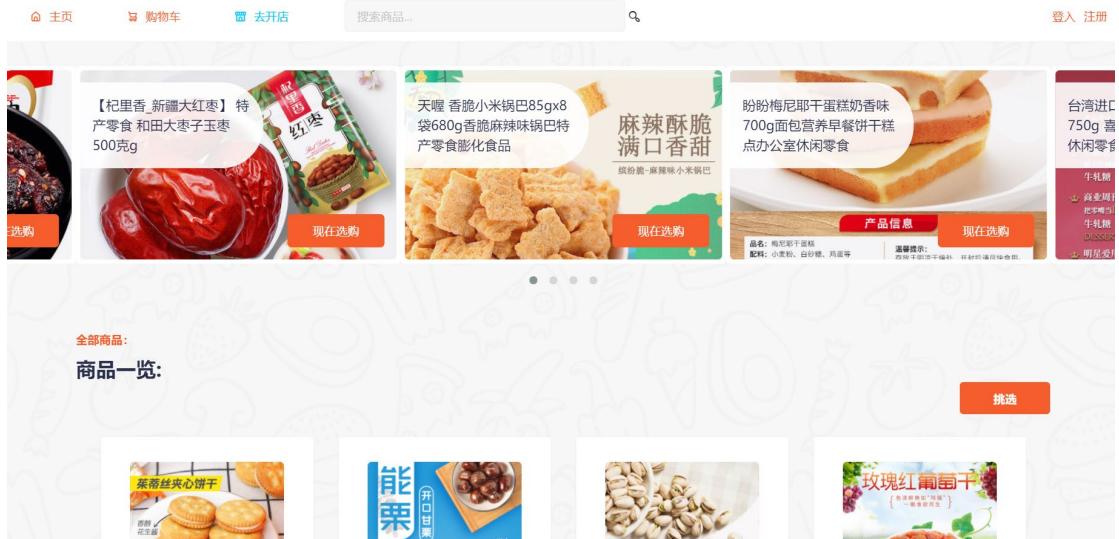


Figure 8.2.1

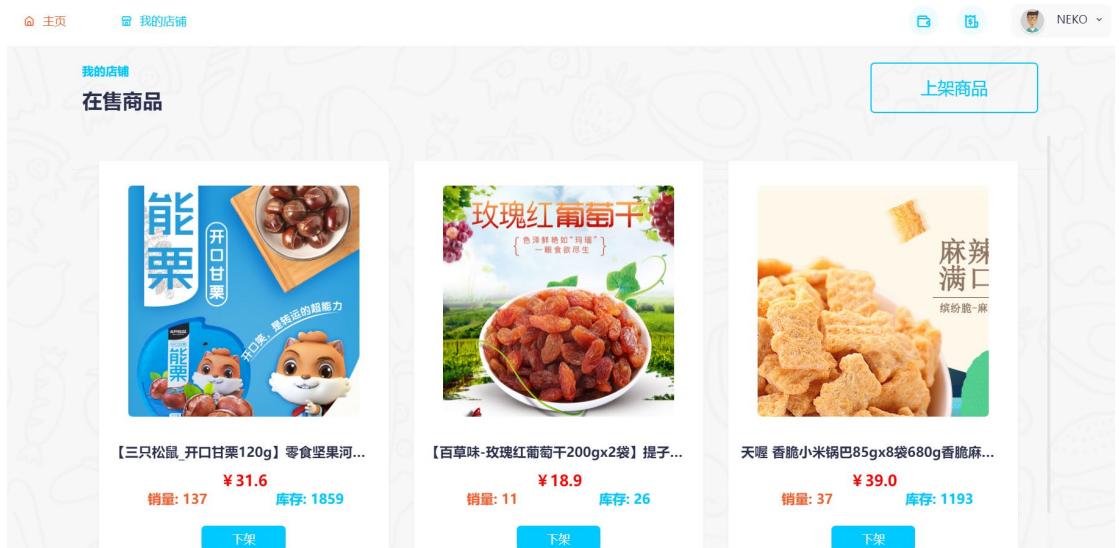


Figure 8.2.2

The homepage of the website is mainly composed of two modes: the buyer homepage (Figure 8.2.1) and the seller homepage (Figure 8.2.2). The buyer homepage can perform operations such as product purchase, fast classification of products, and product search, and the seller homepage can perform operations Commodity on and off shelves, replenish inventory, increase product pictures and other functions

