

Software Project and Process Management

“ICE”—Online Entity Game Store



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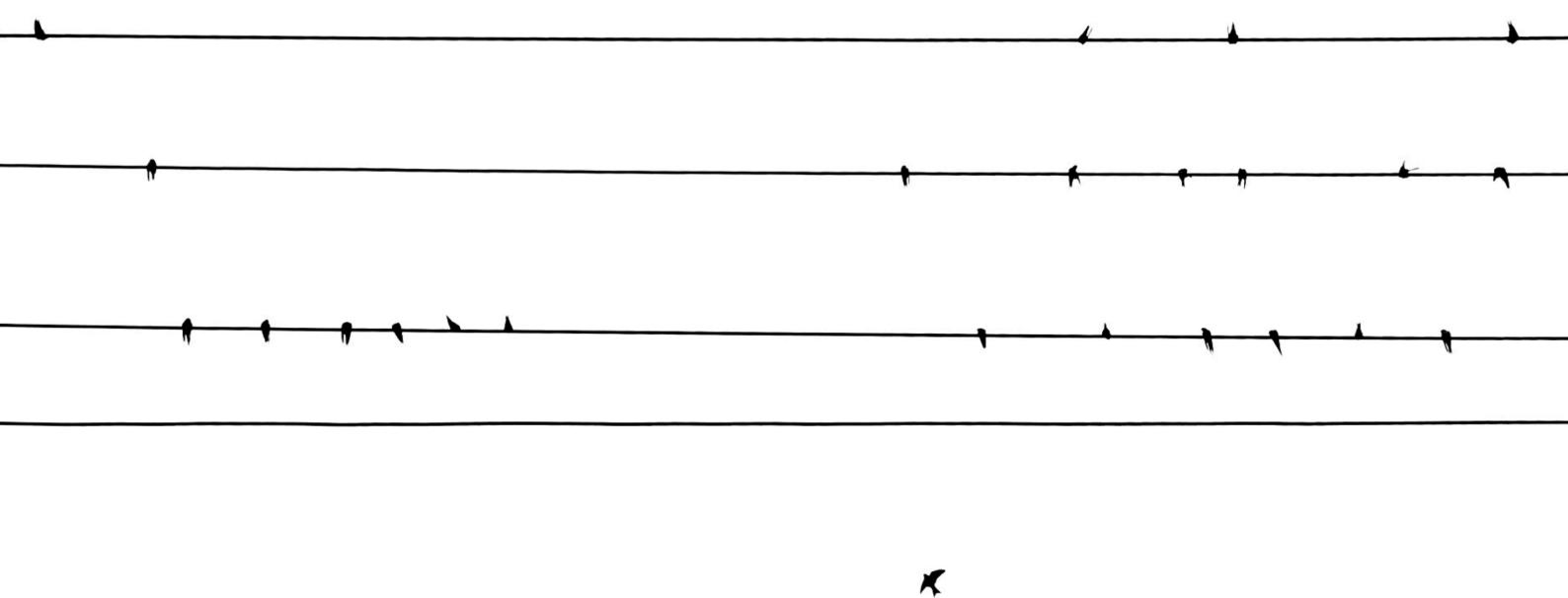
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Part I:

Software Project and Process Management

1. Overview of the project

1.1 General View

1.1.1 Background

With the development of platform like steam and GOG, digital games seem to be the very first choice for computer gamers nowadays. However, gamers of other gaming console still tend to buy entity games for purpose of collecting or others, and this market is still booming with more and more gamers buying game consoles. However, there doesn't exist a comprehensive platform for players to buy entity games of different consoles from different video game companies. So here comes ICE!

ICE is an online store selling entity games from different game companies for gamers owning different gaming consoles. Authorized by the game publishers, we sell only the legal copies and provide an easy access to purchasing entity games. Besides, we encourage players to discuss the game products freely, thus to build a community gathering players from all over the world.

1.1.2 Vision

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

Before the appearance of ICE, the usual way for gamers to buy entity games is buying them on online retailers like Taobao, Amazon, and so on. There are several problems about this. First, most of those entity games sold on those websites are from personal business rather than official, which will cast doubt on the quality of the products. They could be illegal copies or second handed. Additionally, the prices of the products can float because of the lack of official rules, thus chances are that gamers buy a product at a unnecessary high price. Another relative safer way to buy entity games is buying them on the official websites of the games or the publishers. However, it annoys people that they have to create different accounts for varied websites to buy games they want.

As is demonstrated above, there is a vacancy of a comprehensive entity game market where gamers with different game consoles can buy absolute legal copies of the entity games they want and publishers can attract all sorts of gamers to try their games. Actually, ICE can also serve as a community besides a store.

1.1.3 Requirement

Access of the game store for customers 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 customers to search in our system for his or her favorite game and add games to shopping cart or wish list. Gamers with different game consoles can buy all sorts of physical games easily. And what is super significant is that they need to confirm what they buy are legal copies. To ensure that, the system must maintain a gamers forum that all customers could refer to the comments from others before buying the specific game and deliver personal opinions on a product after they purchase the game. When the game is ordered, it is delivered immediately if available in stock, or else, the specific game is ordered to the publisher, and a compatible deadline is informed to the customer.

The system must give publishers a platform to add new games, managing game-related information, and managing orders conveniently. The functions about the information management of games are only belong to the publisher, ordinary users do not have these permissions. Besides, because publishers always look forward to a lower cut of the sale platform, with audience owning all sorts of game consoles and a lower middleman's cut, ICE will provide a suitable share of the profit to fit publishers' demands.

The system must allow a manager to generate reports on bestselling games, and on most profitable customers, as well as suggest games for buying based on past customer's interests. Furthermore the system must have the capability of predicting the sales in order to provide better decision (inventory, reordering products, etc.) with the solid foundation. When an entity game is set to be delivered, the system should be able make a decision of selecting the most economical way to provide that the deadline can be met.

1.1.4 Assumptions

1. No pirate games are stocked or sold.
2. No second-hand games are stocked or sold.
3. No second-hand games are stocked or sold.
4. Marketing manager contract through e-mail rather than the management system.
5. Third-party logistics company contract to deliver all games.
6. Customer service have all mastered relevant knowledge and skills.
7. Customer service are all familiar with how to buy games with the system.
8. Clients pay for their orders with Alipay or Wechat wallet.

1.2 Initiation and Scope Definition

1.2.1 Requirement Management

1.2.1.1 Determination and Negotiation

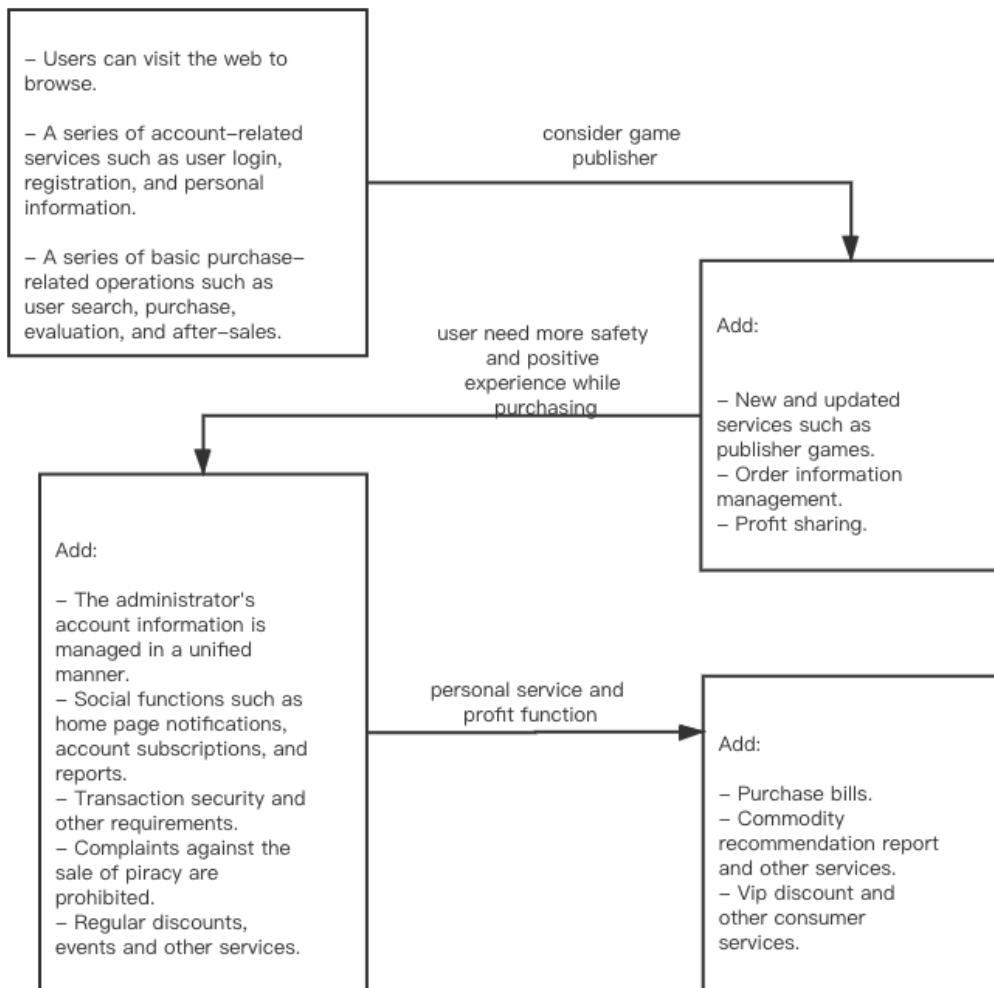
With the development of platforms such as Steam and GOG, today, digital games seem to have become the first choice for computer gamers. However, players of other gaming machines still tend to purchase physical games for collection or other purposes, and as more and more players purchase gaming machines, this market is still booming.

In such a large environment, we decided to create a sales platform specifically for the market, let major game manufacturers sell their products on the platform, users can purchase, evaluate, communicate and other activities on this platform Consultation and game purchase experience.

Therefore, customers must go through the website to access the game store and manage the company. Users can access it via PC or mobile device. The system must allow the customer to search his or her favorite game in our system and add the game to the shopping cart or wish list. The system must provide a platform for publishers to add new games, manage game-related information, and easily manage orders.

1.2.1.2 Review and Revision

Here are the revolution of our requirements.



1.2.2 Feasibility Analysis

1.2.2.1 Functions

- Functions for users
 - The user logs in to ICE.
 - The user searches for games in ICE.
 - The user views game categories in ICE.
 - The user views game consoles in ICE.
 - The user views game publishers in ICE.
 - The user views personal homepage in ICE.

- The user views order information in ICE.
 - The user views shopping cart information in ICE.
 - The user views game details information in ICE.
 - The user purchases game in ICE.
 - The user adds the game to the shopping cart in ICE.
 - The user adds the game to the wish list in ICE.
 - The user modifies personal information in ICE.
 - The user adds delivery address in ICE.
 - The user rates the order in ICE.
- Functions for publishers
 - The publisher logs in to ICE.
 - The publisher views personal information in ICE.
 - The publisher modifies personal information in ICE.
 - The publisher views game list in ICE.
 - The publisher modifies game information in ICE.
 - The publisher removes game in ICE.
 - The publisher adds game in ICE.
 - The publisher views order in ICE.
 - The publisher modifies the order information in ICE.
 - The publisher delivery the game product in ICE.
- Functions for administrators
 - The administrator logs in to ICE.
 - The administrator exits from ICE.
 - The administrator makes announcement in ICE.
 - The administrator manages users' account in ICE.
 - The administrator checks users' comments in ICE.
 - The administrator handles with report informations in ICE.
 - The administrator makes recommend information in ICE.
- Functions for analysts
 - Which entity games are better sold in the second quarter than the first quarter?
 - Which categories of entity games are the most profitable ones?
 - What is the average time between the order placed and shipped?
 - Is there any significant difference between entity games published by different publishers in terms of profitability?
 - Basic "Gamers Persona" for customers visit our website.

1.2.2.2 Constraints

- Customers would pay by credit card, Alipay, or WeChat. All transactions should be secured.
- Access to the system will be available through a web site via PC, mobile devices etc.
- User (Customers) can discuss any games, but ICE only provides entity games from different game companies for gamers owning different gaming consoles.

1.2.2.3 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.
 - Searching according to the specific conditions of number and name during non-peak hours, you can get the search results within 3 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.
 - 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.
 - Can withstand general malicious attacks from the Internet. Such as virus (including Trojan horse) attacks, password guessing attacks, hacking, etc.
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.

1.2.3 Scope

ICE's strategic goals include continuous growth and profitability, as well as increasing awareness and building a platform atmosphere. This project is based on the entity game market. It hopes to attract users' favor with comprehensive and exquisite games, and optimize the work of managers with concise and refined operation methods. It will improve customer performance with excellent early warning and feedback, and gradually create a user online purchase entity games is the preferred platform and provides long-term and

stable services for our buyers and partners. In order to achieve this goal, it is necessary to ensure sufficient game sources, and a certain amount of overhead is allowed in the early stage to increase the popularity of the platform and the complete game purchase experience.

Specific and direct goals are:

1. Meet business needs. ICE 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. ICE needs to respond to some preset scenarios and optimize the management of administrators to improve work efficiency.
3. Improve profitability. ICE 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. ICE is committed to improving the buying experience of buyers, enhancing the visibility of the platform, strengthening the construction of atmosphere, and improving profitability from the side.

2. Planning Management

2.1 Planning Activities

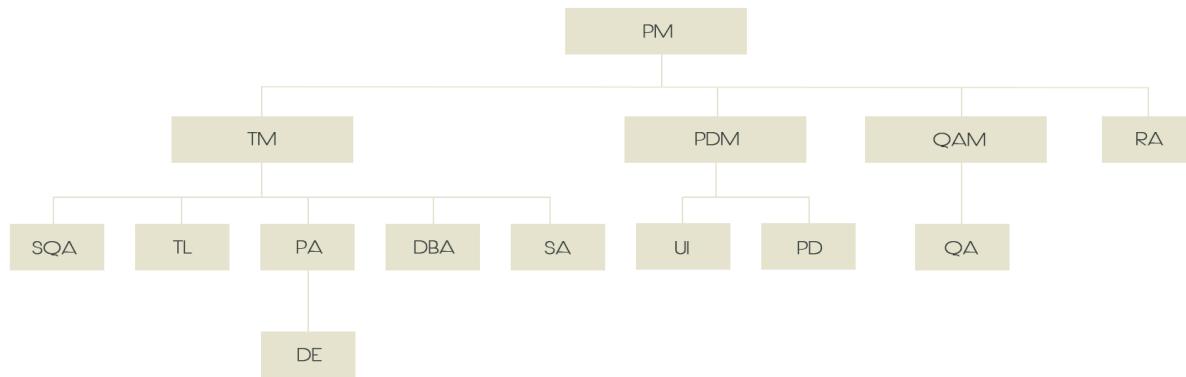
Step	Activity
0 : Select project	ICE: an entity game platform
1 : Identify project scope and objectives 1.1 Identify objectives and measures of effectiveness 1.2 Establish authority 1.3 Identify stakeholders 1.4 Modify objectives in the light of stake holder analysis 1.5 Establish methods of communication	<ul style="list-style-type: none">- 1.1: Objectview- 1.2: The project authority is controlled by the project steering committee, and is particularly responsible for setting, monitoring and revising the goals. At present, this work is performed by three people in our group.- 1.3: Stakeholders: Project staff; people outside the project in the same organization, like communication personnel; persons outside the organization game purchasers, game manufacturers.- 1.4: Review and Revision- 1.5: Communication Style
2 : Identify project infrastructure 2.1 Establish relationship between project and strategic planning 2.2 Identify installation standards and procedures 2.3 Identify project team organization	<ul style="list-style-type: none">- 2.1: Need to decide in what order to execute these projects, need to establish a framework to accommodate the new system, such as hardware and software standards.- 2.2: There should be standards for change control and configuration management; there may be provisions for quality checks at every point in the project life cycle; there should also be a measurement procedure to control the data that must be collected at each stage; the project manager should be aware of any relevant projects Planning and control standards.- 2.3: The person in charge of a large project may need to control the organizational structure of the project team. While our team has very simple Team Structure.
3 : Analyse project characteristics 3.1 Objective- or product-driven 3.2 Analyze other project characteristics 3.3 Identify high-level project risk 3.4 Take into account user requirements concerning implementation 3.5 Select general life-cycle approach 3.6 Review overall resource estimates	<ul style="list-style-type: none">- 3.1: Mostly product-driven.- 3.2: Features- 3.3: Assess the risk level of all projects, make risk prioritization and focus on high-risk projects- 3.4: Customers sometimes have their own regulatory requirements. Some of them in Requirement.- 3.5 Development method and life cycle method: Scrum Process Model- 3.6 Identifying Resource Requirements for all projects, and consider the project's personnel allocation and other issues

<p>4 : Identify project products and activities</p> <p>4.1 Identify and describe project products 4.2 Document generic product flows 4.3 Recognize product instances 4.4 Produce ideal activity network 4.5 Modify ideal to take into account need for stages and checkpoints</p>	<ul style="list-style-type: none"> - 4.1: Identifying all the items to be created by the project helps to ensure that all activities that need to be performed have been considered. Including deliverables, intermediate products, etc., including both technical products and products related to project management and quality. These products have their own hierarchical structure, which can be represented by Product Breakdown Structure. - 4.2: Determine the order in which products are created or used through the Product Flow Diagram - 4.3: When the same common PFD fragment is related to multiple instances of a particular type of product, tries to identify each instance. - 4.4: The ideal activity web with sufficient resources. - 4.5: Introduce checkpoint activity to modify activity network.
<p>5 : Estimate effort for each activity</p> <p>5.1 Carry out bottom-up estimates 5.2 Revise plan to create controllable activities</p>	<ul style="list-style-type: none"> - 5.1: Estimate the amount of staff work required for each activity, possible time consumption, and required non-human resources with Network Plan - 5.2: Activities that take a long time to split, activities that take a short time to merge. Set the time span of the activity to be the same as the reporting period used to monitor and control the project.
<p>6 : Identify out bottom-up estimates</p> <p>6.1 Identify and quantify activity-based risks 6.2 Plan risk reduction and contingency measures where appropriate 6.3 Adjust plans and estimates to take account of risks</p>	<ul style="list-style-type: none"> - 6.1: Review each activity and estimate their risk of success. - 6.2: Some identified risks can be avoided or at least reduced. If there is a risk, the emergency plan specifies the actions to be taken. - 6.3: May change the plan, or add some new activities to reduce risk.
<p>7 : Allocate resources</p> <p>7.1 Identify and allocate resources 7.2 Revise plans and estimates to take account of resource constraints</p>	<ul style="list-style-type: none"> - 7.1: Record the type of employees required for each activity, identify the employees available for the project, and temporarily assign to these projects. - 7.2: Establish priorities for tasks to ensure the completion of key tasks; ensure the full work and high utilization rate of available personnel, presented using Gantt charts.
<p>8 : Review/ publicize plan</p>	<ul style="list-style-type: none"> - 8.1: When each task is completed, determine whether the task can be ended by determining good quality criteria. - 8.2: Document the plan carefully so that the various departments of the project understand the plan and agree to commit to the plan.
<p>9/10 : Execute plan/ lower levels of planning & May require the reiteration of lower level planning</p>	<p>Once the project starts, it is necessary to make a more detailed plan for each phase that is about to begin, and let go of the detailed planning for the subsequent phases.</p>

2.2 Project Organization

2.2.1 Team Structure

There is the organization of our development team. Each manager is responsible for his or her department, report their work and progress to the project manager. The project manager will charge the whole our and make sure the project is under control. The product manager will join in the development process to guarantee that the project meets the requirements and take charge of the later popularizing of the bookstore website.



2.2.2 Roles, Responsibilities and Authority

Every one in our team has a specific responsibility, and the following table shows each of the member's respective responsibility:

Roles	Name	Responsibility
Project Manager	Zhe Zhang	Take full responsibility for the entire project, monitor development progress, make decision on risk control and resource provision, and ensure software quality
Requirements Analyst	Di Bu	Responsible for communicating requirements with customers, assisting project manager to control and follow up requirement change
Product Architect	Kaixin Chen, Sion	Responsible for the design of the software part of the system structure and model, develop the software development plan, determine the software technology selection
Product Design Manager	Rudi	Responsible for monitoring project functional requirements and product design, as well as product functional design and interaction design
Product Designer	Auston	Responsible for the collection and analysis of needs, product design and interaction design
User Interface Designer	Marica	Responsible for prototype design and user experience design
Technical Manager	Sakura	Responsible for system function module coding implementation and correction test feedback product defects

Team Leader	Iwan, Eren	Responsible for management of the development team and monitoring the progress of the project
Development Engineer	Rina, Barkley, Gaia, Tyler	Responsible for system function module coding implementation and correction test feedback product defects
Quality Assurance Manager	Ozzy	Responsible for test plan, and the whole quality assurance activities of the project
Quality Assurance	Cindy, Lily, Zoe	Responsible for test cases design, test execution and evaluation of the test execution process, as well as evaluate test results and document defects found
System Administrator	Lie	Responsible for deployment of software products, completion of project related system engineering work, and customer technical support
Software Quality Assurance	Lucia	Responsible for supervising the process planning and implementation of the project, checking the products produced by the project, and checking the conformity of the project development process
Database Administrator	Liv	Responsible for designing and constructing database system and optimizing database perfo

2.2.3 Communication Style

Communicate in the team through the following collaborative communication methods:

1. Formal, non-personal methods such as software engineering documents and project products, memos, schedules and project control tools, change requests, etc .;
2. Formal, person-to-person communication, focusing on quality assurance, such as status review meetings, design, and code inspection;
3. Informal, person-to-person communication, such as group meetings to exchange information and solve problems;
4. E-mail, mainly to communicate with people outside the project such as instructors and certain technical personnel

2.3 Software Project Planning

2.3.1 WBS

According to the software engineering methodology, we divide the overall system development into six main processes: requirements analysis, outline design, detailed design, coding, testing, and deployment, and then decompose the six major processes respectively.

For demand analysis, it is mainly divided into four parts: demand collection, demand communication, demand analysis and demand confirmation.

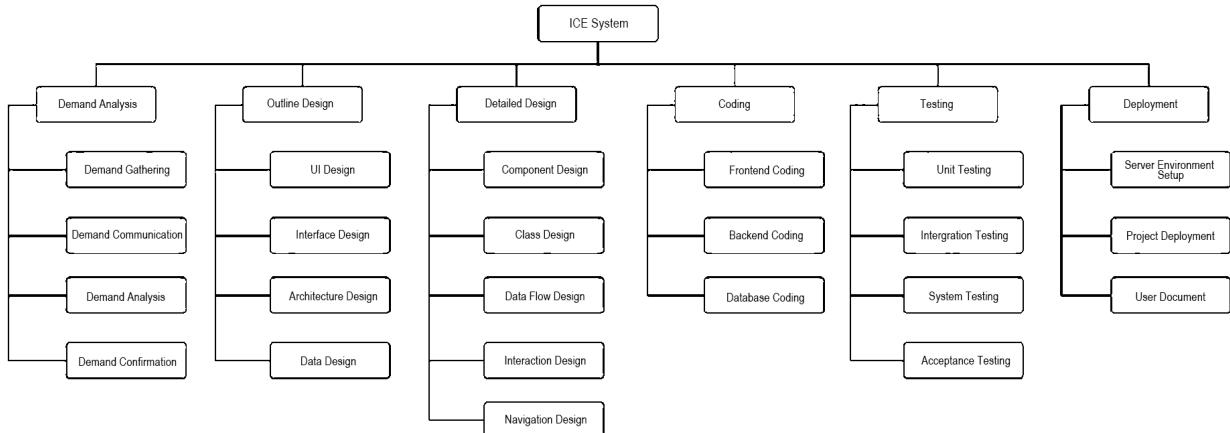
In the outline design stage, we mainly complete the interface design, interface design, architecture design, database design and other contents.

The detailed design stage is subdivided into module design, class design, data flow design, interaction design, and navigation design.

The coding is split into front-end coding, back-end coding and database implementation.

Testing is divided into unit testing, integration testing, system testing and acceptance testing based on software testing theory.

Finally, we configure the server environment for the deployment phase, project deployment and user documentation.

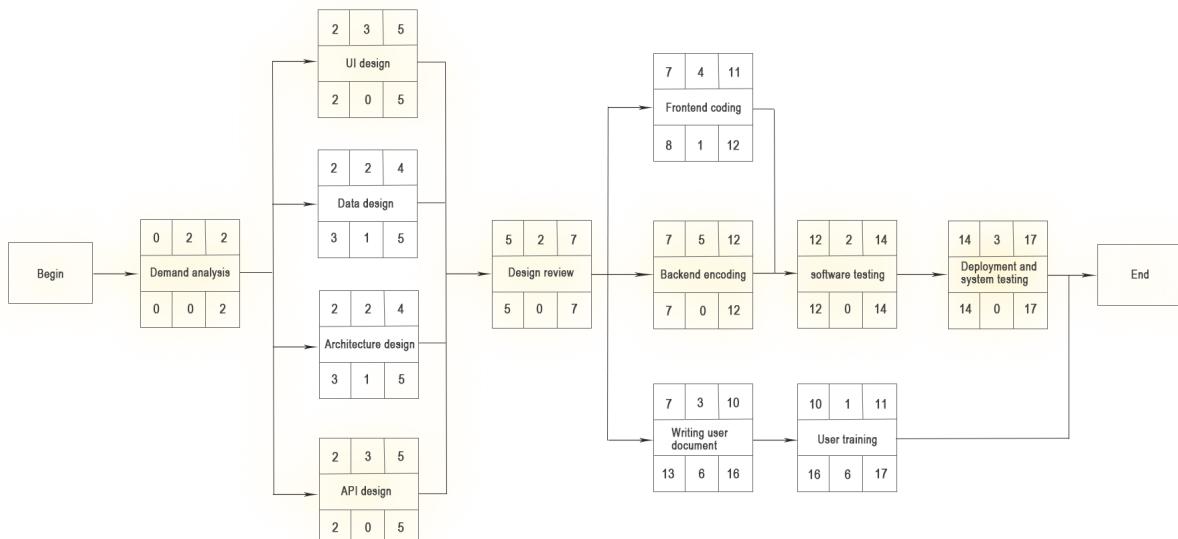


2.3.2 Network Plan & Critical Path

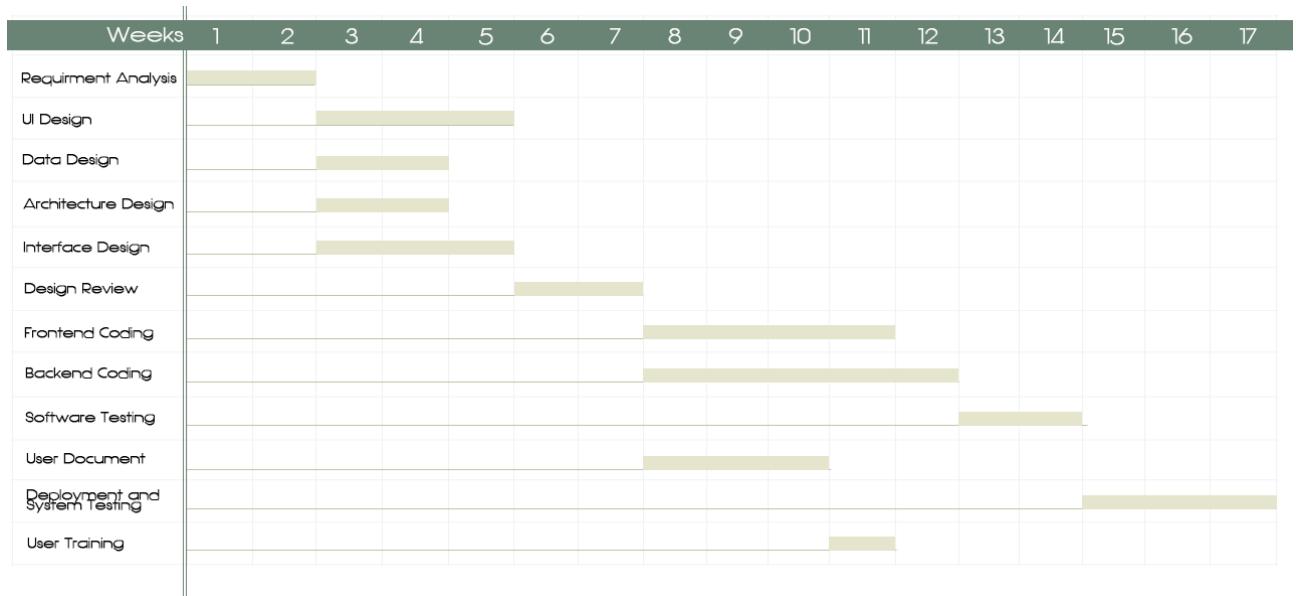
The project uses an activity-based approach to identify activities, divides the project into the main life cycle stages, considers the activities of each stage and its activity cycle separately, and analyzes the pre-activities of individual activities to obtain the following activity list :

No	Activity	Estimated Duration (Weeks)	Depends on
A	Requirement Analysis	2	
B	UI Design	3	A
C	Data Design	2	A
D	Architecture Design	2	A
E	Interface Design	3	A
F	Design Review	2	B, C, D, E
G	Frontend Coding	4	F
H	Backend Coding	5	F
I	Software Testing	2	G, H
J	User Document	3	F
K	Deployment and System Testing	3	I
L	User Training	1	J

Network plan is like below, with the yellow background highlights the **Critical Path** :



Relative Gantt chart:



3. Business Case

3.1. Executive Summary

3.1.1 Brief description of the problem or opportunity

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

Opportunity: If we can ensure sufficient communication with manufacturers and users, and adjust the problems in the early stage of the platform in a timely manner, the transaction model will become more standardized and safe. With a distinctive sales style, in the subsequent development, we can strive to create a platform atmosphere, guide a platform culture, and give users a greater sense of belonging, so as to have a solid foundation for future development.

3.1.2 Brief description of organization's goal and strategy

ICE's strategic goals include continuous growth and profitability, as well as increasing awareness and building a platform atmosphere. This project is based on the entity game market. It hopes to attract users' favor with comprehensive and exquisite games, and optimize the work of managers with concise and refined operation methods. It will improve customer performance with excellent early warning and feedback, and gradually create a user online purchase entity games is the preferred platform and provides long-term and stable services for our buyers and partners. In order to achieve this goal, it is necessary to ensure sufficient game sources, and a certain amount of overhead is allowed in the early stage to increase the popularity of the platform and the complete game purchase experience.

Specific and direct goals are:

5. Meet business needs. ICE 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.
6. Improve work efficiency. ICE needs to respond to some preset scenarios and optimize the management of administrators to improve work efficiency.
7. Improve profitability. ICE needs to complete the summary of sales reports, inventory information, etc., so that administrators can adjust business strategies in time to obtain greater profits.
8. Enhance corporate brand. ICE is committed to improving the buying experience of buyers, enhancing the visibility of the platform, strengthening the construction of atmosphere, and improving profitability from the side.

3.1.3 Brief 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	Within 3 months 65 percent of our customers will visit our website at least once a week.
Strategic	We will develop and manufacture an exclusive flagship game by April 1 next year, and its price is \$ 20 lower than the most popular games of its competitors.
Financial	By the end of the next quarter, our game sales growth will increase from 3% to 6%.
Operational	By the end of this fiscal year, our inventory turnover rate has increased by 15%.
Social	The number of accidents in our platform will be reduced to zero next year.

How it ties to the organizational goal and strategy:

Our customized MOV can help us get a group of stable and loyal customers, which will ensure the long-term profitability of our platform, and also increase the popularity of the platform and enhance the brand charm.

The MOVs we have formulated in terms of strategy can help us to be more competitive in business and require the introduction of better talents to improve the work efficiency and profitability of the platform.

The MOV we set up in finance can help us increase the sales of games, which is an important way to increase the profitability of the platform and an effective means to obtain sufficient funds to support the long-term development of the platform.

The MOV we have formulated in terms of operations can help us better improve our logistics capabilities, and a more flexible inventory turnover can allow customers to receive purchased games earlier, which not only improves our work efficiency, but also facilitates the building of corporate brands.

The MOV that we have formulated in the social field can ensure that the operation of our platform conforms to the specifications, and the safety of property information of employees and users can be effectively guaranteed, which also has a great help in the promotion of our corporate brand.

3.1.4 Brief description of each option or alternative analyzed

1. Do nothing. The business is doing well, and we can continue to operate without this new project.
2. Adopting or adapting an application developed by a different area or department within the organization.
3. Reengineering the existing system.
4. Purchasing an off-the-shelf application package from a software vendor.
5. Custom building a new application using internal resources or outsourcing the development to another company.
6. Design and implement the new intranet capabilities in-house using mostly existing hardware and software.

3.1.5 Brief explanation of which alternative is being recommended and why

Design and implement the new intranet capabilities in-house using mostly existing hardware and software maybe the best option. On the one hand, the full use of existing hardware and software can control the development cost, on the other hand, if redesign and complete outsourcing, the progress and quality of development is difficult to be guaranteed. The purchase of off-the-shelf application packages not only requires a lot of docking work, but will also be a great expense.

3.2 Introduction

3.2.1 Background

ICE is an online store selling entity games from different game companies for gamers owning different gaming consoles. Authorized by the game publishers, we sell only the legal copies and provide an easy access to purchasing entity games. With the development of platform like steam and GOG, digital games seem to be the very first choice for computer gamers nowadays. However, gamers of other gaming console still tend to buy entity games for purpose of collecting or others, and this market is still booming with more and more gamers buying game consoles. However, there doesn't exist a comprehensive platform for players to buy entity games of different consoles from different video game companies. We believe that ICE can also become a community gathering players from all over the world where they can discuss the game products freely.

3.2.2 Current situation

ICE is based on the web platform. Allow a customer to search his or her favorite game in our system and add the game to a shopping cart or wish list. Gamers with different consoles can easily purchase a variety of physics games. Most importantly, they need to confirm that they purchased a legal copy. At the same time, a platform must be provided for publishers to add new games, manage game-related information, and easily manage orders. The game information management function belongs only to the publisher, and ordinary users do not have these permissions. The system must allow managers to generate reports on best-selling games and the most profitable customers, and suggest games to buy based on past customer interests. ICE will hire experienced information management and analysts to manage the various data generated by a game sales platform.

3.2.3 Description of the problem or opportunity

Question: In the early stages of platform development, there needs to be enough game content for players to choose. This requires us to conduct accurate research on the game styles that players love. In order to ensure the maximum initial benefits, we need to work with game manufacturers Communicate to make the released games have good sales. At the same time, please ensure that the transaction content is a legal copy. The games sold on the platform must meet the standards. The game content must be reviewed to ensure that it meets the legal requirements before it can be placed on the transaction. Exemplary role. In the transitional stage of the development of the website platform, the transaction volume increases and the transaction content increases. At this time, we need to pay attention to efforts. We must strengthen the standardization and security of platform transactions, ensure the safety of the reputation of users and game manufacturers, and ensure the platform The reliability and stability of the trading model, at the same time, we must pay attention to the creation of the platform atmosphere, and create a community culture of physical games, which is both an opportunity and a challenge.

Opportunity: If we can ensure full communication with manufacturers and users, and solve problems in a timely manner in the early stages of the platform, the game styles sold by the platform will be more popular, and it will help to establish a good reputation early and attract users quickly. Amplify. If we can make enough achievements in the security of platform transactions, then the transaction model will become more standardized and safe, which will also help our credibility to further improve. With a unique sales style, in the subsequent development, we can strive to create a platform atmosphere, guide the platform culture, give users a greater sense of belonging, and lay a solid foundation for future development.

3.2.4 Project's measurable organizational value

MOV:

Area of Impact	The project will be successful if ...
Customer	Within 3 months 65 percent of our customers will visit our website at least once a week.
Strategic	We will develop and manufacture an exclusive flagship game by April 1 next year, and its price is \$ 20 lower than the most popular games of its competitors.
Financial	By the end of the next quarter, our game sales growth will increase from 3% to 6%.
Operational	By the end of this fiscal year, our inventory turnover rate has increased by 15%.
Social	The number of accidents in our platform will be reduced to zero next year.

3.2.5 How achieving the project's MOV will support the organization's goal and strategy

Our customized MOV can help us get a group of stable and loyal customers, which will ensure the long-term profitability of our platform, and also increase the popularity of the platform and enhance the brand charm.

The MOVs we have formulated in terms of strategy can help us to be more competitive in business and require the introduction of better talents to improve the work efficiency and profitability of the platform.

The MOV we set up in finance can help us increase the sales of games, which is an important way to increase the profitability of the platform and an effective means to obtain sufficient funds to support the long-term development of the platform.

The MOV we have formulated in terms of operations can help us better improve our logistics capabilities, and a more flexible inventory turnover can allow customers to receive purchased games earlier, which not only improves our work efficiency, but also facilitates the building of corporate brands.

The MOV that we have formulated in the social field can ensure that the operation of our platform conforms to the specifications, and the safety of property information of employees and users can be effectively guaranteed, which also has a great help in the promotion of our corporate brand.

3.2.6 Objectives of writing this business case

1. Thorough in detailing all possible impacts, costs, and benefits.
2. Clear and logical in comparing the cost/benefit impact of each alternative.
3. Objective through including all pertinent information.
4. Systematic in terms of summarizing the findings.

3.3 Alternatives

1. Description of alternative 1

Do nothing. The business is doing well, and we can continue to operate without this new project.

2. Description of alternative 2

Adopting or adapting an application developed by a different area or department within the organization.

3. Description of alternative 3

Reengineering the existing system.

4. Description of alternative 4

Purchasing an off-the-shelf application package from a software vendor.

5. Description of alternative 5

Custom building a new application using internal resources or outsourcing the development to another company.

6. Description of alternative 6

Design and implement the new intranet capabilities in-house using mostly existing hardware and software.

3.4 Analysis of Alternatives

3.4.1 Methodology of how alternatives will be analyzed

Data collection methods

1. Stakeholder suggestions: We need to respect the opinions of stakeholders in major decisions that affect the effectiveness of the project, 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 value 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 explanation why they are relevant

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.

3.4.2 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

3.4.3 Proposed recommendation

It is best to use most existing hardware and software to design and implement new intranet functions internally. In economic considerations, this method will not cause too much overhead, and the direct purchase of external software packages will greatly increase development costs. In terms of technology, this method will not have too high technical requirements, unlike redesigning the system will have a great demand for manpower and material resources. In terms of organization, this method can independently complete the work internally, and will not rely on other departments to cause delays in the progress of other projects. From the perspective of sensitivity, this method is in line with the routine and will not cause commercial sensitivity. From a risk perspective, the risk of this approach is low, and it will not be difficult to control and guarantee the quality and schedule like product outsourcing.

4. Project Charter

4.1 Project Name or Identification

This project will implement a entity game sales platform, we named it ICE. Steam is a well-known online game sales platform, and ICE means "entity" steam, which is an online entity game sales platform.

4.2 Project Stakeholders

Name	Role	Position	Phone numbers	E-mail address
Zhe Zhang	Sponsor	ICE, CEO	15216805515	doubleZ0108@163.com
Zhe Zhang	Project Manager	ICE, manager	15216805515	doubleZ0108@163.com
Di Bu	Requirements Developer	ICE, requirement developer	17717924664	997219957@qq.com
Zhe Zhang	Risk Manager	ICE, risk manager	15216805515	doubleZ0108@163.com
Kaixin Chen	Quality Assurance	ICE, quality assurance manager	15316172513	1536768420@qq.com
Zhe Zhang	Developer	ICE, IT department	15216805515	doubleZ0108@163.com
Di Bu	Developer	ICE, IT department	17717924664	997219957@qq.com
Kaixin Chen	Developer	ICE, IT department	15316172513	1536768420@qq.com
Di Bu	Team Member	ICE, consultant	17717924664	997219957@qq.com
Kaixin Chen	Team Member	ICE, consultant	15316172513	1536768420@qq.com
Prof. Huang	Advisor	Client Representative	—	huangjie@tongji.edu.cn

4.3 Project Description

4.3.1 Background

With the development of platform like steam and GOG, digital games seem to be the very first choice for computer gamers nowadays. However, gamers of other gaming console still tend to buy entity games for purpose of collecting or others, and this market is still booming with more and more gamers buying game consoles. However, there doesn't exist a comprehensive platform for players to buy entity games of different consoles from different video game companies. So here comes ICE!

ICE is an online store selling entity games from different game companies for gamers owning different gaming consoles. Authorized by the game publishers, we sell only the legal copies and provide an easy access to purchasing entity games. Besides, we encourage players to discuss the game products freely, thus to build a community gathering players from all over the world.

4.3.2 Description of the challenge or opportunity

Challenge: In the early stages of platform development, there needs to be enough game content for players to choose. This requires us to conduct accurate research on the game styles that players love. In order to ensure the maximum initial benefits, we need to work with game manufacturers Communicate to make the released games have good sales. At the same time, please ensure that the transaction content is a legal copy. The games sold on the platform must meet the standards. The game content must be reviewed to ensure that it meets the legal requirements before it can be placed on the transaction. Exemplary role. In the transitional stage of the development of the website platform, the transaction volume increases and the transaction content increases. At this time, we need to pay attention to efforts. We must strengthen the standardization and security of platform transactions, ensure the safety of the reputation of users and game manufacturers, and ensure the platform The reliability and stability of the trading model, at the same time, we must pay attention to the creation of the platform atmosphere, and create a community culture of physical games, which is both an opportunity and a challenge.

Opportunity: If we can ensure full communication with manufacturers and users, and solve problems in a timely manner in the early stages of the platform, the game styles sold by the platform will be more popular, and it will help to establish a good reputation early and attract users quickly. Amplify. If we can make enough achievements in the security of platform transactions, then the transaction model will become more standardized and safe, which will also help our credibility to further improve. With a unique sales style, in the subsequent development, we can strive to create a platform atmosphere, guide the platform culture, give users a greater sense of belonging, and lay a solid foundation for future development.

4.3.3 Overview of the desired impact

ICE's strategic goals include continuous growth and profitability, as well as increasing awareness and building a platform atmosphere. This project is based on the entity game market. It hopes to attract users' favor with comprehensive and exquisite games, and optimize the work of managers with concise and refined operation methods. It will improve customer performance with excellent early warning and feedback, and gradually create a user online purchase entity games is the preferred platform and provides long-term and stable services for our buyers and partners. In order to achieve this goal, it is necessary to ensure sufficient game sources, and a certain amount of overhead is allowed in the early stage to increase the popularity of the platform and the complete game purchase experience.

4.4 Measurable Organizational Value (MOV)

Area of Impact	The project will be successful if ...
Customer	Within 3 months 65 percent of our customers will visit our website at least once a week.
Strategic	We will develop and manufacture an exclusive flagship game by April 1 next year, and its price is \$ 20 lower than the most popular games of its competitors.
Financial	By the end of the next quarter, our game sales growth will increase from 3% to 6%.
Operational	By the end of this fiscal year, our inventory turnover rate has increased by 15%.
Social	The number of accidents in our platform will be reduced to zero next year.

4.5 Project Scope

4.5.1 What will be included in the scope of this project

Access of the game store for customers 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 customers to search in our system for his or her favorite game and add games to shopping cart or wish list. Gamers with different game consoles can buy all sorts of physical games easily. And what is super significant is that they need to confirm what they buy are legal copies. To ensure that, the system must maintenance a gamers forum that all customers could refer to the comments from others before buying the specific game and delivery personal opinions on a product after they purchase the game. When the game is ordered, it is delivered immediately if available in stock, or else, the specific game is ordered to the publisher, and a compatible deadline is informed to the customer.

The system must give publishers a platform to add new games, managing game-related information, and managing orders conveniently. The functions about the information management of games are only belong to the publisher, ordinary users do not have these permissions. Besides, because publishers always look forward to a lower cut of the sale platform, with audience owning all sorts of game consoles and a lower middleman's cut, ICE will provide a suitable share of the profit to fit publishers' demands.

The system must allow a manager to generate reports on bestselling games, and on most profitable customers, as well as suggest games for buying based on past customer's interests. Furthermore the system must have the capability of predicting the sales in order to provide better decision (inventory, reordering products, etc.) with the solid foundation. When a entity game is set to be delivered, the system should be able make a decision of selecting the most economical way provide that the deadline can be met.

4.5.2 What will be considered outside the scope of this project

Logistics inquiry : In this project, after the transaction between the buyer and the merchant is completed, only the logistics order number is provided to the buyer after the logistics is issued, and no real-time detailed logistics query is provided. The user can query the logistics information through the logistics order number as needed.

Friends: This project does not provide a friend function. Each user exists as a separate buyer, but different users can exchange information about products through forum.

Live broadcast: This project does not support users to set up a live game broadcast function on the platform. For the introduction of game content, we support the display in the details page in the form of pictures and videos.

Hardware: This project only provides sales channels for entity games, and does not allow other hardware products to be sold on the platform.

4.6 Project Schedule Summary

Project start date: April 12.