8.3 Product details page

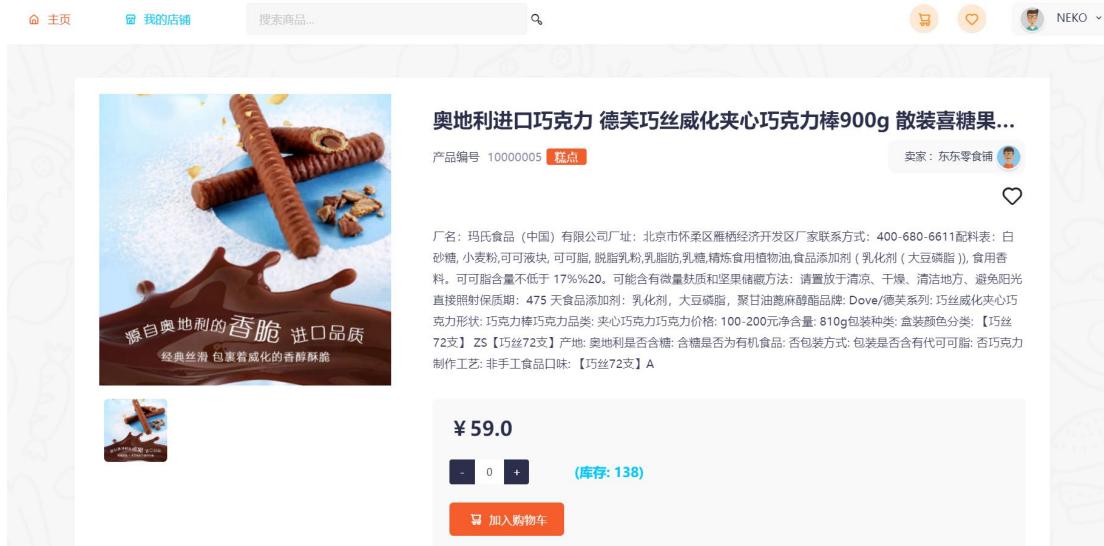


Figure 8.3.1

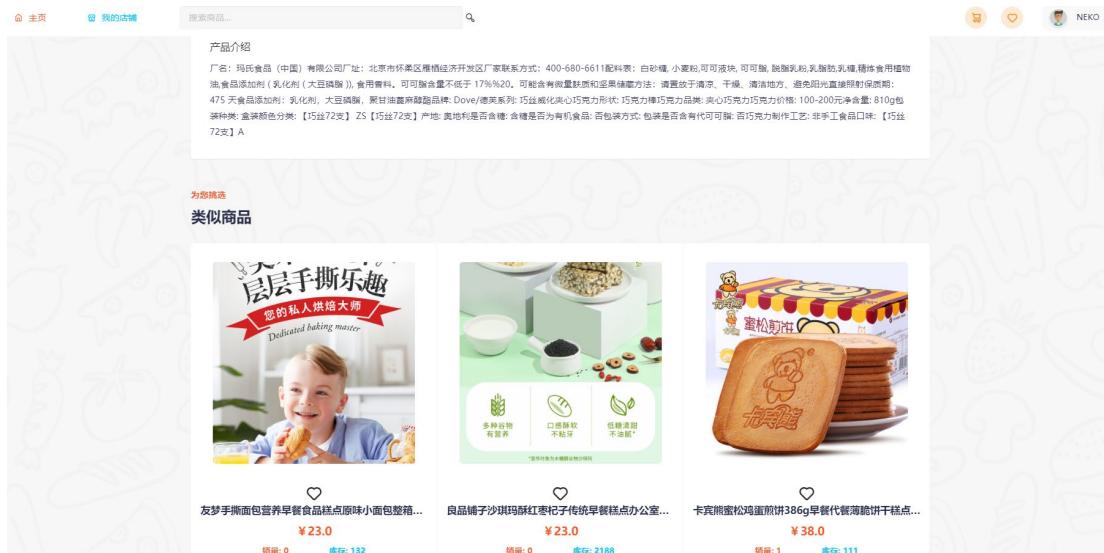


Figure 8.3.2

The product detail page (Figure 8.3.1) is used to display the detailed content of a single product in detail, including the product detail page, serial number, seller information, sales and inventory, and other information. It also includes similar recommendations for related products (Figure 8.3.2) .