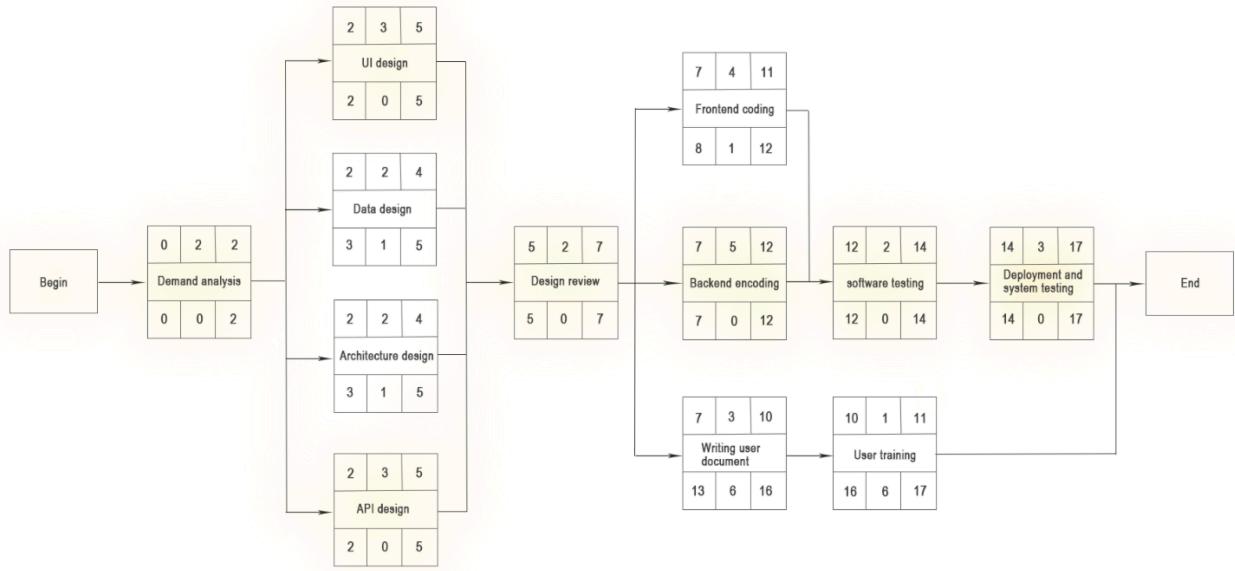
Project end date May 4.

4.6.1 Timeline of project phases and milestones

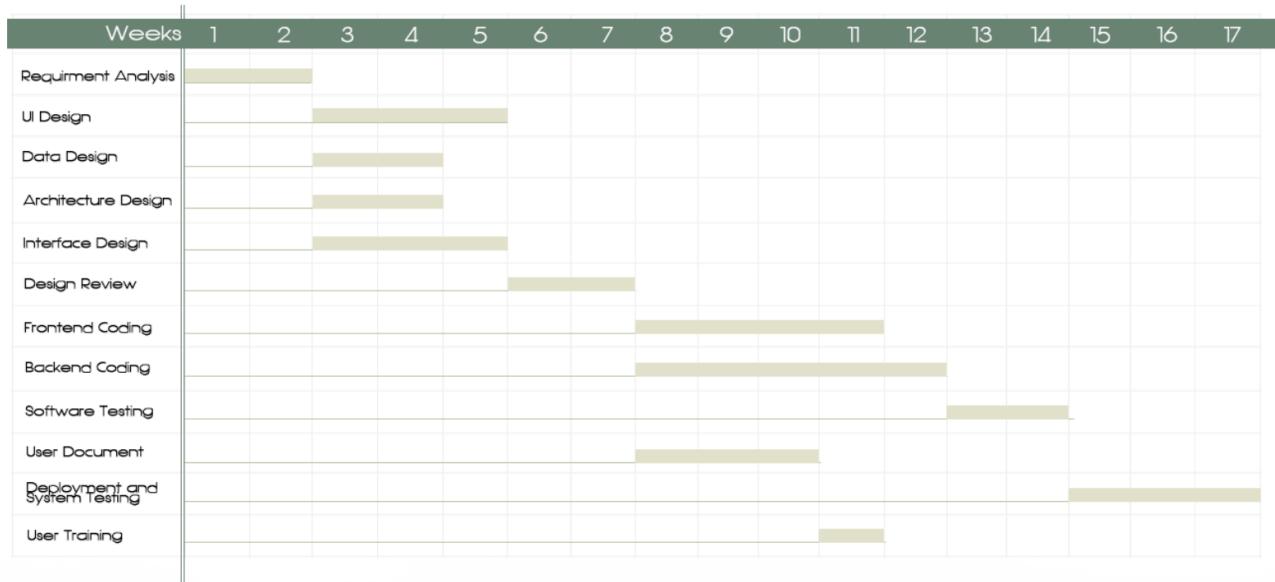
The project uses an activity-based approach to identify activities, divides the project into the main life cycle stages, considers the activities of each stage and its activity cycle separately, and analyzes the pre-activities of individual activities to obtain the following activity list :

No.	Activity	Estimated Duration (Weeks)	Depends on
A	Requirement Analysis	2	
B	UI Design	3	A
C	Data Design	2	A
D	Architecture Design	2	A
E	Interface Design	3	A
F	Design Review	2	B, C, D, E
G	Frontend Coding	4	F
H	Backend Coding	5	F
I	Software Testing	2	G, H
J	User Document	3	F
K	Deployment and System Testing	3	I
L	User Training	1	J

Network plan is like below, with the yellow background highlights the **Critical Path** :



Relative Gantt chart:



4.6.2 Project review and review dates

We will deliver the project on May 4th, and the main results include the official game sales platform and the merchant back-end management platform. Their specific details will be described in relevant documents.

4.7 Quality Issues

4.7.1 Specific quality requirements

Software engineering documents need to comply with IEEE standards

Code writing needs to comply with code specification standards

The project summary report needs to meet the reference textbook standard

4.8 Resources Required

Resource	Name of resource provider	Date to be provided
People	Our development team	April 12
Technology	Our development team	April 12
Facilities	Our development team	April 12
Meeting room	Zhe Zhang	April 12
Document specifications	Prof.Huang	April 12

4.9 Assumptions and Risks

As this project is a separate course project with smaller specifications, there is no high degree of technical dependence and dependence on other projects, and the project has little impact on different areas of the organization. Therefore, in this module, we do not use the classic risk assessment method for large software projects, but design our own risk assessment for this course project.

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:

No.	Risk	Risk reduction techniques
R1	Team members did not communicate well	Agree on the way of communication; Regular communication of work progress; The minutes of the meeting
R2	Technology adopted is flawed	Use familiar technology; Specially-assigned person to study the new technology needed
R3	Project management structure is not clear	Formulate the management structure; Special personnel to maintain the management structure
R4	Code integration issues	Convention code specification; Incremental development and integration
R5	Personnel changes	More than one person participated in the core work of the project in order to familiar with the project process
R6	Implementation tools do not meet the requirements	Early implementation of the sources of tools; Look for alternative tools
R7	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
R8	System quality and performance risks	More exchange of work results; Inspection and review; Using performance test

4.10 Project Administration

1. Communications plan

Continuously update the project report during the process of the project, compare the expected progress with the actual progress in the form of burn down charts, etc., and hold regular meetings with stakeholders to discuss the project.

2. Scope management plan

Continuously update the progress during the project. If there are changes that are different from the expected plan, upload to git and notify in time to ensure that the development team is always clear about the scope of the project. You can also submit, record and view the scope management through git

3. Quality management plan

During the project process, the project is divided into relatively independent small modules. After each module is completed, special module test work is designed to ensure the quality of the project in progress, and to avoid hidden risks in the project due to early vulnerabilities. Testing and correction can fully guarantee the quality of the project

4.11 Acceptance and Approval

Name: Zhe Zhang, Kaixin, Chen, Di Bu

Signature:



Dates for approval: May 4.

4.12 Terminology or Glossary

No.	Terminology	Explanation
1	Customer	People shopping on this electronic shopping platform
2	Publisher	Provider of entity game sources in the system
3	Sales manager	One of the administrator users, execute sales-related decisions and operations in the system
4	Customer service	Online employees who provide users with after-sales, recommendation and other services in the system
5	Logistics manager	Responsible for shipping docking with the publisher, warehouse management and logistics outsourcing
6	Financial Statements	Organize and count the financial status of the bookstore's income and expenditure over a period of time, and display it visually, mainly to provide financial analysis basis for financial managers.
7	Forum	A platform for users to exchange experiences
8	General functions	Features that will be used by all users of the system
9	W3C standard	That is the World Wide Web Consortium standard, it is not a certain standard, but a collection of standards. The web is mainly composed of three parts: structure, presentation, behavior.

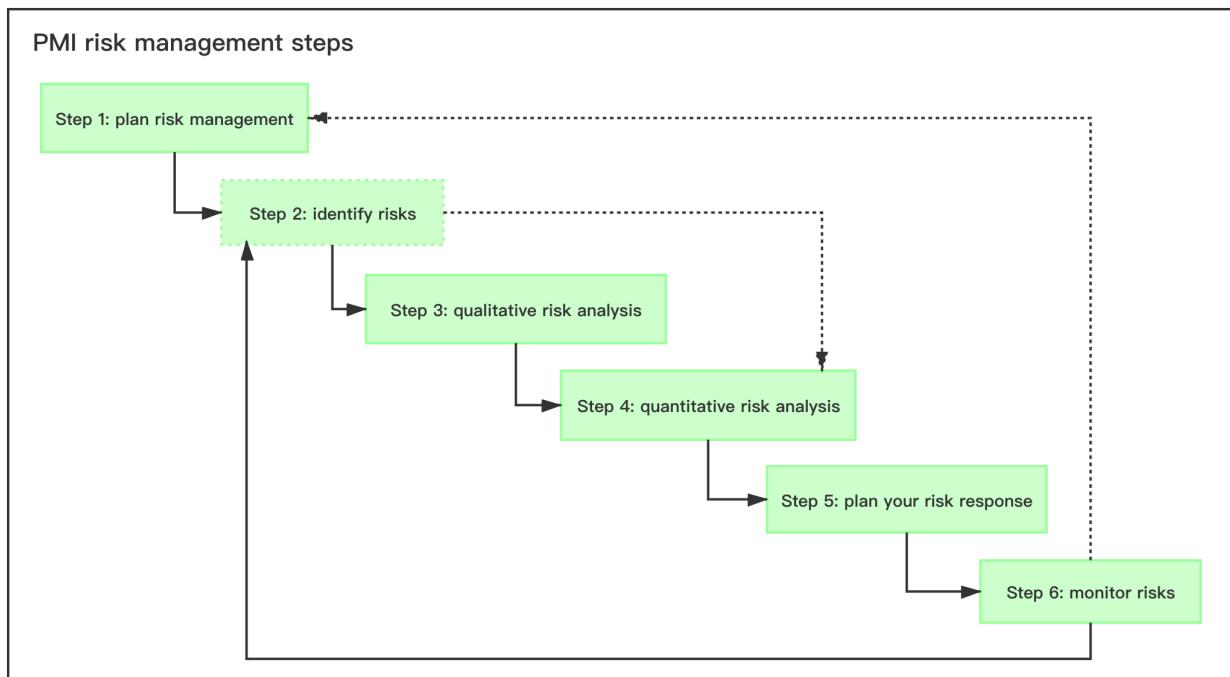
5. Risk Management

5.1 Risk Management Plan

According to Project Management Institute(**PMI**) risk management steps, our group make risk management plan firstly. And then we identify risks from 4 parts, qualitative risk analysis, quantitative risk analysis. Every effort will be made to proactively identify risks ahead of time in order to implement a mitigation strategy from the project's onset.

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.

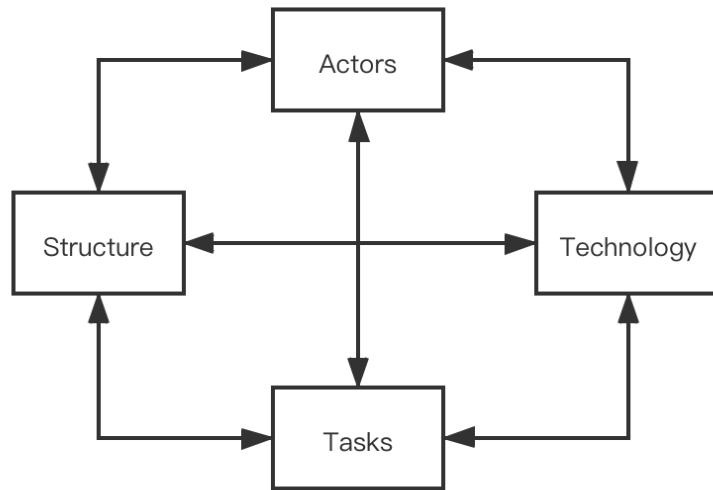
Upon the completion of the project, during the closing process, the project manager will analysis each risk as well as the risk management process. Based on this analysis, the project manager will identify any improvements that could be made to the risk management process for future projects



5.2 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 Entity Game Store — ICE**”, 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 ICE system

5.3 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:

No	Risk	Risk reduction techniques
R1	Team members did not communicate well	Agree on the way of communication; Regular communication of work progress; The minutes of the meeting
R2	Technology adopted is flawed	Use familiar technology; Specially-assigned person to study the new technology needed
R3	Project management structure is not clear	Formulate the management structure; Special personnel to maintain the management structure
R4	Code integration issues	Convention code specification; Incremental development and integration
R5	Personnel changes	More than one person participated in the core work of the project in order to familiar with the project process
R6	Implementation tools do not meet the requirements	Early implementation of the sources of tools; Look for alternative tools
R7	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
R8	System quality and performance risks	More exchange of work results; Inspection and review; Using performance test

5.4 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%		
7	60% ~ 70%		Very likely
6	50% ~ 60%	Moderate	
5	40% ~ 50%		Likely
4	30% ~ 40%		
3	20% ~ 30%	Low	
2	10% ~ 20%		Almost impossible
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		Some influences on the project	
5			
4	Moderate		
3			
2	The negative impact is almost negligible		
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

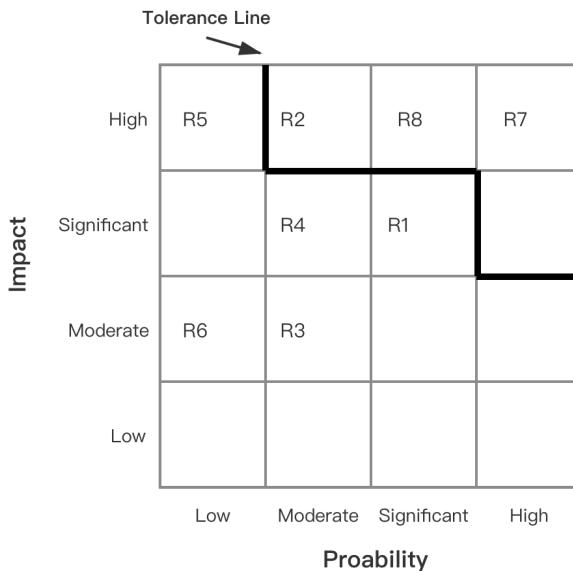
After defining the levels, we analyzed the potential risks in the project from the four aspects mentioned above.

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	Likelihood	Impact	Risk
R1	Team members did not communicate well	5	5	25
R2	Technology adopted is flawed	3	10	30
R3	Project management structure is not clear	3	4	12
R4	Code integration issues	4	5	20
R5	Personnel changes	2	8	16
R6	Implementation tools do not meet the requirements	2	4	8

R7	Change to requirements specification during coding	8	8	64
R8	System quality and performance risks	6	7	42

And the **probability impact matrix** is as follow:



5.5 Risk Prevention

For risk R1, 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 R1.

For risk R2, 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.

For risk R3, formulate the management structure in advance, and let a team member manage and maintain the management structure;

For risk R4, 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;

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;

For risk R6, identify and implement the source of the tools at the beginning of the project, find the necessary alternative tools, and implement the tools in place before the tools need to be used;

For risk R7, 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;

For risk R8, in the regular meeting of the team, the work results are exchanged, the results are checked and reviewed, and the performance test is carried out. After the performance test meets the indicators, the follow-up work is carried out.

5.6 Risk Actions

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

$$RRL = (RE_{before} - RE_{after})/\text{cost of risk reduction}$$

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	Team members did not communicate well				
Owner	Zhe Zhang	Data raised	2019/4/1	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							
		Probability	Impact				
			Cost	Duration	Quality		
Pre-mitigation		25	2	7	5		
Post-mitigation		10	1	3	3		
Incident/action history							
Date	Incident/action		Actor	Outcome/comment			
2019/4/5	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	R2	Risk title	Technology adopted is flawed				
Owner	Kaixin Chen	Data raised	2019/4/3	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	Duration	Quality		
Pre-mitigation		30	6	6	7		
Post-mitigation		8	2	3	3		
Incident/action history							
Date	Incident/action		Actor	Outcome/comment			
2019/4/8	Using SpringBoot framework for back-end; Using origin framework for front-end		Di Bu	/			

RISK RECORD					
Risk id	R3	Risk title	Project management structure is not clear		
Owner	Di Bu	Data raised	2019/4/9	Status	first update
Risk Description: There is no clear understanding of the overall management structure of the project and no clear explanation.					
Impact Description: Work chaos, slow progress.					
Recommended risk mitigation: Formulate the management structure in advance and let a team member manage and maintain the management structure.					
Probability/impact values: 3 / 4					
	Probability	Impact			
		Cost	Duration	Quality	
Pre-mitigation	12	3	3	3	
Post-mitigation	5	1	2	1	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2019/4/14	Make sure project management structure and maintenance and develop by Kaixin Chen		All team member	/	

RISK RECORD					
Risk id	R4	Risk title	Code integration issues		
Owner	Zhe Zhang	Data raised	2019/4/9	Status	third 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					
	Probability	Impact			
		Cost	Duration	Quality	
Pre-mitigation	8	3	3	2	
Post-mitigation	2	1	1	1	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2019/4/10 2019/4/15	Integrate currently code for personal responsibility		All team member	Decrease work for later code integration	

RISK RECORD					
Risk id	R5	Risk title	Personnel changes		
Owner	Zhe Zhang	Data raised	2019/4/9	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			
		Cost	Duration	Quality	
Pre-mitigation	16	4	4	4	
Post-mitigation	/	/	/	/	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
/	/		/	/	

RISK RECORD					
Risk id	R6	Risk title	Implementation tools do not meet the requirements		
Owner	Kaixin Chen	Data raised	2019/4/2	Status	first update
Risk Description: Whether the management tools, development tools and test tools that must be used in the project development and implementation process can be in place in time and whether the tool versions in place meet the project requirements.					
Impact Description: Additional time will be spent reselecting and implementing tools to slow down the project.					
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: 2 / 4					
	Probability	Impact			
		Cost	Duration	Quality	
Pre-mitigation	16	5	5	5	
Post-mitigation	10	3	1	3	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2019/4/16	IDE for front-end we choose JetBrains WebStorm; IDE for back-end we choose JetBrains IntelliJ IDEA; Database we choose MySQL Workbench		Di Bu	Decrease work later	

RISK RECORD					
Risk id	R7	Risk title	Change to requirements specification during coding		
Owner	Di Bu	Data raised	2019/3/21	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			
		Cost	Duration	Quality	
Pre-mitigation	64	8	7	7	
Post-mitigation	8	2	2	2	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
2019/4/1 2019/4/10	Requirement changing		Zhe Zhang	/	

RISK RECORD					
Risk id	R8	Risk title	System quality and performance risks		
Owner	Zhe Zhang	Data raised	2019/4/9	Status	none update
Risk Description: Users will have a high demand for software quality and the software system will have a high demand for performance.					
Impact Description: /					
Recommended risk mitigation: In the regular meeting of the team, the work results are exchanged, the results are checked and reviewed, and the performance test is carried out. After the performance test meets the indicators, the follow-up work is carried out.					
Probability/impact values: 6 / 7					
	Probability	Impact			
		Cost	Duration	Quality	
Pre-mitigation	42	7	8	8	
Post-mitigation	/	/	/	/	
Incident/action history					
Date	Incident/action		Actor	Outcome/comment	
/	/		/	/	

5.7 Risk Evaluation

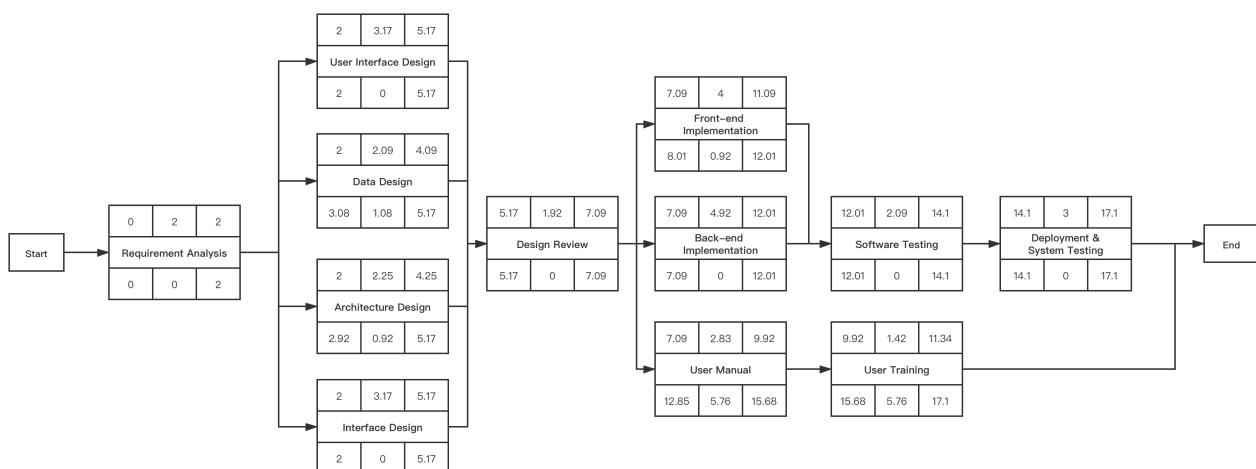
We use **PERT(Program Evaluation and Review Technique)** for risk evaluation. PERT was developed to deal with the uncertainty surrounding estimates of task durations.