8.4 PurchaseCar

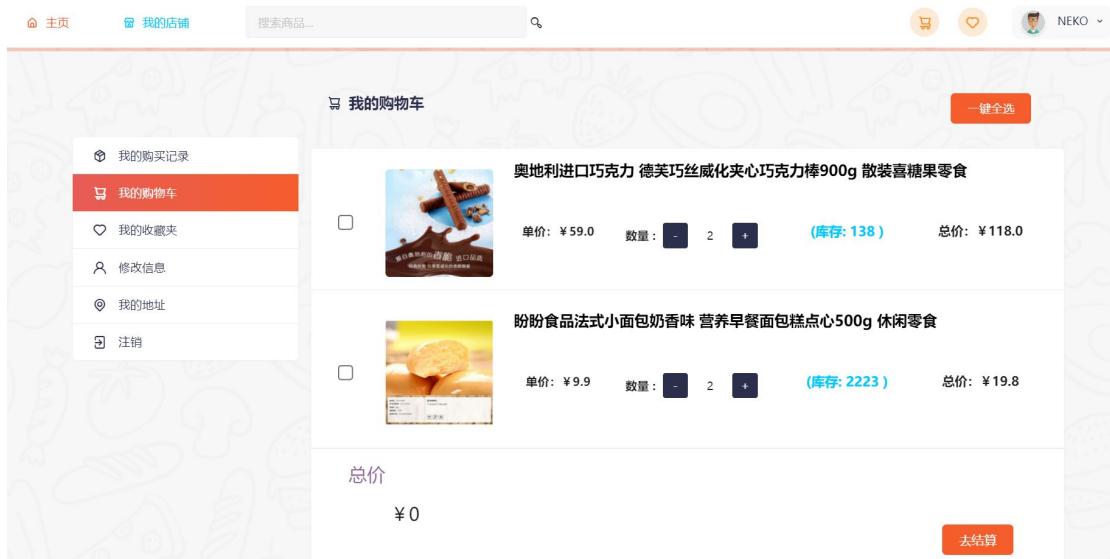


Figure 8.4.1

The shopping cart page (Figure 8.4.1) is used to display the current buyer's shopping cart. Buyers can filter products for purchase here