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**

5.7.1 PERT Activities Schedule

Serial Numver	Activity	Optimistic Time	Most Likely Time	Pessimistic time	Expected Duration	Standard Deviations
A	Requirement Analysis	1	2	3	2	0.33
B	User Interface Design	2	3	5	3.17	0.5
C	Data Design	1.5	2	3	2.09	0.25
D	Architecture Design	1.5	2	4	2.25	0.42
E	Interface Design	2	3	5	3.17	0.5
F	Design Review	1	2	2.5	1.92	0.25
G	Front-end Implementation	3	4	5	4	0.33
H	Back-end Implementation	3.5	5	6	4.92	0.42
I	Software Testing	1.5	2	3	2.09	0.25
J	User Manual	1	3	4	2.83	0.5
K	Deployment & System Testing	2	3	4	3	0.33
L	User Training	0.5	1	2	1.42	0.25

5.7.2 Project Cycle Activities Network Diagram



6. Resource Allocation

6.1 Identifying Resource Requirements

We use **activity network analysis techniques** to plan when activities should take place in **3.3.2**. They was calculated as a time span during which an activity should take place - bounded by the earliest start and latest finish dates. We also use **PERT technique** in **4.7.1** forecasting a range of expected dates by which activities would be completed. And after further consideration, we match the activity plan to available resources and assess the efficacy of changing the plan to fit the resources in some aspects.

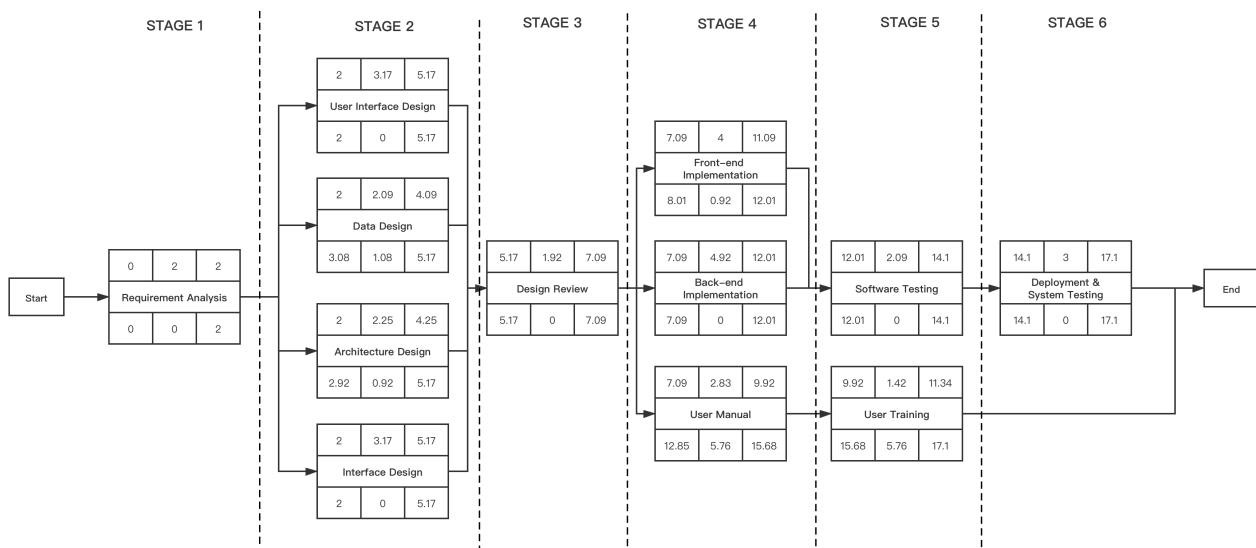
The allocation of resources to activities will lead us to review and modify the ideal activity plan. And we revise state and project completion dates after resource allocation.

Firstly, we product a resource allocation plan to list the resources that will be required along with the expected level of demand. Some of them should considering each activity in turn and identifying the resources required, and there will also be resources required that are not activity specific, but are part of the project's infrastructure or required to support other resources. The **table of identified resource requirements** are shown below:

Category	Specification	Qualitative/Quantitative
Labour	The main items in this category will be members of the development project team such as the project manager, systems analysts and software developers. Equally important will be the quality assurance team and other support staff and any employees of the client organization who might be required to undertake to participate in specific activities.	<ul style="list-style-type: none">- PM- Requirement Analyst- Product Architect- PD Manager & PD- UI Designer- Technical Manager- Team Leaser- Development Engineer- QA- Administrators
Equipment	Obvious items will include workstations and other computing and office equipment. Also basic equipment such as desks and chairs are also should be considered.	<ul style="list-style-type: none">- Laptop * n- Work table * n- Work chairs * n- Display * n- A number of hard disks
Materials	Items that are consumed, rather than equipment that is used. They are of little consequence in most software projects but can be important for some software that is to be widely distributed.	<ul style="list-style-type: none">- floppy disk (our project don't need)
Space	For projects that are undertaken with existing staff, space is normally readily available.	<ul style="list-style-type: none">- most time work online, need a basic meeting room
Services	Procurement of specialist services - development of a wide area distributed system.	<ul style="list-style-type: none">- some specific knowledge about entity game manufactures

Time	The resource that is being offset against the other primary resources - project timescales can sometimes be reduced by increasing other resources and will almost certainly be extended if they are unexpectedly reduced.	- according to schedule is about 17 weeks, a floating number
Money	Secondary resource - it is used to buy other resources and will be consumed as other resources are used. It is similar to other resources in that it is available at a cost - in this case interest charges.	- money for employee people - money for purchase equipment and material - money to rent space

The stage of our ICE project is shown below:



Resource Requirement List (mainly take Labour into consideration)

Stage	Activities	Resources	Time	Amount	Appendix
1	ALL Requirement Analysis	PM Workstation Senior analyst	104F/T	34	Check software availability
2	ALL User Interface Design Data Design Architecture Design Interface Design	WorkStation Analyst/Designer Analyst/Designer Analyst/Designer	34F/T — 20F/T 15F/T 25F/T 15F/T	3	One per person is ideal
3	ALL Design Review	Workstation Senior analyst	2F/T	2	May use Analyst/Designer
4	ALL Font-end Implementation Back-end Implementation User Manual	WorkStation Analyst/Designer Analyst/Designer Analyst/Designer	2F/T — 7F/T 6F/T 4F/T 4F/T	3	The same as Stage 2

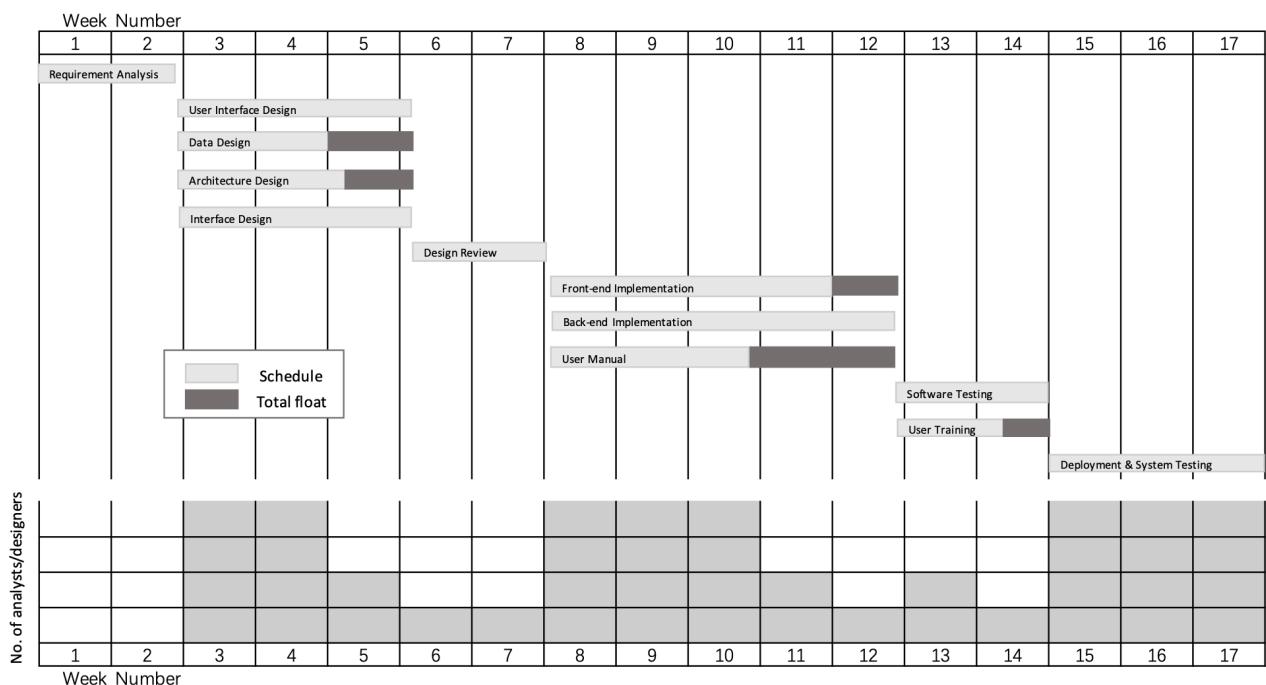
5	ALL Software Testing User Training	WorkStation Office place Programmer Programmer Programmer	— 30F/T 28F/T 15F/T 25F/T	4	One per programmer
6	ALL Deployment & System Testing	Full collection access Analyst/Designer	— 6F/T		The full system test took about 20 hours

6.2 Scheduling Resources

- **Activity schedule:** The activity schedule indicates the planned start and completion dates for each activity.
- **Resource schedule:** The resource schedule shows the dates on which each resource will be required and the level of that requirement.
- **Cost schedule:** The cost schedule shows the planned cumulative expenditure incurred by the use of resources over time.

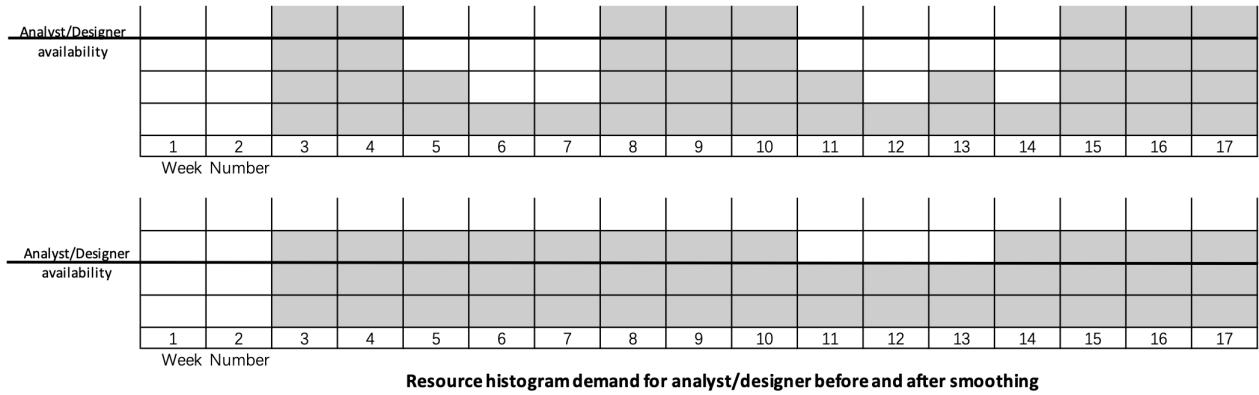
Secondly, map the resource requirements produced in the first step on to the activity plan to assess the distribution of resources over the duration of the project.

Using **Bar Chart** to produce a **resource histogram** for resource(mainly take Labour into consideration)



Each activity has been scheduled to start at its earliest start date - a sensible initial strategy, and we also wish to save any float to allow for contingencies. Earliest start date scheduling frequently creates resource histograms that start with a peak and then tail off.

By adjusting the start date of some activities and splitting others, our resource histogram can, subject to constraints such as precedence requirement, be smoothed to contain resource demand at available levels. So we smooth the resource histogram demand of analyst/designer ideally, update **smoothing resource histogram chart** is shown below:



But we don't take resource conflict into consideration, therefore, we should prioritize activities so that resources can be allocated to competing activities in some rational order. The priority must almost always be to allocate resources to critical path activities and then to those activities that are most likely to affect others. In that way, lower-priority activities are made to fit around the more critical, already scheduled activities.

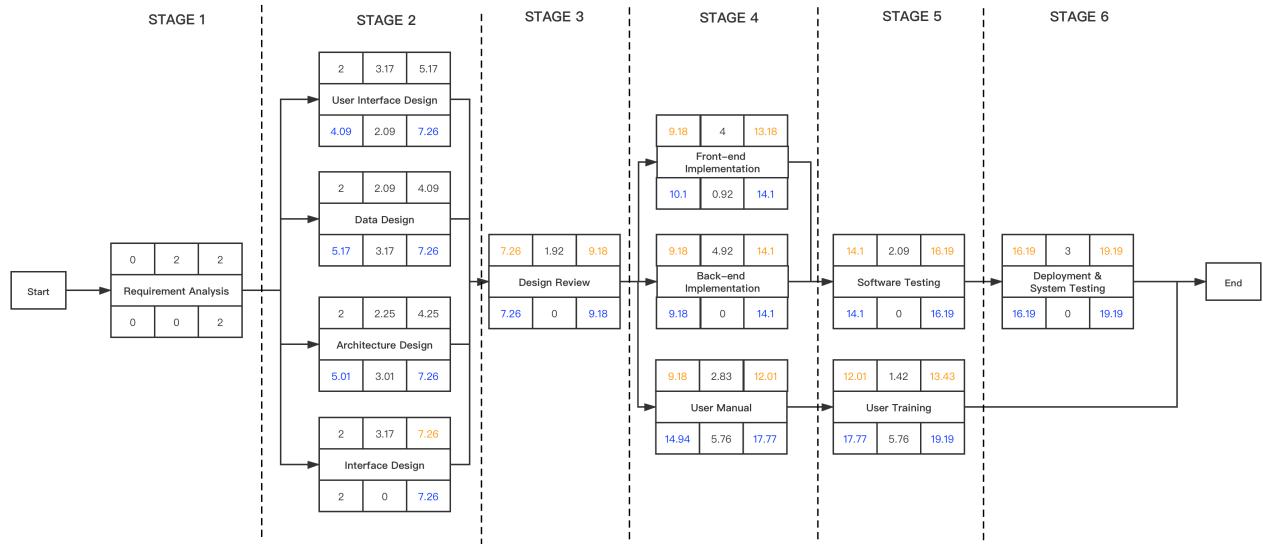
We use both **Total float priority** to smallest float has the highest priority and **Ordered list priority** according to the criteria.

Total float priority: ordered according to the total float, those with the smallest total float having the highest priority. In the simplest application of this method, activities are allocated resources in ascending order of total float. However, as scheduling proceeds, activities will be delayed and total floats will be reduced. It is therefore desirable to recalculate floats each time an activity is delayed.

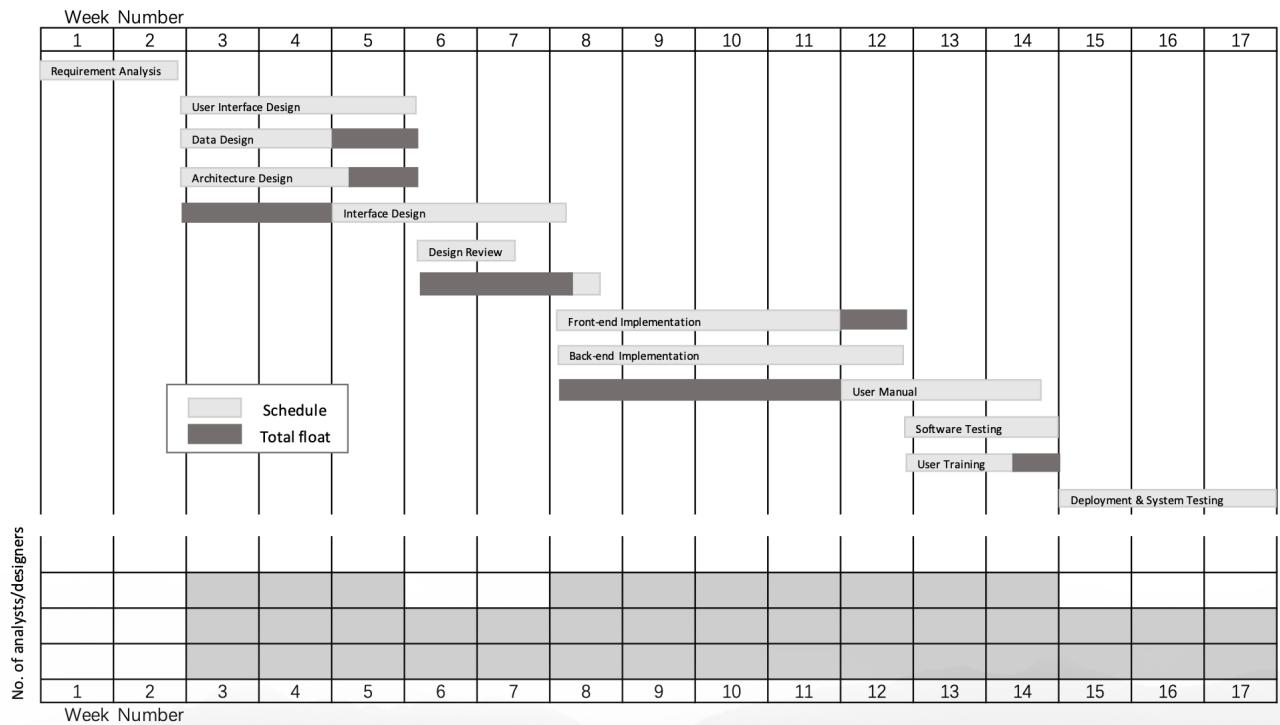
Ordered list priority: activities that can proceed at the same time are ordered according to a set of simple criteria.

- shortest critical activity
- critical activities
- shortest non-critical activity
- non-critical activity with least float
- non-critical activities

Project cycle Activity Network Diagram under Total float priority and Ordered list priority is shown below:

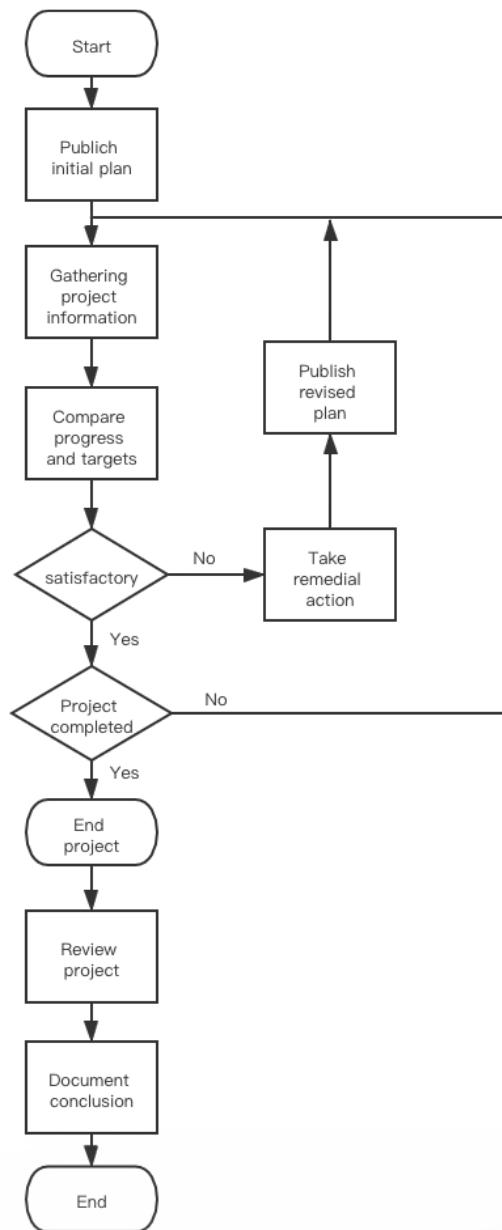


Bar Chart and resource histogram for resource under labour resource constraint are shown below:



7. Monitor & Control

7.1 Project control framework



We monitor the progress of the project, compare the difference between the actual progress and the plan, we modify the plan so that the project can return to the desired track. The product manager in charge of the business pays attention to the progress of the project every day, and the project manager conducts a weekly project report. Ask team members who work harder to be effective, or allocate additional resources to tune resources on non-critical paths to critical paths. Of course, other members in the team also need to give their reports in different ways and frequencies.

7.2 Data Collection

Every one should gather the tasks which are partially completed. In the process of collecting data, there are two methods: **partial completion report** and **risk report**. Considering that the partial completion of the report will make employees less focused and may cause delays, the task of making the partial completion report is left to the product manager for production and analysis. Each employee confirms the risk report weekly.