8.5 Purchase and payment

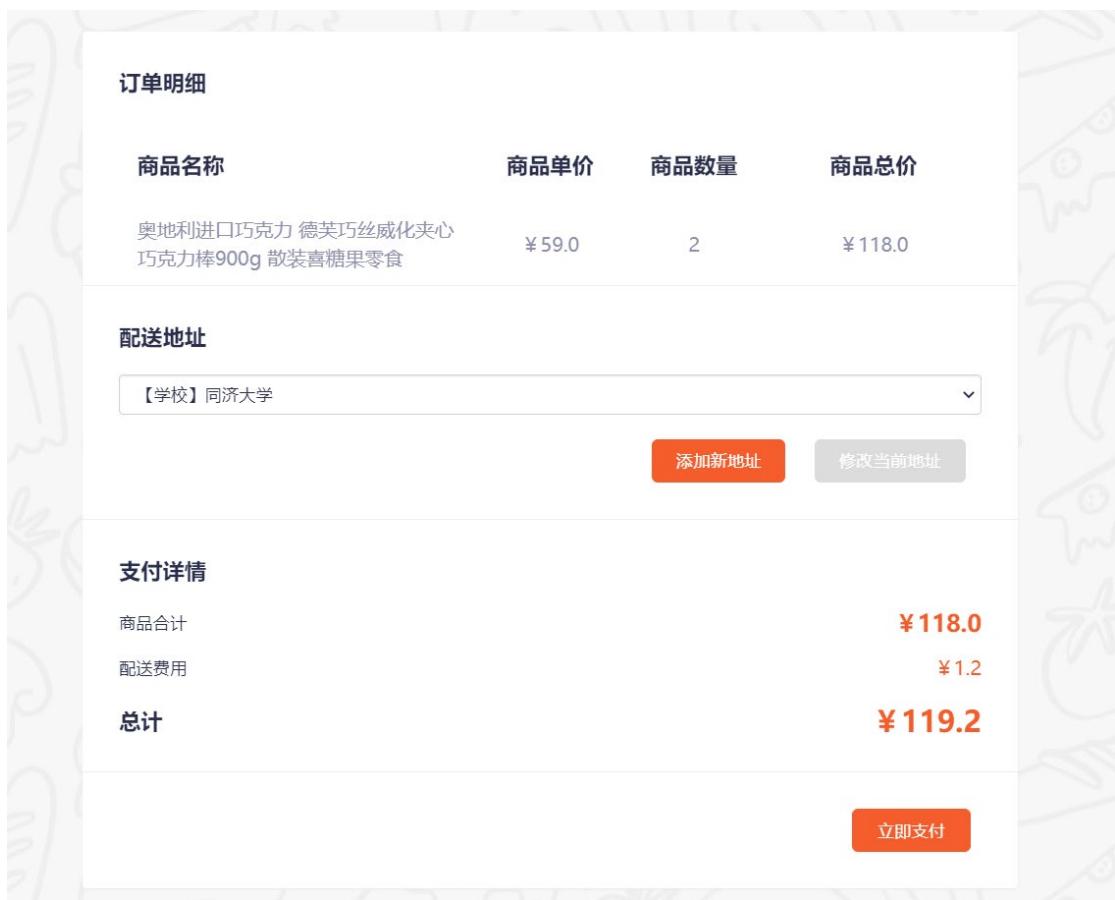


Figure 8.5.1



Figure 8.5.2



Figure 8.5.3

The purchase payment page (Figure 8.5.1) is used to display the list of products that the buyer confirms to purchase. The buyer can select and modify the delivery address on this page, and can perform payment operations after confirming that the purchase amount corresponds to the product. The payment page (Figure 8.5.2) displays the amount that the buyer needs to pay, and the user can make the payment through the two payment methods provided (WeChat and Alipay). Figure 8.5.3 is the display of the payment success page.

8.6 View purchase history

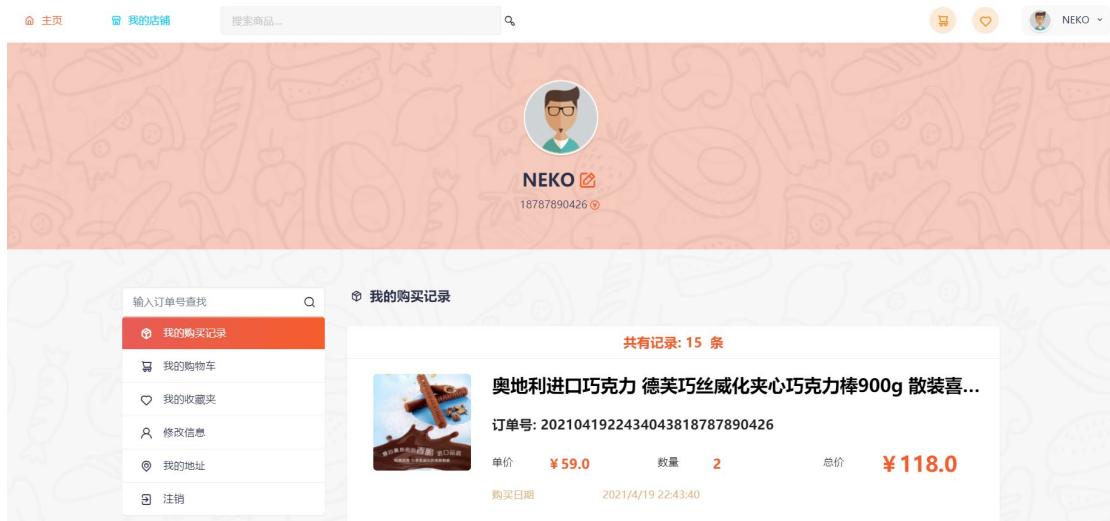


Figure 8.6.1

The View Purchase Record page (Figure 8.6.1) records all purchase records of the buyer. The buyer can view in detail on this page, or enter the order number to filter

9. References

- Kathy, Schwalbe. Information Technology Project Management 6th.
- Robert Hughes et al. Software Project Management. 5th Edition. 2009
- ISO 31000 RISK MANAGEMENT. ISO.
<https://www.iso.org/iso-31000-risk-management.html>
Accessed 13 April 2020.