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

Time Sheet

Staff Zhezhang Week ending 12/4/2020

Rechargeable hours

Project	Activity code	Description	Hours this week	% complete	Scheduled completion	Estimated completion
P06	A223	Code mod A2	13	50	20/4/2020	20/4/2020
P25	D347	Document take-on	6	10	5/5/2020	3/5/2020
Total recharged hours			19			

Non-rechargeable hours

Code	Description	Hours this week	Comment and authorization
Z14	work for a emergency work	15	Authorized by RB
Total non-rechargeable hours			15

Activity Assessment Sheet

Staff Budidi

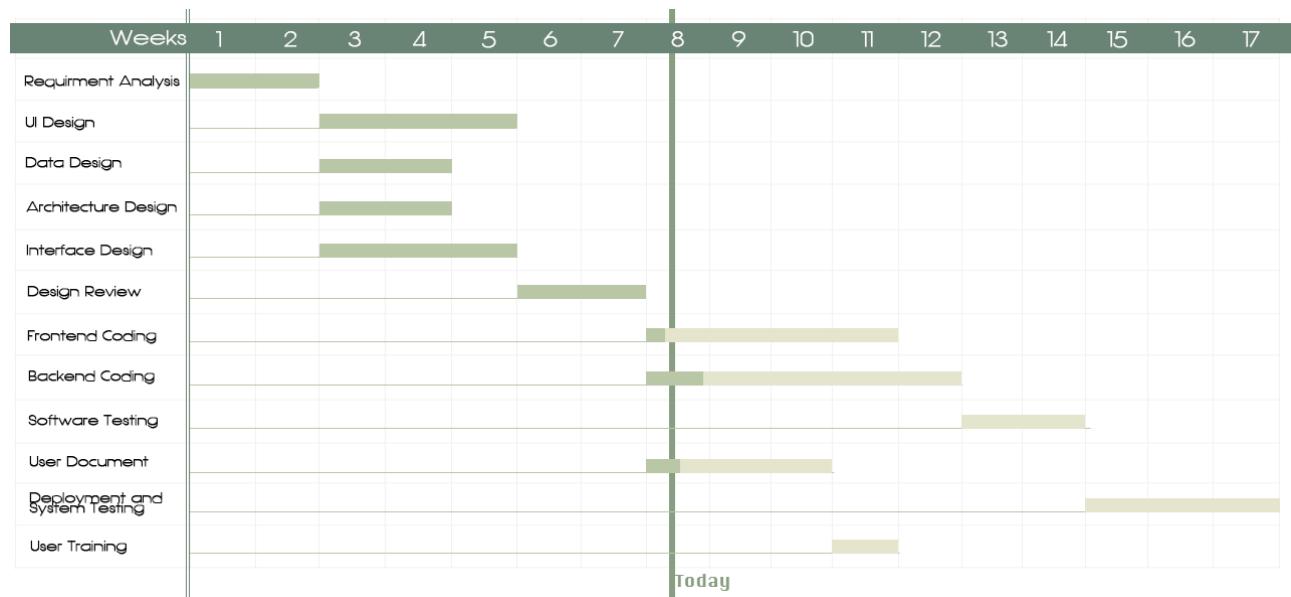
Ref: G/3

Activity: Frontend Coding Module 3

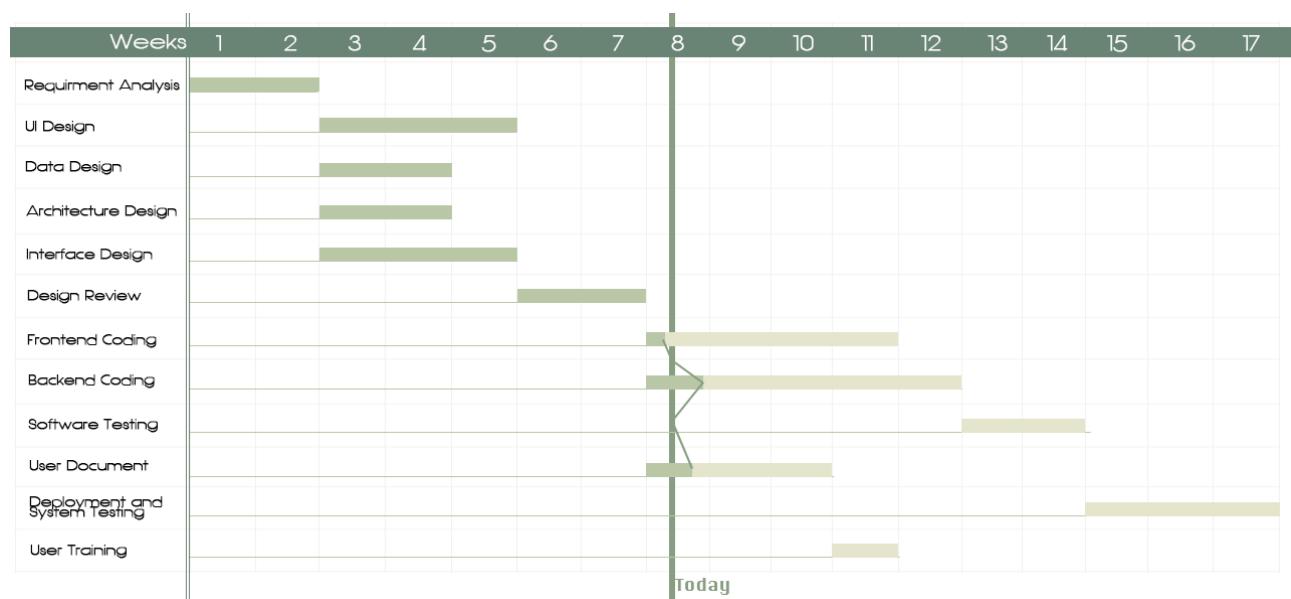
Week number	13	14	15	16	17	18	
Activity summary	G	A	A	R			
Component							Comments
Screen handling procedures	G	G	A	G			
File update procedures	G	A	R	A			
Housekeeping procedures	G	G	G	A			
Compilation	G	G	G	R			
Test data runs	G	G	G	A			
Program documentation	G	G	A	R			

7.3 Progress Visualization

The project manager can modify the Gantt chart when an activity is completed, and the visualization of it should given to all the member.

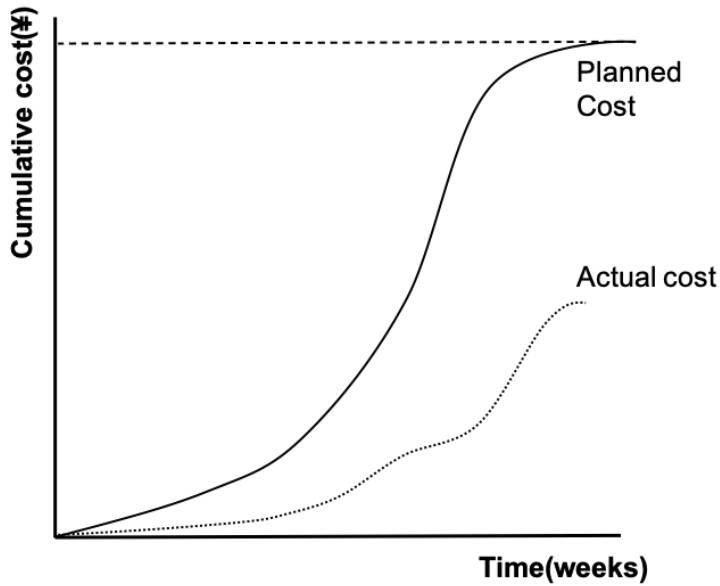


Someone prefer **slip chart**. A slip chart is a very similar alternative favored by some project manager, who believe it provides a more striking visual indication of those activities that are not progressing to schedule. The two chart are both a simple example of project.

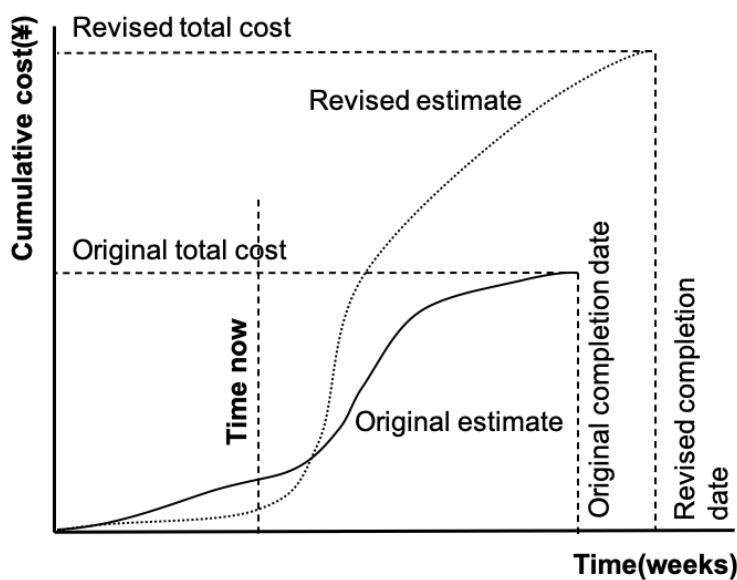


7.4 Cost Monitoring

Expenditure monitoring is an important component of project control, it provides an indication of the effort that has gone into our ICE project. Our ICE project might be on time but only because more money has been spent on activities than originally budgeted. **Our Cumulative Expenditure Chart** is shown below, which provides a simple method of comparing actual and planned expenditure. Also we need to take account of the current status of our ICE project activities before attempting to interpret the meaning of recorded expenditure.



Then we add projected future costs calculated by adding the estimated costs of uncompleted work to the costs already incurred. Where a computer-based planning tool is used, revision of cost schedules is generally provided automatically once actual expenditure has been record. We update the Cumulative Expenditure Chart and including additional information available once the revised cost schedule.



7.5 Earned Value Analysis

Earned Value Management measures progress against a baseline. It involves calculating three key value for each activity in the WBS.

- **Planned Value(PV):** the portion of the approved cost estimate planned to be spent on the given activity during a given period
- **Actual Cost(AC):** the total of the costs incurred in accomplishing work on the activity in a given period. It must correspond to whatever was budgeted for the Planned Value and the Earned Value
- **Earned Value(EV):** the value of the work actually completed

These three values are combined to determine at that point in time whether or not work is being accomplished as planned. The most commonly used measures are the cost variance:

$$CV = EV - AC$$

and the schedule variance:

$$SV = EV - PV$$

These two values can be converted to efficiency indicators to reflect the cost and schedule performance of the project. The most commonly used cost-efficiency indicator is the **Cost Performance Index(CPI)**. It is calculated as:

$$CPI = \frac{EV}{AC}$$

The sum of all individual EV budgets divided by the sum of all individual AC's is known as the cumulative CPI, and is generally used to forecast the cost to complete a project. The **Schedule Performance Index(SPI)** is often used with the CPI to forecast overall project completion estimates, and it can be calculated by:

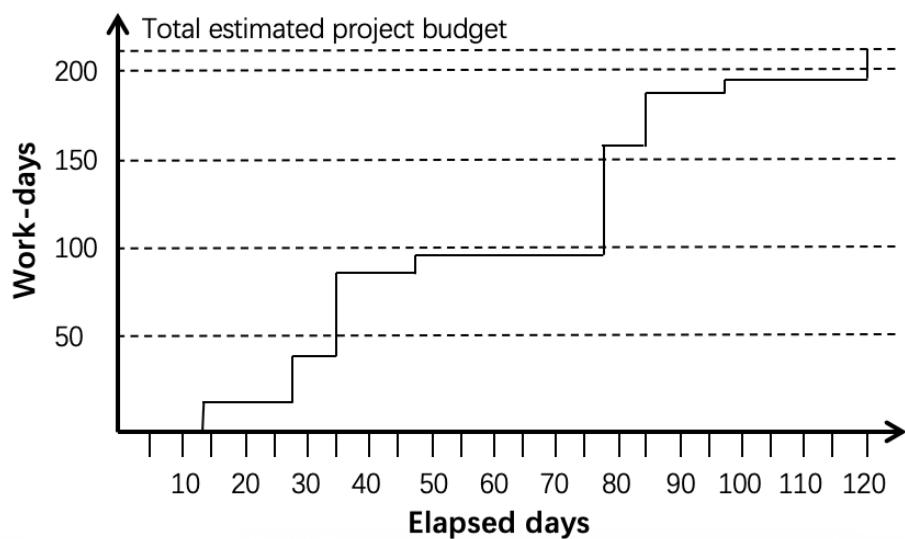
$$SPI = \frac{EV}{PV}$$

A negative schedule variance(SV) calculated at a given point in time means the project is behind schedule, while a negative cost variance(CV) means the project is over budget.

We combined the **Baseline Budget** and **0/100 technique**, assigning 0 to task unfinished and 100% to task completed of the budget value

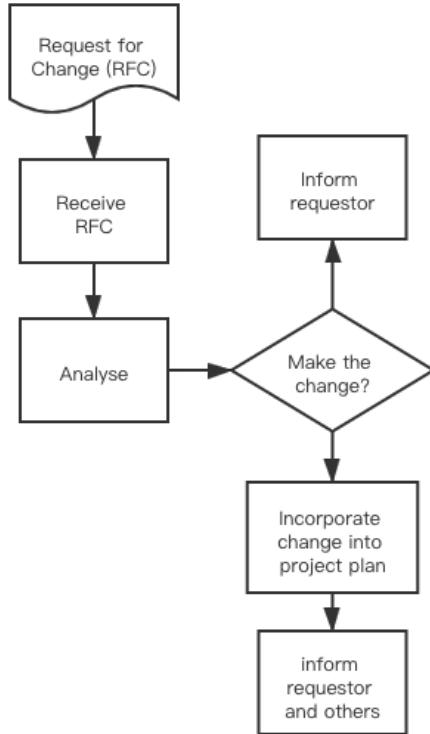
Task	Budgeted workdays	Scheduled completion	Cumulative workdays	% cumulative earned value
------	-------------------	----------------------	---------------------	---------------------------

Requirement Analysis	14	14	14	6.25
Architecture Design	14	28	42	18.75
Data Design	14	28		
User Interface Design	21	35	84	37.5
Interface Design	21	35		
Design Review	14	49	98	43.75
User Manual	21	70	119	53.125
User Training	7	77	154	68.75
Front-end Implementation	28	77		
Back-end Implementation	35	84	189	84.375
Software Testing	14	98	203	90.625
Deployment & System Testing	21	119	224	100



7.6 Change Control

Because that the changes including requirements changes and staff changes couldn't be avoided in the process, so we must control and manage the changes. The change control managing process is showed in the following figure:



The key points is to plan the change beforehand, then we estimate the risk of controlling the change, and include verification of the success, the testing must be done to the change to ensure that we can control it, at last, we assign our staff with new responsibilities to solve the problems caused by the changes.

8. Project Implementation

8.1 Process Model

Scrum Process Model

In this project, we chose to use the Scrum process model for software development. Like all other forms of agile software processes, Scrum has frequent intermediate deliverables that contain functions that can work. This allows customers to get working software earlier, and at the same time allows projects to change project requirements to adapt to changing needs. Frequent risk and mitigation plans are developed by our development team.

In the process of using Scrum for software development, different members play different roles.

Role	Person	Task
Product Owner	Prof. Huang	<ol style="list-style-type: none">1. Determine the function of the project.2. For each sprint, adjust features and priorities as needed.3. Inspection word of the development team.
Scrum Master	Zhe Zhang	<ol style="list-style-type: none">1. Link Team and Product owner.2. Organize Daily Scrum, Sprint Review and Sprint Planning meetings.3. Ensure good collaboration between members.4. Resolve obstacles in team development.
Team	Di Bu, Kaixin Chen	<ol style="list-style-type: none">1. Mainly responsible for product development.2. Deliver potential deliverable product increments after each Iteration. Ensure that the goals of the Sprint are achieved.

Meetings are an important part of Scrum. During the meeting, the product owner tells the development team which order items he needs to complete in the product order. The development team decides how many line items they can promise to complete in the next sprint. During the sprint, no one can change the sprint backlog, which means that demand is frozen during a sprint.

In the process of using Scrum for software development, we will hold the following types of meetings:

Meeting	Task
Planning Meeting	Every Thursday at 19:00. Arrange next week's task
Daily Meeting	Discuss how to get the job done in the team every day
Review Meeting	On the project display day, Prof.Huang participated in the discussion, and we show the results of the previous stage to the teacher.
Retrospective Meeting	Every Thursday at 19:00, review last week's accomplishments before the planning meeting and dynamically adjust the tasks for the next week

In the process of software development using Scrum, we need to generate a series of documents as a guide and summary in our development process. In our development process, we will also write the following documents.

Document	Function
Product backlog	The product backlog is a summary document for the entire project. The product order includes a rough description of all required features.
Sprint backlog	The sprint backlog is a greatly refined document that contains information on how the team will fulfill the requirements of the next sprint.
Burn down chart	The burn down chart is a publicly displayed chart showing the number of unfinished tasks in the current sprint or the number of unfinished line items on the sprint order.

8.2 Development Techniques

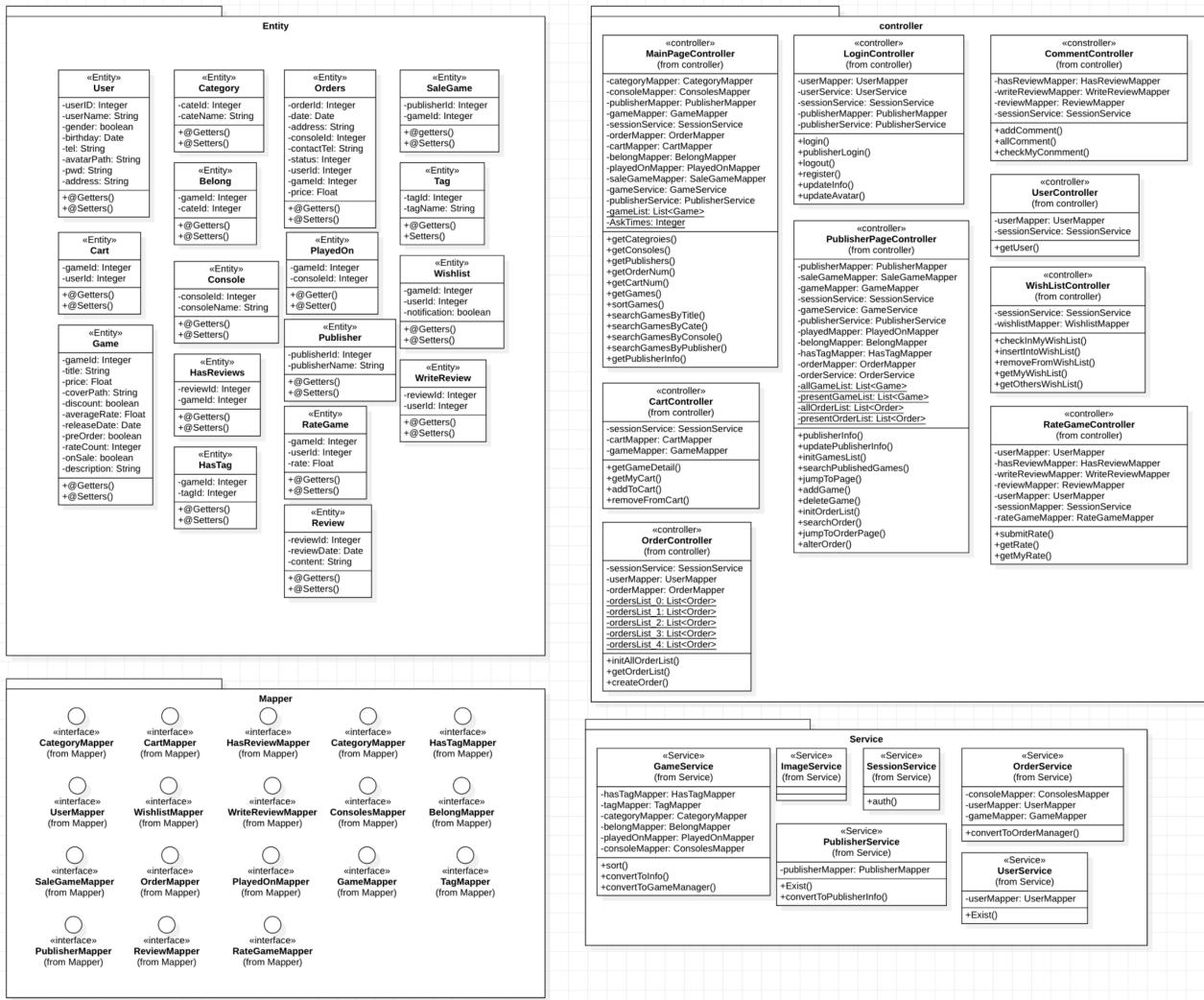
1. Development Tools

Tool	Illustration	Official Web
Eclipse	IDE	https://www.eclipse.org
IDEA	IDE	https://www.jetbrains.com/idea/download
Navicat	Database connecting tool	https://www.formysql.com/xiazai.html
PowerDesigner	Database designing tool	http://powerdesigner.de/
Edraw	Flowchart drawing tool	http://www.edrawsoft.cn
Postman	API platform	https://www.postman.com

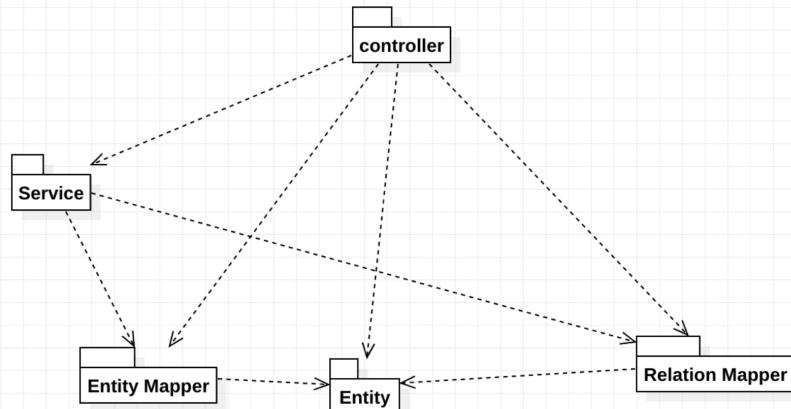
2. Development Environment

Tool	Version	Download
JDK	1.8	https://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
Mysql	5.7	https://www.mysql.com/
Nginx	1.10	http://nginx.org/en/download.html

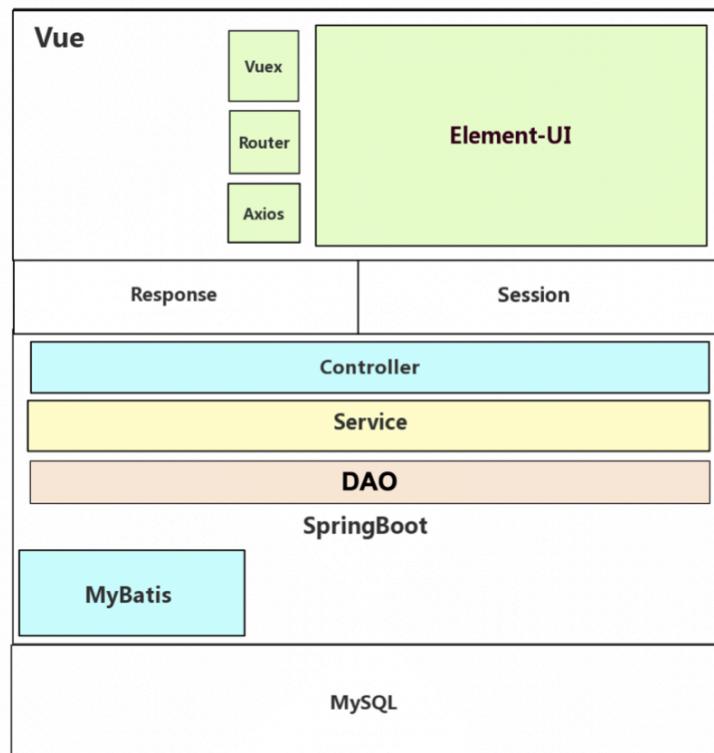
3. Design Elements



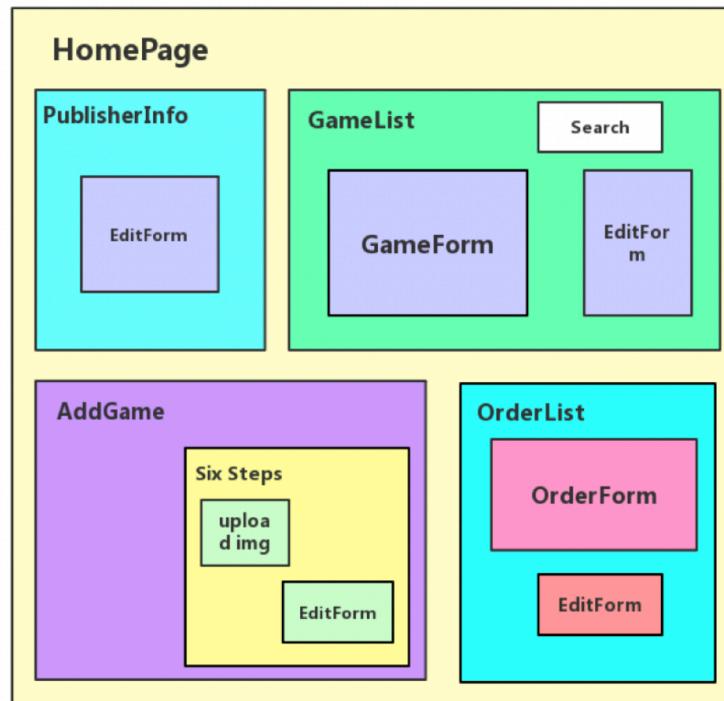
4. Package Diagram



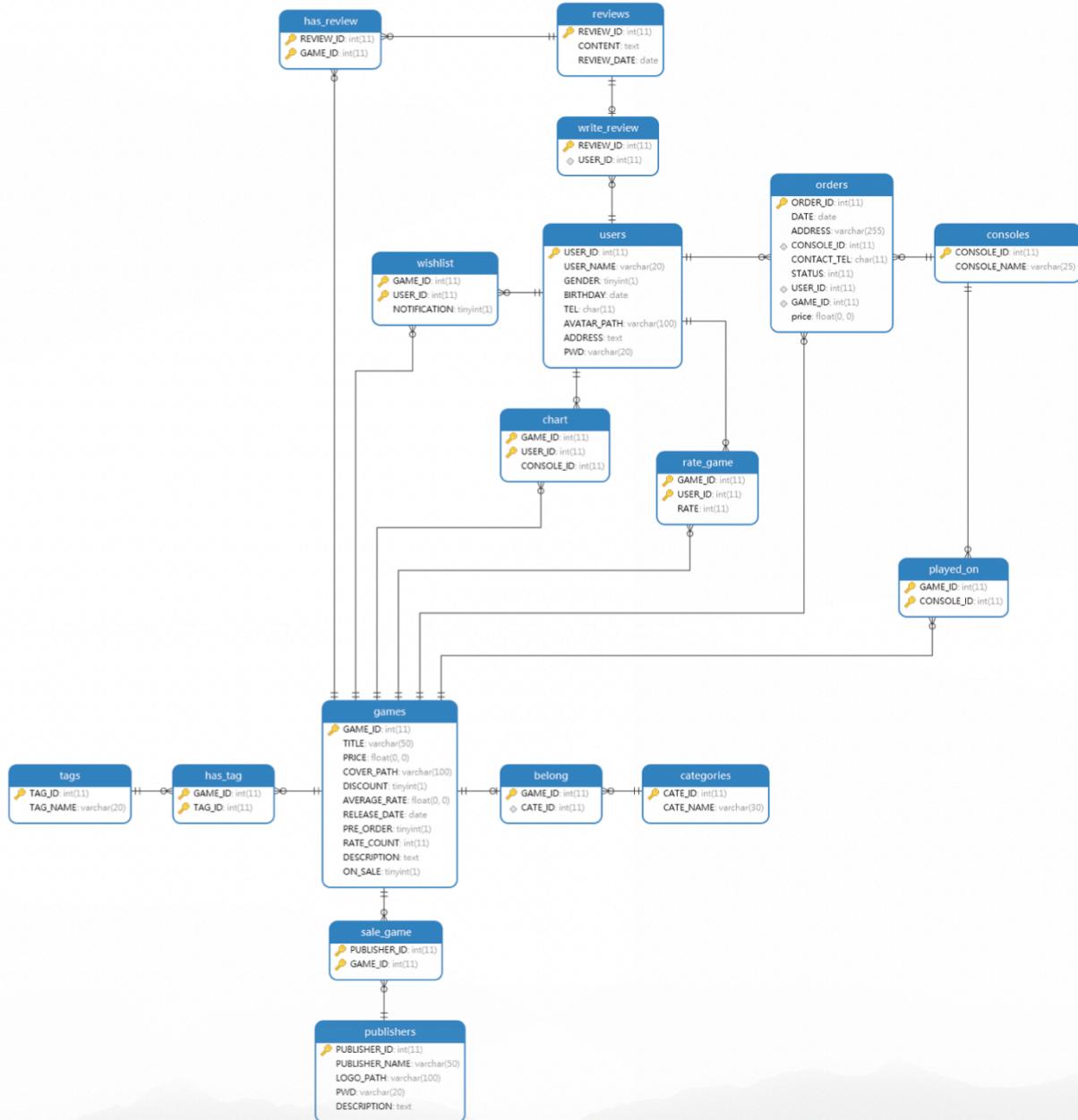
5. Design Architecture: The whole scope of the project and how we organize it.



6. Design Elements: All the components and the function methods supporting those components.



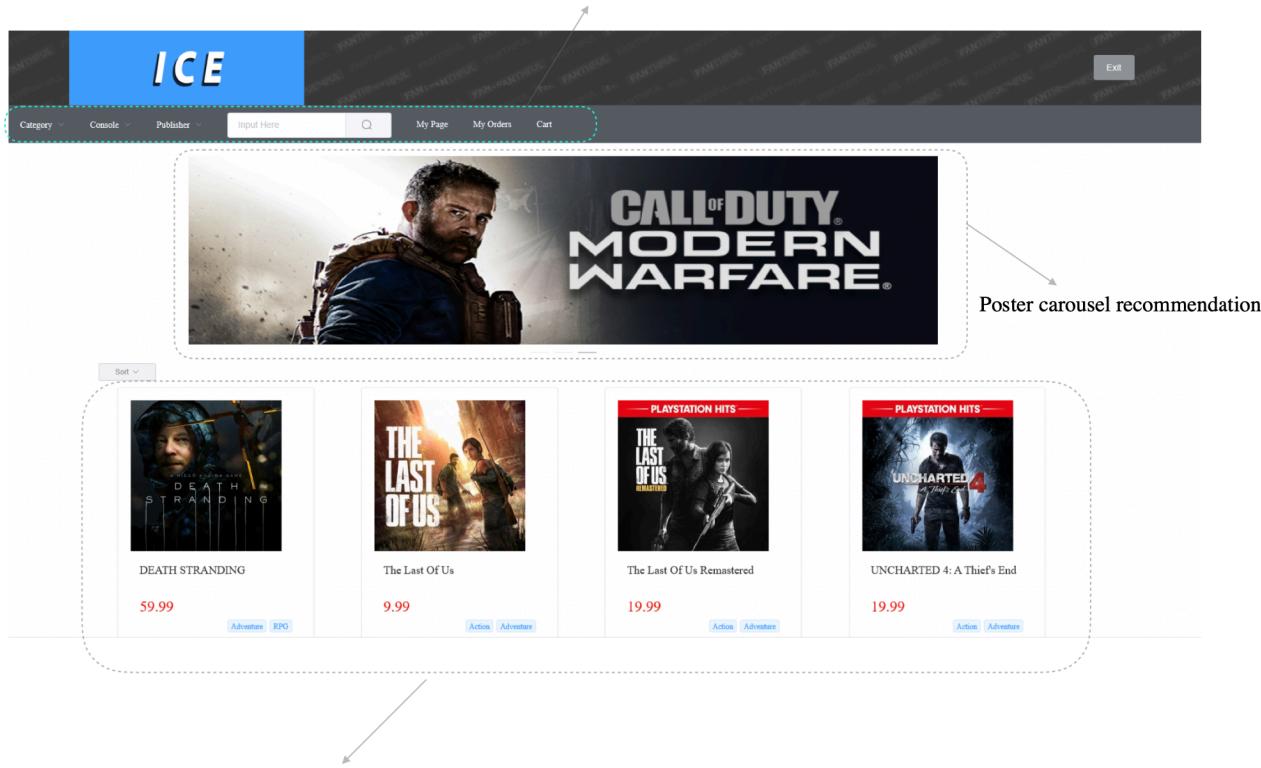
7. Design constraints: value constraints, relationships exclusivity constraints, navigability, generalization sets, multiplicity, derivation, changeability, initial value, qualifier, ordering, static, pre-condition, post-condition, and generalization set constraints. Those constrains are mainly designed and realized in the database design part, as is shown below



9. Prototype

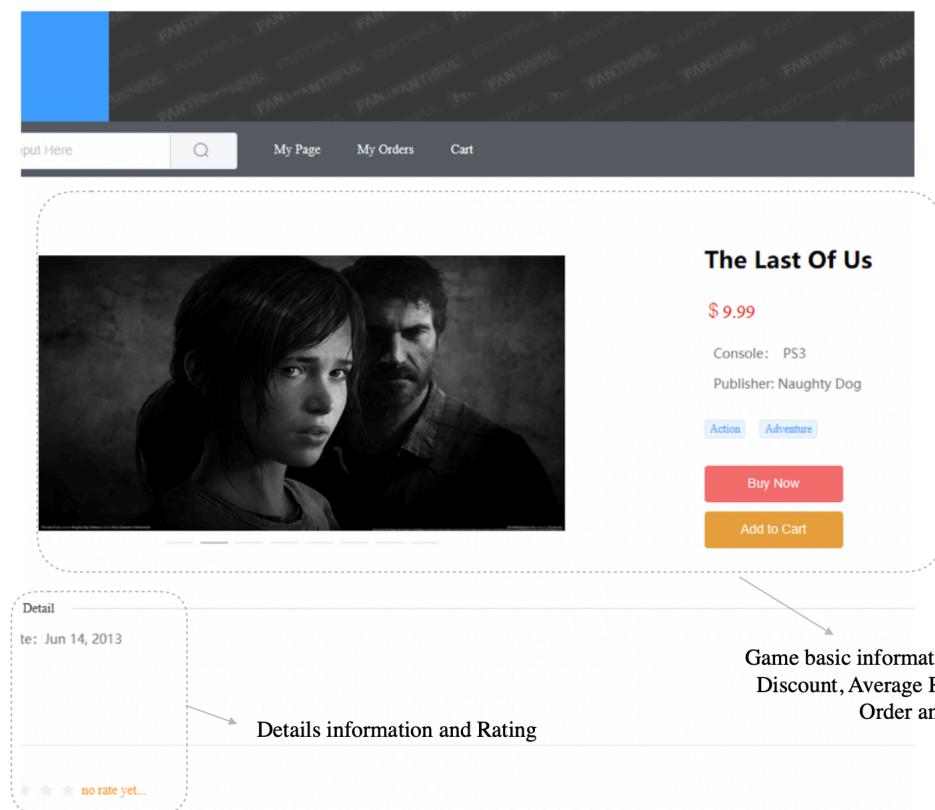
HomePage

Provide search function and common page jump



Game List: Show all games in the mall

Game Detail Page



Game basic information: include Title, Price, Discount, Average Rate, Release Date, Pre Order and Consoles

Game List Page

Search bar: Publisher can search game by title

The screenshot shows a search bar at the top with the placeholder "Please enter content" and a magnifying glass icon. Below it is a table with columns: #, Title, Price, Discount, Average Rate, Release Date, Pre Order, and Consoles. The table contains four rows of game data:

#	Title	Price	Discount	Average Rate	Release Date	Pre Order	Consoles
1	The Last Of Us	9.99	Off	Not rated	2013-06-13	Off	PS3
2	The Last Of Us Remastered	19.99	Off	Not rated	2014-07-28	Off	PS4
3	UNCHARTED 4: A Thief's End	19.99	Off	Not rated	2016-05-09	Off	PS4
4	The Last Of Us Part II	59.99	Off	5	2020-05-28	On	PS4

At the bottom, there is a pagination section with "Total 4", "10/page", page numbers 1-4, and a "Go to" input field.

Paging mechanism: realize page turning browsing and page jumping

Game basic information: include Title, Price, Discount, Average Rate, Release Date, Pre Order and Consoles

Order List Page

Cart basic information: include Game Cover, Name, Consoles, Category and Price

The screenshot shows a shopping cart with two items:

Cover	Game	Console	Category	Price	Options
	God of War	PS4	Action	19.99	
	The Witcher 3: Wild Hunt	Nintendo Switch	Role-Playing Games	39.99	

Options button: User can buy or delete game in the shopping cart

Publisher Person Page

The screenshot shows a left sidebar with navigation options: User Manage, Person Infor (selected), Game Manage, and Order Manage. The main content area is titled "Person Infor". It displays the following fields:

- Account ID: 2
- Name: Naughty Dog
- Password: 123456
- Description: (empty)

An "Edit" button is located at the bottom of the form. A callout arrow points from the "Edit" button to the text: "Edit button: Publisher can click this button to modify their information". Another callout arrow points from the "Name" field to the text: "Publisher basic information: include Account ID, Name, Password and Description".

Orders Page

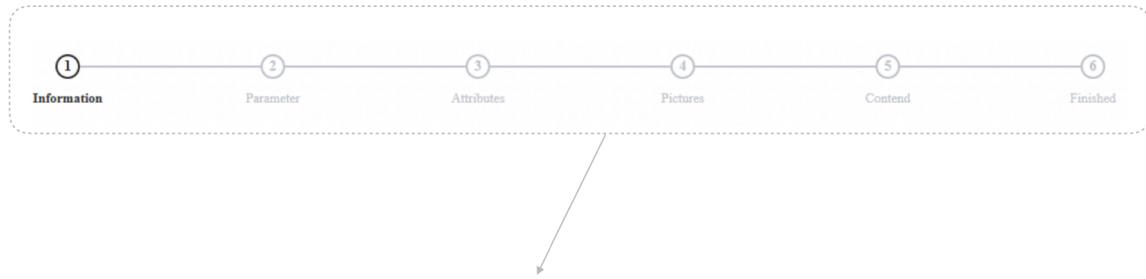
Search bar: Publisher can search game by title

The screenshot shows a search bar with placeholder text "Please enter content" and a magnifying glass icon. Below the search bar is a table with the following columns: #, Order ID, Game, Price, Status, Date, and Options. One row in the table is highlighted with a green background and contains the text "commented". At the bottom of the page, there is a pagination section with buttons for "Total 1", "10/page", and arrows for navigating between pages.

A callout arrow points from the search bar to the text: "Search bar: Publisher can search game by title". Another callout arrow points from the "Options" column in the table to the text: "Paging mechanism: realize page turning browsing and page jumping".

Here publisher can publish their games step by step, and of course they can edit those information later

Add Game Page



Here publisher can publish their games step by step, and of course they can edit those information later

Personal Page

Person basic information: include avatar, username, contact and address

Home > PersonPage

PersonInfor

Avatar: Panda icon

Username: LudwigLiu-CN

Contact: 12345678999

Edit buttons: Edit avatar (orange), Edit information (blue), Add address (green)

Wishlist part: Shows a dashed-line box labeled "Wishlist".

Edit button: Users can click these buttons to modify their information

Wishlist part: Show games added to the wish list by users



Part II:

Software Engineering Economy

1. Company Overview

1.1 Company Profile

The company's mission is to provide customers with a convenient, friendly and fast online physical game platform. The ultimate goal of the company is to be able to build a healthy, friendly and cooperative company, and to have a group of loyal customers and partners. In order to achieve our ultimate goal, game companies, etc. whose physical game resources carry out online sales business, we hope to be favored by customers in the annual customer satisfaction survey and get our suggestions for development and improvement from loyal customers

The company's business philosophy is Q (quality), S (service), S (speed), quality is that the online physical game platform we sell must be easy to use, user-friendly, and excellent quality; service is our Customer services such as pre-sales consulting services/after-sales services/ are all quick to give feedback, attentive and thoughtful; speed lies in the response speed of our online physical game platform is good, and the feedback speed of the company's customer service is rapid.

The online physical game platform can be regarded as a branch of the online shopping platform, but it is not the same. We can focus on meeting the preferences of customers and provide customers with a more convenient, friendly and faster online physical game system. Ability to focus on how to improve the quality of your game resources and increase your game sales. In the information age, the reality of physical game stores will be too few people because of the fast pace of life, the online physical game platform will give customers a channel to develop personal or company online sales of physical games, improve sales, and improve themselves Operating income. Therefore, the company's advantage lies in following the trend of social change, and at the same time seizing the customer's reform ideas, which can help customers increase operating income while reducing the economic burden and labor burden of operating physical game stores.

1.2 Market Analysis

For the company's business, the underlying market is mainly the changes in the physical game market. When the physical game market changes, it will also have an impact on the business strategy of the physical game store operator, and then the operator may consider expanding or Change the operating channel, that is, turn to the understanding of the online physical game platform.

From 2010 to 2020, the 10 years of China's physical game retail market is the 20 years that the market has developed from immature to mature. According to relevant data from the National Bureau of Statistics, the retail sales of physical games reached 71.185 billion yuan in 2018, an increase of 413.72% from 2010. In 2019, the total number of physical games in China reached 6.4 billion, an increase of 29.8% from 2010.

1.2.1 Feasibility Analysis

1. High-quality low-price competitive advantage of online physical game stores

Online shopping has the characteristics of low price, high efficiency, convenience, and a full range of types. Compared with the traditional physical game store business model, online physical game stores can save a lot of cost expenses such as mall rent, employee management salary, and trial loss. Obviously, this will provide a basis for the online physical game store to sell goods at a low price. The best-selling CDs, game cassettes and other products in the traditional game store can be purchased at a low price in the online physical game store.

2. Online physical game store delivery speed is fast

With the rapid development of the network technology and logistics industry, the e-book bookstore has a reliable space for development, which will provide buyers with great convenience, subscribe online, communicate online with the online store, try it directly in the online store, online After the store receives the purchaser's subscription information, the purchaser can immediately play the game they want.

3. Buying customer groups faced by online physical game stores

The current number of people on the Internet in our country will reach 80 million, most of whom are under 30 years old, and the category of college students accounts for more than 60%. In this category of user groups, I like to buy CD games, cassette games, and browse some physical games online. It is easy to accept new things, accept online shopping, and form a new trend of buying. It will form a huge target market. At the same time, the purchase of CD games and cassette games selected by the user group in this category has different levels of selection, that is, the price is low and cheap, which is the appetite for the low price sales of online physical game stores.

Online physical game stores take advantage of the low price, high efficiency, convenience, and full range of features provided by the Internet. Buyers can directly query and select, and then directly order games online. The settlement method can be mobile phone charging, credit card settlement, mail order, wire transfer, etc. After the online physical game store confirms that the purchaser has paid, the physical game is delivered to the reader through its own delivery system.

1.2.2 Ecosystem Analysis

The data shows that in 2015, my country's software and information technology service industry achieved 37 trillion yuan in software business revenue, a year-on-year increase of 2092%, a growth rate of 148 percentage points lower than 2015, but still higher than the electronic information manufacturing industry by about 10 percentage points. In the first half of 2016, my country's software and information technology service industry as a whole operated steadily, with software revenue growth picking up, margins increasing slightly, the central and western regions maintained rapid growth, and the scale of the central city's software industry continued to expand. In the first half of the year, my country's software and information technology service industry completed software business revenue of 20217 billion yuan, a year-on-year increase of 171%, and the growth rate was flat from January to May. Among them, the revenue from completed software business in the second quarter was 114.3 billion yuan, an increase of 30% over the first quarter. In the first half of the year, the total profit of the software and information technology service industry was 219.3 billion yuan, a year-on-year increase of 126%. The growth rate was still 94 percentage points lower than the same period last year, but an increase of 35 percentage points from the first quarter.

According to the 2017-2023 in-depth survey analysis and development prospect research report of the Chinese software market released by the China Market Research Online. According to the report, there are currently about 1,000 new domestic software products listed each year. General software product hotspots are mainly concentrated on educational software, game software, e-book CD/multimedia software, anti-virus software, PC operating system and Chinese platform, cad/cam software. In my country, the life span of general game products is only about three months; the life span of educational software and e-book discs is about six months; the life cycle of other kinds of software is slightly longer, about one year. As technology advances and competition intensifies, the software life cycle tends to shorten. 80% of the products use CD as the carrier, and the operating environment is mostly based on windows. The purchasing power of group users is stronger than that of individual users. The purchase varieties are mainly concentrated in operating systems, databases, tool software, cad/cam software, office suites, etc., and they pay more attention to services; the consumption growth of individual users is higher than that of group users. Pay more attention to price in tools, games, education, e-books, etc. The seasonality of consumption is weak.

1.2.3 Customer Analysis

Our customers are mainly for people who want to develop online game stores. Most of these customers have some game resources offline, want to develop online game sales business to promote sales growth, or want to operate low-cost game stores, Unable to develop offline physical game stores. The income level of these people is higher than that of ordinary people, and their education level is also relatively high.

1.3 Competition Analysis

For the online physical game platform system, we can find many similar platforms, such as Nintendo and other game companies, and there are also many examples of developing from offline game stores to online, such as various physical game online stores in Taobao. Companies that develop online physical game systems do not open source online physical game systems, so competitors are mainly software outsourcing teams.

1.3.1 Competitive Advantages

1. Performance characteristics

Response time: The average response time of API requests is less than 2s, and the opening speed of WEB pages is under 5s.

Online users: The system can support more than 10,000 users online at the same time.

Throughput: The system can support 1,000 users to pay orders at the same time.

Pressure resistance: The system can run stably for 12 hours under the condition that the operating pressure of the actual system is doubled.

Online time: The system works 24 hours a day, 7 days a week.

2. Performance characteristics

1. Reliability

Average failure time: less than 0.1% of system running time.

Average repair time: The average repair time of the fault is less than 3 hours.

2. Effectiveness

The user-friendly interface makes users feel comfortable.

There are fewer errors in user understanding and operation.

User learning operation time is shorter.

In abnormal environments and situations, users can still operate normally.

3. Safety

User passwords and other private information use encryption algorithms.

Database operations prevent injection.

The user login needs to enter the verification code.

The coupling of different modules in the system is low.

4. Maintainability

3. Other features

1. The database sets different permissions for different users to ensure that you should not access things that should not be accessed. At the same time, an efficient index is established to ensure that the database query is rapid to support high concurrent access.

2. The system is internationalized. Temporarily supports Chinese and English.

3. The core business of the project, such as the following orders, payment, commodity information and other modules can be reused.

4. The system is easy to transplant. When the whole system is in a bottleneck after a few years, it can be easily transplanted and expanded.

1.3.2 Competitive Disadvantage

Similar systems (such as Nintendo, Xbox, etc.) that have existed on the market have been developed for a long time, and a large number of sources and users have been gathered. The initial benefits of this system are low.

1.3.3 Competition Analysis Form

1=critical 5=not critical

Factor	This project	Software outsourcing team	Importance
Product	Online physical game platform	Online physical game platform	1
Price	Lower	General	3
Quality	General	General	2
Service	Thoughtful and comprehensive	Thoughtful	3
Reliability	Relatively reliable	Relatively reliable	3
Stability	Stable	Stable	2
Professional knowledge	Profession	Profession	1
Company reputation	Good	General	3
Location	Immobilized	May flow	2
Exterior	Friendly interface and easy operation	Friendly interface	3
Sales method	Portals website	Outsourcing website	2
Ad	Portal website and cooperation website	Outsourcing website	3

1.4 Assumption & Prerequisites

To insure that our project develops stably and the website works responsibly, we make the following assumptions.

1. Before the development, we cost totally ¥71240 to buy necessary devices and software.
2. At the start of each month, we need to pay ¥35,000 for the rent and the miscellaneous office expenses. Suppose it will not change during the period we report
3. We use the first year to develop the website and insure it runs stably. According to our project management, we spend 3 months to develop the website and the next following 6 months we will focus on the maintenance of it.
4. We record the financial data from year1 to year4, and the staff training is only in the first 3 months of year1.
5. In the following 3 years, there will be little fluctuation in the profit and loss projection. We consider a inflation of 2.5% and make some adjustment in profit and loss.

1.5 Operation Plan

1.5.1 Product

1.5.1.1 Production Technology

1. The overall project adopts a microservice architecture to ensure the customizability of functions and code reuse.
2. Highly cohesive production methods, modular product components to meet the needs of customers of all levels.
3. The front-end template can be customized, the front-end functional components are modularized and the display components are templated to achieve the ultimate development purpose.

1.5.1.2 Customer Service

In the business tenet of "bringing customers the most satisfactory products and services", xxx Company solemnly promises: while ensuring the advancedness, reliability, and stability of the equipment, it will continuously improve the quality of service, from sales to after-sales. Cargo, commissioning, equipment maintenance management, technical services, user technical training and other aspects to ensure that customers can get the best service, so that customers are satisfied and assured.

1. Ensure that the system is correct, safe and the quality meets national standards, and submit it to the customer in time.
2. Provide high-quality and fast technical services

In order to better ensure the normal operation of the equipment, answer questions raised by users in time, and help users solve problems, the company's maintenance center and local maintenance outlets are responsible for the service of opening, maintenance, and technical consultation. Full-time engineers are responsible for the maintenance center to provide free technical consultation services to customers at any time.

Ensure that Jiangsu, Zhejiang, Shanghai and Anhui will rush to the site within 24 hours after receiving the user's fault call, and rush to the site within 48 hours in other regions, and solve the problem within 24 hours.

The company's maintenance center has a 24-hour telephone service, and full-time engineers accept user calls to ensure that users receive technical support in the process of using the equipment.

Hotline: 8008208820 24 hours: 13141592126

3. Free debugging and activation for users

Engineers are responsible for the installation, commissioning, commissioning and testing of on-site systems. After the system is successfully debugged, the supplier shall bring the test results to the user in writing, and the supplier's technical personnel may evacuate the site only after obtaining the user's consent.

4. Regular inspection

Our company regards the inspection system as one of the routine maintenance tasks, that is, the company organizes the inspection of the running equipment every six months. The company mainly inspects engineering and technical personnel, and has designers involved. And listen to the problems and recommendations reflected by user maintenance personnel, and constantly improve the software and hardware functions and quality of the product.

5. Warranty

The warranty period of the equipment under the contract is 18 months after successful installation and commissioning. During the warranty period (except for natural disasters and man-made damage), the maintenance costs and business travel costs are borne by the supplier.

6. Lifetime maintenance to ensure user benefits

The company's system is guaranteed free of charge for 18 months under normal conditions (excluding natural disasters and man-made damages) from the date of opening and acceptance. Outside the warranty period, the company will provide lifetime paid service.

7. Establish user files and improve product quality

In addition to carrying out user technical consulting services, the company's maintenance center is also responsible for accepting and collecting user complaint and consulting information, ensuring that users' questions and requirements can be handled in a timely manner, and tracking and verifying the processing status. At the same time, establish user files to record the product usage status, and provide a basis for future product quality improvement. We will continue to strive for excellence and bring customers the most satisfactory products and services.

8. The company's spare parts library can bring users 15 years of use and bring spare parts at the best price.

1.5.1.3 Product Development

1. Back-end services are assembled strictly in accordance with modularization to improve code reuse rate and reduce code error rate.
2. The front-end functional components are highly modular, and the non-functional display components provide users with customized services to meet the needs of various types of users.

1.5.1.4 Product Pricing

1. Pricing method:

Based on the product's high reusability and module customization, and a certain market share brought by the company's customized services, we decided

The target profit pricing method is adopted to price the products based on the company's annual estimated total cost and expected profit rate.

2. Data collection:

1. Based on R&D costs, operating costs, and interest on overdue loans, the expected total cost for 2 years is: 5935580 yuan
2. Software development VAT rate is 3% of sales
3. See sales forecast for expected sales
4. Expected profit rate is 10% of total operating expenses for 2 years

3. Pricing calculation:

$$2\text{YearSales} = (2\text{YearsExpectedCost} + 2\text{YearsSales} * 0.03) * 1.1$$

Calculated 2-year projected sales are: 6751952 yuan

Based on the expected sales volume, the 2-year sales volume is predicted to be 100

That is, the product is priced at 68,000 yuan

1.5.2 Office Environment

Location: Hongqiao Vanke Center, Lane 988, Shenchang Road, Changning District, Shanghai

Area: 90m², can accommodate 15-24 seats

Property: Hongqiao Vanke Center

Transportation: Metro Line 17 Hongqiao Railway Station 702 meters, Line 2 Hongqiao Railway Station 758 meters, Line 10 Main Line Hongqiao Railway Station 758 meters

Building area: 123000m²

1.5.3 Personnel

1.5.3.1 Number and Position

Job Title	Number (person)
Project Manager	1
Software Engineer	3
Test Engineer	2
Architect	1
Department Manager	1
Quality Assurance Supervisor	1
Marketer	2
Configuration Administrator	1
Process Improvement Engineer	1
Accountant	1
Cleaner	1
Total	15

1.5.3.2 Workforce Type

Job Title	Unskilled (person)	Skilled (person)	Profession (person)
Project Manager			1
Software Engineer		2	1
Test Engineer		1	1
Architect			1
Department Manager		1	
Quality Assurance Supervisor		1	
Marketer	1	1	
Configuration Administrator		1	
Process Improvement Engineer		1	
Accountant		1	
Cleaner		1	
Total	1	10	4

1.5.3.3 Salary Structure

Job Title	Salary (yuan/month)
Project Manager	14000
Software Engineer	18000
Test Engineer	16000
Architect	20000
Department Manager	12800
Quality Assurance Supervisor	9000
Marketer	8500
Configuration Administrator	7500
Process Improvement Engineer	8000
Accountant	7000
Cleaner	5000

1.5.4 Sales

1.5.4.1 Promotions

The promotion activities adopted for the online book shopping platform developed by the company mainly include two types. The daily promotion includes the company's official website promotion, cooperation website promotion, brochure promotion, periodic promotion includes game APP promotion, WeChat public account promotion, external activities sponsor;

Among them, the promotion of game APPs is promoted in a traffic game APP every month, depending on whether the promotion effect needs to choose another game APP, WeChat public account promotion chooses WeChat public account related to game recommendation for article promotion, and external event sponsorship to The frequency of twice a month selects sponsorship for game-related activities such as campus game festivals.

1.5.4.2 Promotional Budget

Promotion Items	Promotion cost (yuan)
Company official website promotion	1500
Cooperation website promotion	1500
Game APP promotion	2000
Brochure promotion	500
Sponsorship for external events	2500
WeChat public account promotion	2000
Total	10000

1.5.4.3 Sales Forecast

Through the sales of related systems on outsourcing websites, combined with the actual situation of our online physical game platform, we price the online physical game system at 68,000 yuan/set; the system will be developed from scratch in the first two months of the company. As a result, there is no sales volume. With the development and technological progress, and the promotion of promotion, the third month to the fifth month are expected to be able to sell three online physical game systems every month, the sixth month By the ninth month, it is expected to be able to sell four online physical game systems each month, and then gradually stabilize on the baseline of five systems sold per month.

2. Budget

2.1 Statement

Before the content of the financial management document, we first explain our basic conditions and premises:

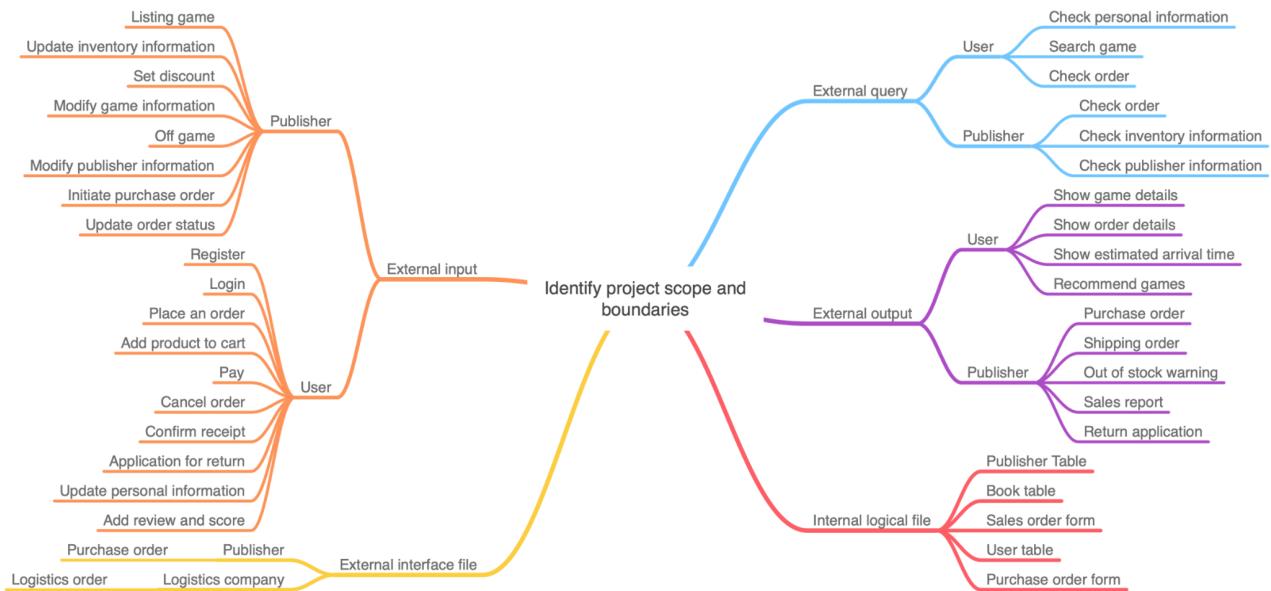
1. Our company is an independent Internet company that aims to develop a console game platform. At first, it may not pay attention to revenue and value the popularity and the number of users. After delivery, we will continue to maintain and improve the system.
2. The development cycle of the game platform ICE starts on March 10 and lasts about 4 months (17 weeks according to the plan).
3. Suppose our staff trains ICE platform administrators for 3 weeks, and it is only needed in the first month of a development cycle.
4. Apply for a loan at the beginning of the development process.
5. The length of the recorded financial data is 4 years.

2.2 Effort Estimation

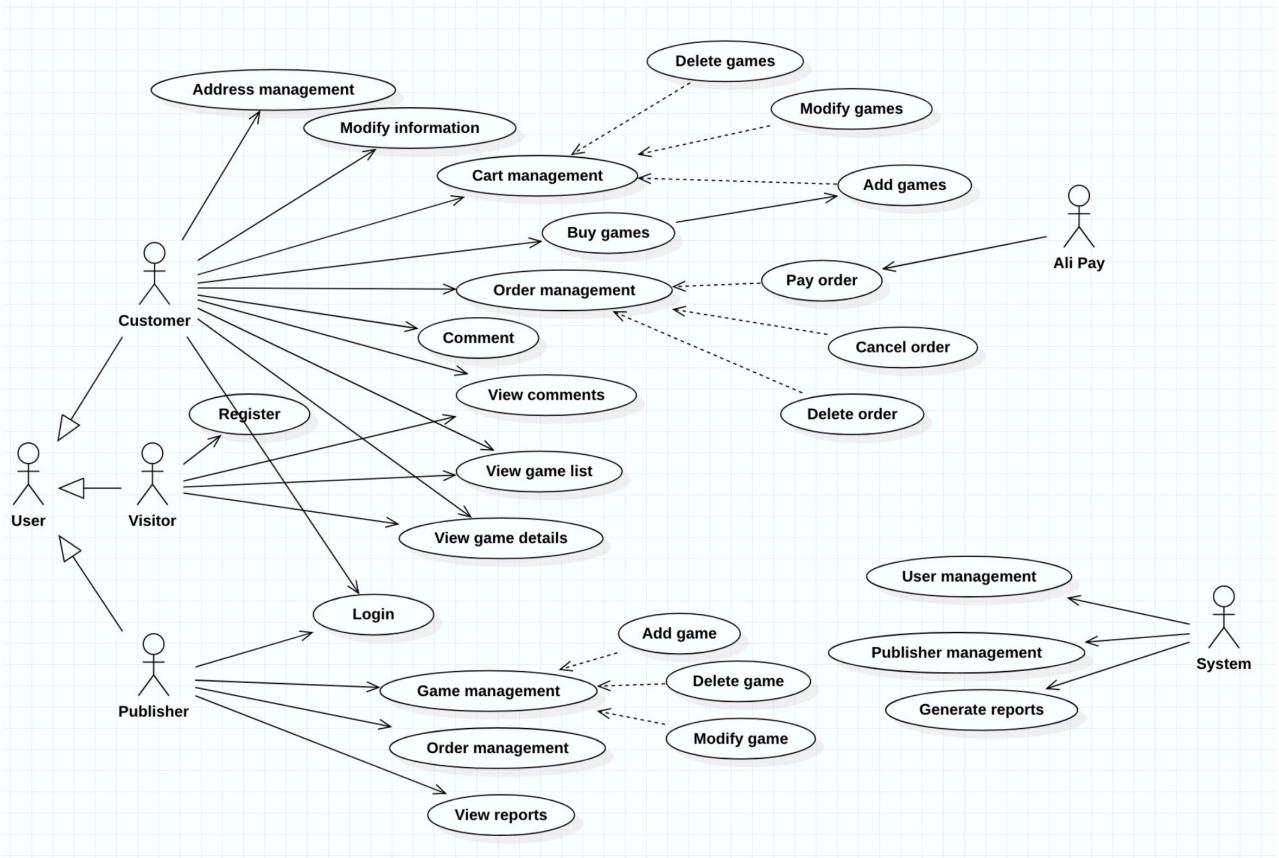
2.2.1 Function Points Estimation

This project adopts the project estimation method based on **Function Points**, focusing on the value of information domain, external input, external output, external query, internal logic document, external interface file identification and counting. We use **IFPUG standard** to analysis Function Points of our project, the steps are as following:

1. Identify project scope and boundaries



2. Use usecase diagrams to visualize the use cases(According to the scope and boundaries, but we make some adaptive adjustment here)



3. According to the five basic function types, we can get the **unadjusted function points**(based on both the mind map and the usecase diagram)

External User Type	Complexity Level									Total UFP	
	Simple			Average			Complex				
	Count	Score	Points	Count	Score	Points	Count	Score	Points		
EI	17	3	51	1	4	4	0	0	0		
EO	9	4	36	0	0	0	0	0	0		
EQ	6	3	18	0	0	0	0	0	0		
ILF	4	7	28	1	10	10	0	0	0		
EIF	2	5	10	0	0	0	0	0	0		
Total UFP			143			14			0	157	

4. The complexity matrix is calculated based on the complexity of the external user types, and the functions points of each complexity level are obtained by multiplying the number of external user types by the score value. As a result, we got the total UFP: 157.

5. The adjustment factor VAF is determined according to the 14 basic system characteristics by **Relative Complexity Adjustment Factor(RCAF)**, and the adjustment factor is applied to the unadjusted function point. Then we calculate the adjusted function points as follow:

No.	System Characteristic	Score
1	Requirement for reliable backup and recovery	2
2	Requirement for data communication	3
3	Extent of distributed processing	2
4	Performance requirements	5
5	Expected operational environment	2
6	Extent of online data entries	3
7	Extent of multi-screen or multi-operation online data input	0
8	Extent of online updating of master files	2
9	Extent of complex inputs, outputs, online queries and files	1
10	Extent of complex data processing	3
11	Extent that currently developed code can be designed for reuse	3
12	Extent of conversion and installation included in the design	2
13	Extent of multiple installations in an organization and variety of customer organizations	0
14	Extent of change and focus on ease of use	4
	Total	32

Then we can get **VAF(Value Adjustment Factor)** by

$$VAF = 0.65 + (0.01 * SUM(score)) = 0.97$$

ICE is a new development project and there is no need to integrate with other systems, and it does not involve a conversion function point (CFP).

6. Finally, we can get AFP (Adjusted Function Point) by

$$FP = UFP * VAF = 152.29$$

2.2.2 Development Effort Estimation

1. Software scale estimation

Scale calculation formula:

$$S = US * CF$$

S: Adjusted scale, unit is function point (FP).

US: Without adjusting the scale, the unit is function point (FP) , which is the calculated above.

CF: The scale change factor, which estimates the later planning stage, takes a value of 1. (Judging from the late estimation of the benchmark data of the Chinese software industry in 2019)

The calculation is:

$$S = 152.29FP$$

2. Adjusted effort estimates

According to the unadjusted workload calculation formula:

$$UE = C * S^a$$

UE: Unadjusted workload, unit is man-hours (ph).

C: Productivity adjustment factor, the median value of software development productivity of industry benchmark data is 7.10 person-hours/FP. (2019 China Software Industry Benchmark Data)

表 3.1 软件开发生产率基准数据明细

软件开发生产率详细信息（单位：人时/功能点）				
P10	P25	P50	P75	P90
2.29	4.08	7.10	12.37	17.31

Take the productivity adjustment factors at the time points 25, 50, and 75 of the function points as follows:

$$P_{25} = 4.08$$

$$P_{50} = 7.10$$

$$P_{75} = 12.37$$

a: The software scale adjustment coefficient calculated based on the benchmark data , which is assumed to be 1.

The calculation is:

$$UE_{25} = 621.34$$

$$UE_{50} = 1080.26$$

$$UE_{75} = 1883.83$$

According to the adjustment workload calculation formula:

$$AE = UE * A * IL * L * T$$

A E: Adjusted workload, unit is man-hour (ph).

A: Application field adjustment factor, value range 0.8~1.2, value 1.0 (check parameter table).

IL: Integrity level, value range 1.0~1.8, value 1.1 (check parameter table).

L: Development language adjustment factor, value range 0.8~1.2, value 1.0 (check parameter table).

T: Maximum team size, value range 0.8~1.2, value 1.0 (check parameter table).

The calculation is:

$$AE_{25} = 638.48$$

$$AE_{50} = 1189.38$$

$$AE_{75} = 2072.21$$

(When unit is ph, subscript represents percentage)

According to the specification, assuming 8 hours of work per day and 21.75 days per month, the converted workload is:

$$AE_{25} = 3.928$$

$$AE_{50} = 6.836$$

$$AE_{75} = 11.909$$

(Unit is pm, the following table represents the percentage)

Subsequent calculations will use the 50th percentile workload of person-months.

2.2.3 Operation and Maintenance Effort Estimation

Based on China's software industry benchmark database for operation and maintenance cost estimation, it is also necessary to first estimate the scale, and then estimate the workload and expenses.

From the above, the estimated results of the software scale are:

$$S = 152.29FP$$

Through reference materials, we found a workload calculation method similar to the above:

工作量 AE = 调整后规模 × 生产率调整因子 × 运维水平要求因素 × 运维能力因素 × 运维系统特征因素

Productivity adjustment factor: The software operation and maintenance productivity median value of industry benchmark data is 0.92 person-hours/FP.

表 3.3 应用软件运维生产率基准数据明细

应用软件运维生产率详细信息 (单位: 人时/功能点)				
P10	P25	P50	P75	P90
0.32	0.57	0.92	1.54	2.16

Take the productivity adjustment factors at the time points 25, 50, and 75 of the function points as follows:

$$P25 = 0.57$$

$$P50 = 0.92$$

$$P75 = 1.54$$

Factors required for operation and maintenance level : value 0.95.

Operation and maintenance capability factor : value 1.00.

Characteristic factors of operation and maintenance system : value 1.14.

The calculated effort is:

$$AE_{25} = 94.01$$

$$AE_{50} = 151.74$$

$$AE_{75} = 253.99$$

(When unit is ph, subscript represents percentage)

According to the specification, assuming 8 hours of work per day and 21.75 days per month, the converted workload is:

$$AE_{25} = 0.540$$

$$AE_{50} = 0.872$$

$$AE_{75} = 1.460$$

(Unit is pm, the following table represents the percentage)

Subsequent calculations will use the 50th percentile workload of person-months.

2.3 Development Cost Estimation

2.3.1 Direct Labor Cost Estimation

The direct labor cost includes the human resources expenses such as the salaries, bonuses and benefits of the project team members of the developer. Among them, project members include all R&D or support personnel involved in the project's R&D process, such as project managers, requirements analysts, designers, developers, testers, deployers, user documentation writers, quality assurance personnel, configuration managers, etc. . For the part-time personnel engaged in the research and development of the project, the human resources cost is converted according to the proportion of the project workload in their total workload.

Activity	Requirement	Design	Construction	Test	Deployment
Effort percent	13.95%	13.16%	40.26%	21.89%	10.74%
Effort (pm)	0.9536pm	0.8996pm	2.7522pm	1.4964pm	0.7342pm

According to the industry monthly benchmark rate data, the average monthly rate in Shanghai is 28548 yuan/pm. This data represents the median of the regional statistics (P50), which is 21.75 days in January. **Expenses include direct labor costs for software development, indirect labor costs, some indirect non-labor costs and reasonable profits, excluding direct non-labor costs.**

For insurance, the calculation is: **direct labor cost + indirect labor cost = Yuan.** (No longer calculated after indirect labor cost)

2.3.2 Direct Non-labor Cost Estimates

Direct non-labor costs mainly include:

1. Office expenses, that is, the administrative office expenses incurred by the developer to develop this project, such as office supplies, communications, mailing, printing, conferences, etc.;
2. Travel expenses, that is, travel expenses incurred by the developer to develop this project, such as transportation, accommodation, and travel subsidies;
3. Training fee, that is, the cost of special training arranged by the developer for research and development of this project;
4. Business expenses, that is, expenses incurred by the developer in order to complete the R&D work of this project, such as hospitality fees, review fees, inspection fees, etc.;
5. Procurement fee, that is, the developer needs to purchase special assets or services for the development of this project, such as special equipment fee, special software fee, technical cooperation fee, patent fee, etc.;
6. Others, that is not listed in the above project but it is the cost of the developer to develop this project.

Cost Category	Amount	
Office expenses	Office Supplies	¥2000.00
	Communication fee	¥1700.00
	Printing fee	¥600.00
	Total	¥4300.00
Travel expenses	Transportation fee	¥4000.00
	Accommodation fee	¥6000.00
	Total	¥10000.00
Training fee	Training fee	¥8000.00
	Total	¥8000.00
Service fee	Review fee	¥3000.00
	Inspection fee	¥2000.00
	Total	¥5000.00
Purchase fee	Equipment rental fee	¥36000.00
	Software purchase fee	¥10000.00
	Equipment purchase fee	¥40000.00
	Total	¥86000.00
Total		¥113300.00

2.3.3 Indirect Labor Cost Estimation

Indirect labor cost refers to the allocation of human resources costs of non-project team personnel who serve the overall needs of R&D management. Including the allocation of wages, bonuses, benefits, etc. of R&D department managers, project management office (PMO) personnel, engineering process group (EPG) personnel, product planners, organization-level quality assurance personnel, organization-level configuration management personnel, etc.

2.3.4 Indirect Non-labor Cost Estimates

Indirect non-labor cost refers to the non-labor cost allocation that the developer does not incur for a specific project, but serves the overall R&D activities. Including the rent of the R&D site of the developer, water and electricity, and property, the allocation of the daily office expenses of the R&D personnel, and the rental, maintenance, and depreciation of various R&D office equipment.

Cost Category	Amount
Rental fee	¥56000.00
Utilities fee	¥8000.00
Equipment Maintenance fee	¥4000.00
Property costs	¥6000.00
Daily office expenses	¥6000.00
Total	¥80000.00

2.3.5 Total Development Cost Estimate

According to the calculation formula of software development cost:

$$SDC = DHC + DNC + IHC + INC$$

SDC: Software R&D cost, the unit is yuan;

DHC: Direct labor cost, the unit is yuan;

DNC: Direct non-labor costs, the unit is yuan;

IHC: Indirect labor cost, the unit is yuan;

INC: Indirect non-labor costs, the unit is yuan.

Calculated software development cost:

$$SDC = 38854\text{¥}$$

2.4 Operation and Maintenance Cost Estimation

2.4.1 Labor Cost Estimation (direct + indirect)

According to the benchmark data of the industry monthly rate, the average monthly rate in Shanghai is 23,593 yuan/pm. This data represents the median of the regional statistics (P50), which is 21.75 days in January. **Expenses include direct labor costs for software development, indirect labor costs, some indirect non-labor costs and reasonable profits, excluding direct non-labor costs.**

For insurance, the calculation is: **direct labor cost + indirect labor cost = 20573 Yuan.** (Workload during operation and maintenance period 0.872 person-months)

2.4.2 Non-labor Cost Estimates (direct + indirect)

Cost Category	Amount
Rental fee	¥28000.00
Utilities fee	¥4000.00
Equipment Maintenance fee	¥2000.00
Property costs	¥3000.00
Daily office expenses	¥3000.00
Communication fee	¥850.00
Printing fee	¥300.00
Travel expenses	¥5000.00
Advertisement fee	¥10000.00
Total	¥56150.00

Addition calculation:

运维成本总计为 : 76723¥

2.5 Source of Budgets

Source	Ourselves	ICBC	Total
Amount	¥800000.00	¥1000000.00	¥180000.00
Type	Originator	Liability	

2.6 Repayment Strategies

If you want to repay 400,000.00 yuan, and consider that the annual interest rate is 4.75% (medium and long-term loans: one to five years, including five years), which is equivalent to a monthly interest rate of 0.396%, and the plan is to pay off in three years. We can choose two repayment methods: equal principal repayment.

2.6.1 Equivalent Principal:

For this method, the loan payment is equal to the sum of principal and interest. For fixed principal loans, the loan repayment amount will decrease during the loan term. The principal included in each payment remains unchanged, but the interest decreases during each payment period. The fixed principal loan plan is also called "fixed principal falling interest loan amortization plan".

Equal Principle Repayment

Repayment	Equal Principle Repayment	Total repayment: ¥1073260.00		Total interest: ¥73260.00
Number of Period	Monthly Supply	Monthly Principle	Monthly Interest	Principle Balance
1	¥31737.78	¥27777.78	¥3960.00	¥972222.22
2	¥31627.78	¥27777.78	¥3850.00	¥944444.44
3	¥31517.78	¥27777.78	¥3740.00	¥916666.66
4	¥31407.78	¥27777.78	¥3630.00	¥888888.88
5	¥31297.78	¥27777.78	¥3520.00	¥861111.10
6	¥31187.78	¥27777.78	¥3410.00	¥833333.32
7	¥31077.78	¥27777.78	¥3300.00	¥805555.54
8	¥30967.78	¥27777.78	¥3190.00	¥777777.76
9	¥30857.78	¥27777.78	¥3080.00	¥749999.98
10	¥30747.78	¥27777.78	¥2970.00	¥722222.20
11	¥30637.78	¥27777.78	¥2860.00	¥694444.42
12	¥30527.78	¥27777.78	¥2750.00	¥666666.64
13	¥30417.78	¥27777.78	¥2640.00	¥638888.86
14	¥30307.78	¥27777.78	¥2530.00	¥611111.08
15	¥30197.78	¥27777.78	¥2420.00	¥583333.30
16	¥30087.78	¥27777.78	¥2310.00	¥555555.52
17	¥29977.78	¥27777.78	¥2200.00	¥527777.74
18	¥29867.78	¥27777.78	¥2090.00	¥499999.96
19	¥29757.78	¥27777.78	¥1980.00	¥472222.18
20	¥29647.78	¥27777.78	¥1870.00	¥444444.40
21	¥29537.78	¥27777.78	¥1760.00	¥416666.62
22	¥29427.78	¥27777.78	¥1650.00	¥388888.84
23	¥29317.78	¥27777.78	¥1540.00	¥361111.06
24	¥29207.78	¥27777.78	¥1430.00	¥333333.28
25	¥29097.78	¥27777.78	¥1320.00	¥305555.50
26	¥28987.78	¥27777.78	¥1210.00	¥277777.72
27	¥28877.78	¥27777.78	¥1100.00	¥249999.94
28	¥28767.78	¥27777.78	¥990.00	¥222222.16
29	¥28657.78	¥27777.78	¥880.00	¥194444.38
30	¥28547.78	¥27777.78	¥770.00	¥166666.60
31	¥28437.78	¥27777.78	¥660.00	¥138888.82
32	¥28327.78	¥27777.78	¥550.00	¥111111.04
33	¥28217.78	¥27777.78	¥440.00	¥83333.26
34	¥28107.78	¥27777.78	¥330.00	¥55555.48
35	¥27997.78	¥27777.78	¥220.00	¥27777.70
36	¥27887.70	¥27777.70	¥110.00	¥0.00
Total	¥1073260.00	¥1000000.00	¥73260.00	

2.6.2 Equal Repayment of Principal and Interest: (selected)

For this method, the repayment amount remains unchanged during the mortgage period. Each payment will reduce the principal, resulting in a reduction in interest payable. During the loan period, the payment amount is the same, but the payment method has changed: the portion of the payment applied to the principal increases with time, and the portion used for interest decreases because the principal owed is less.

Equal Repayment of Principle and Interest

Repayment	Equal Principle Repayment	Total repayment: ₩1074948.48		Total interest: ₩74948.48
Number of Period	Monthly Supply	Monthly Principle	Monthly Interest	Principle Balance
1	₩29859.68	₩25899.68	₩3960.00	₩974100.32
2	₩29859.68	₩26002.24	₩3857.44	₩948098.08
3	₩29859.68	₩26105.21	₩3754.47	₩921992.87
4	₩29859.68	₩26208.59	₩3651.09	₩895784.28
5	₩29859.68	₩26312.37	₩3547.31	₩869471.90
6	₩29859.68	₩26416.57	₩3443.11	₩843055.33
7	₩29859.68	₩26521.18	₩3338.50	₩816534.15
8	₩29859.68	₩26626.20	₩3233.48	₩789907.95
9	₩29859.68	₩26731.64	₩3128.04	₩763176.30
10	₩29859.68	₩26837.50	₩3022.18	₩736338.80
11	₩29859.68	₩26943.78	₩2915.90	₩709395.02
12	₩29859.68	₩27050.48	₩2809.20	₩682344.55
13	₩29859.68	₩27157.60	₩2702.08	₩655186.95
14	₩29859.68	₩27265.14	₩2594.54	₩627921.81
15	₩29859.68	₩27373.11	₩2486.57	₩600548.70
16	₩29859.68	₩27481.51	₩2378.17	₩573067.19
17	₩29859.68	₩27590.33	₩2269.35	₩545476.86
18	₩29859.68	₩27699.59	₩2160.09	₩517777.27
19	₩29859.68	₩27809.28	₩2050.40	₩489967.99
20	₩29859.68	₩27919.41	₩1940.27	₩462048.58
21	₩29859.68	₩28029.97	₩1829.71	₩434018.61
22	₩29859.68	₩28140.97	₩1718.71	₩405877.65
23	₩29859.68	₩28252.40	₩1607.28	₩377625.24
24	₩29859.68	₩28364.28	₩1495.40	₩349260.96
25	₩29859.68	₩28476.61	₩1383.07	₩320784.35
26	₩29859.68	₩28589.37	₩1270.31	₩292194.98
27	₩29859.68	₩28702.59	₩1157.09	₩263492.39
28	₩29859.68	₩28816.25	₩1043.43	₩234676.14
29	₩29859.68	₩28930.36	₩929.32	₩205745.78
30	₩29859.68	₩29044.93	₩814.75	₩176700.85
31	₩29859.68	₩29159.94	₩699.74	₩147540.90
32	₩29859.68	₩29275.42	₩584.26	₩118265.49
33	₩29859.68	₩29391.35	₩468.33	₩88874.14
34	₩29859.68	₩29507.74	₩351.94	₩59366.40
35	₩29859.68	₩29624.59	₩235.09	₩29741.81
36	₩29859.68	₩29741.81	₩117.87	₩0.00
Total	₩1074948.48	₩1000000.00	₩74948.48	

We chose this method to repay the loan, because the payment for the first three months is much lower than the latter method. In addition, the difference between the two methods in the final payment is small. Therefore, considering these factors, we decided to choose the second factor.

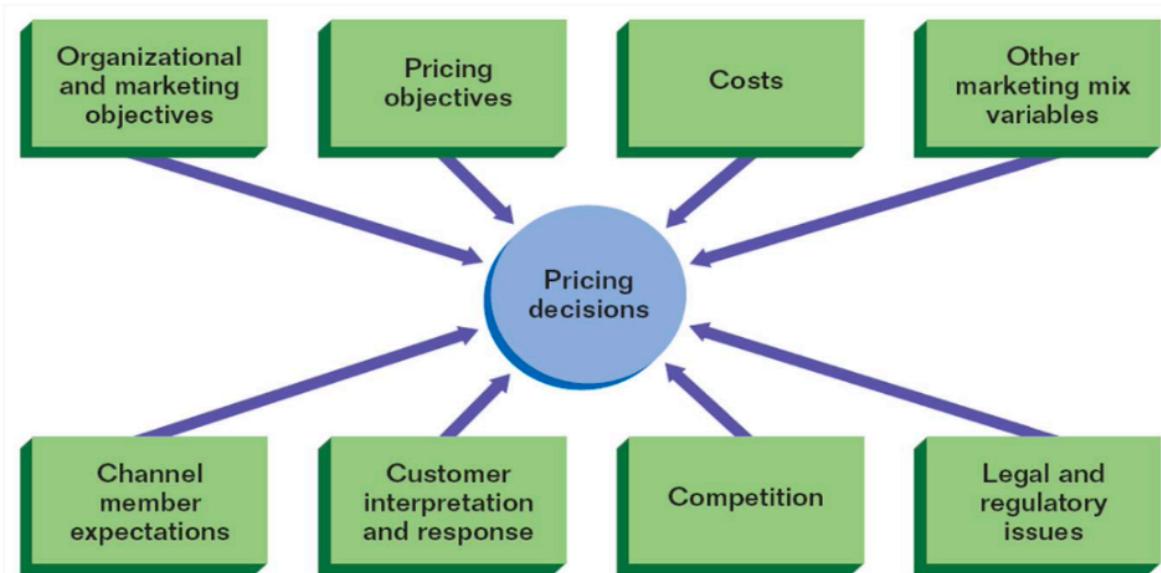
3.Financial Evaluation

3.1 Pricing Strategy

Business may benefit from lowering or raising prices, depending on the needs and behaviors of customers and clients in the particular market. Finding the right pricing strategy is an important element in running a successful business. So at the beginning of financial evaluation of our ICE project, we concrete on the pricing strategy.

3.1.1 Factors Affecting Pricing

According to the *SEE.ch09.lecture 8th PPT of Prof. Huang*, there are 8 essential factors that are supposed to be taken into consideration, they are showing as follow:



3.1.2 Six Steps For Pricing Decision

And after compare the 5 main pricing strategies of software which are Personalized Pricing, Group Pricing, Versioning Pricing, Bundling Pricing, Usage-based Pricing. We make a 7 steps procedure for determine the pricing strategy.

1. Organization and market objectives

1. a more convenient online entity game trading environment
2. a more direct interactive platform for game publisher and game buyer and lovers
3. a more convenient way for entity game lover compare to online game and other electronic game

2. Determining the pricing objective

- survival
- maximum current profit
- maximum market share
- quickly occupy the direct sales licenses of large entity game publishers

3. Considering the demand

- elasticity
- the relationship between price and demand
- the sensitivity for demand to price
- adjust business strategy in real time

4. Estimating the cost in 4 aspects mentioned in The National Standard

- direct labor costs
- direct non-labor costs
- indirect labor costs
- indirect non-labor costs

5. Analysis competitor's price strategy

- competitor's costs
- competitor's prices
- competitor's market share compare to me
- competitor's market share to the whole market
- competitors products

6. Legal and regulatory issues

According to the relevant regulations of the Chinese government, we must supervise the types of entity games on sale, which may also bring costs for labors.

3.1.3 Determine the Final Price Strategy

1. Selecting the final pricing method

There are 6 method of pricing we can choose

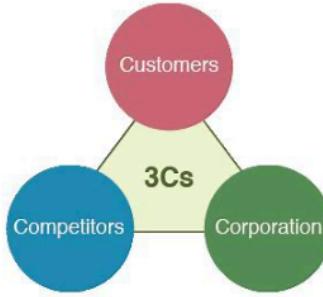
- Mark up pricing
- Target - return pricing
- Perceived - value pricing
- Value - pricing
- Going - rate pricing
- Sealed - bid pricing

After considering the pricing objects and the determine demand, we chose the **Mark-up pricing** finally

$$Price = Cost + ProfitMargin$$

Also we take **Bundling pricing** into combination, this means we open up different interfaces for customers which is similar to Prime users on Amazon. And with different payment strategies or policies, they can enjoy different services including ideal products recommendation, more convenient shopping experience, less uncorrelated ads, multiple themes and patterns and so on...

2. Setting the price by using **3 Cs Strategic Triangle Model**



For entity games publishers:

Firstly, the entity game publishers who want to use our platform should pay ¥5,000 for their credits and the guarantee of their record in the ministry of industry and information technology annually.

By considering competitor's prices and profit margins, we determined our final profit as 20%. This mean we want to gain 20% of the cost we spend from the entity games publishers.

For entity games customers:

According to our developing cost ¥388,454 and maintenance cost ¥76723 monthly, we finally make 4 kinds of services for entity games publishers to choose, they are:

Service A: 50% common customers. ¥10,000 per year (basic)

Service B: 30% customers and a slightly lower promotion effort than Service A. ¥30,000 per year. (middle)

Service C: 20% customers, promotion by our website and their entity games can be chosen firstly. ¥50,000 per year (prime)

3.2 Cash Flow

3.2.1 Statements of Cash Flow

Before we use the techniques we learnt from the course based on Prof Huang's lecture, we make some statements on our cash flow:

1. Each cash flow is calculated at the end of the year.
2. For the 12 month cash flow from 2020 to 2022, we definite one season as one software development cycle.
3. For the 3 year cash flow, estimate costs and sales are based on the data of the first year.
4. The first four months are development months, and the other is maintenance months.

5. Sales of our ICE online Entity Game increase every year and with a normal rate. This means the number of publisher, number of normal customer, number of prime customer will increase with a normal rate(also we take a slight random distribution into consideration).
6. Rent costs, miscellaneous increase with currency inflation.
7. According to the national policies on software industry, at the first two years, we needn't to pay any tax. The tax rate of year 3 is 12.5%.
8. Basic formula for cash flow calculation we use is:

$$CashFlow_t = TotalInflow_t - TotalOutflow_t + CashFlow_{t-1}$$

9. The salary of our team members increases with a 10% rate per year.

According to these 9 statements we mentioned above, we make the cash flow of the first three years of our company and also we make a global cash flow for all of the three years.

First, we divide the cash flow into 2 aspects.

Cash flow inflows

Cash flow outflow

As for the total product sales, we divide it into 3 parts which is mentioned in the **Part II: 2.2.2**

Development Effort Estimation. As for development costs and operating costs, we divide the development costs into labor costs and non-labor costs which is mentioned in the **Part II: 2.2.3 Operation and Maintenance Effort Estimation.**

And after that, we transform our point of view into another aspect, in which we divide the cash flow table into 3 parts:

Operating cash flow

Investing cash flow

Financing cash flow

We transform total product sales which come from the cash flow inflows above, and we expand the non-labor costs into 10 parts(office expenses, travel expenses, staff training, service expenses, equipment and software purchase, rent, utilities, equipment maintenance fee, property costs, daily office expenses). Also we expand the investment into investing inflows and investing outflows consist of several subjects. Thirdly we combine start-up capital, loan and other related financing into the financing cash flow.

From the second form of cash flow table we can get the details of cash flow more visually and we can also understand the significant of cash flow more meaningful.

3.2.5 Project Cash Flow in 3 years

Finally, the following table is the 3-year cash flow chart. We assume that the revenue from selling services for entity game publishers and entity game customers rises at a reasonable rate. At the same time, miscellaneous fees and rents are also rising accordingly due to inflation. And also we draw a 3-year cash flow trend which shows that the overall company's cash flow rising in the last column of the project cash flow in 3 years.

3 Year Cash Flow Plus				
	Year 1	Year 2	Year 3	Total
Operating Cash Flow				
Operating Inflows				
Total product sales	¥2810000.00	¥6000000.00	¥6000000.00	¥14810000.00
Publisher: Rent and Service charge	¥674400.00	¥1440000.00	¥1440000.00	¥3554400.00
Customer: Transaction draw	¥1714100.00	¥3660000.00	¥3660000.00	¥9034100.00
Customer: VIP Service	¥421500.00	¥900000.00	¥900000.00	¥2221500.00
Others related to operating inflow	¥0.00	¥0.00	¥0.00	¥0.00
Total of operating inflows	¥2810000.00	¥6000000.00	¥6000000.00	¥14810000.00
Operating Outflows				
Personal costs(wage)	-¥2506432.00	-¥2588724.00	-¥2588724.00	-¥7683880.00
Non-labor costs	-¥1138100.00	-¥553800.00	-¥553800.00	-¥2245700.00
Office expenses	-¥22100.00	-¥13800.00	-¥13800.00	-¥49700.00
Travel expenses	-¥80000.00	-¥60000.00	-¥60000.00	-¥200000.00
Staff training	-¥32000.00	¥0.00	¥0.00	-¥32000.00
Service expenses	-¥20000.00	¥0.00	¥0.00	-¥20000.00
Equipment and Software purchase	-¥344000.00	¥0.00	¥0.00	-¥344000.00
Rent	-¥448000.00	-¥336000.00	-¥336000.00	-¥1120000.00
Utilities	-¥64000.00	-¥48000.00	-¥48000.00	-¥160000.00
Equipment maintenance fee	-¥32000.00	-¥24000.00	-¥24000.00	-¥80000.00
Property costs	-¥48000.00	-¥36000.00	-¥36000.00	-¥120000.00
Daily office expenses	-¥48000.00	-¥36000.00	-¥36000.00	-¥120000.00
Loan interest	-¥40677.82	-¥25232.57	-¥9055.20	-¥74965.59
VAT	¥0.00	¥0.00	-¥750000.00	-¥750000.00
Others related to the operating outflow(Ad)	-¥80000.00	-¥120000.00	-¥120000.00	-¥320000.00
Total of operating outflows	-¥3765209.82	-¥3287756.57	-¥4021579.20	-¥11074545.59
Investing Cash Flow				
Investing Inflows				
Sales of fixed assets and intangible assets	¥0.00	¥0.00	¥0.00	¥0.00
Sales of investment products (such as bonds)	¥0.00	¥50000.00	¥150000.00	¥200000.00
Interest income from investment products	¥0.00	¥3105.00	¥9315.00	¥12420.00
Others related to investing inflow	¥0.00	¥0.00	¥0.00	¥0.00
Total of investing inflows	¥0.00	¥53105.00	¥159315.00	¥212420.00
Investing Outflows				
Buying of investment products (such as bonds)	¥0.00	-¥50000.00	-¥150000.00	-¥200000.00
Acquisition of fixed assets and intangible assets	¥0.00	-¥51000.00	¥0.00	-¥51000.00
Others related to investing outflow	¥0.00	¥0.00	¥0.00	¥0.00
Total of investing outflows	¥0.00	-¥101000.00	-¥150000.00	-¥251000.00
Financing Cash Flow				
Financing Inflows				
Received Investment	¥800000.00	¥0.00	¥0.00	¥800000.00
Loan	¥1000000.00	¥0.00	¥0.00	¥1000000.00
Others related to financing inflow	¥0.00	¥0.00	¥0.00	¥0.00
Total of financing inflows	¥1800000.00	¥0.00	¥0.00	¥1800000.00
Financing Outflows				
Loan Principles Repaid	-¥317655.44	-¥333083.59	-¥349260.97	-¥1000000.00
Dividends of shareholders	¥0.00	¥0.00	¥0.00	¥0.00
Others related to financing outflows	¥0.00	¥0.00	¥0.00	¥0.00
Total of financing outflows	-¥317655.44	-¥333083.59	-¥349260.97	-¥1000000.00
Net profit	-¥83832.00	¥2860581.00	¥2116791.00	¥4142840.00
Total Cash Flow Inflow	¥4610000.00	¥6053105.00	¥6159315.00	¥16822420.00
Total Cash Flow Outflow	-¥4087165.26	-¥3721840.16	-¥4520840.17	-¥1235545.59
Total Net Cash Flow	¥522834.74	¥2331264.84	¥1638474.83	¥4496874.41
Cumulative Cash Flow	¥522834.74	¥2854099.58	¥4492574.41	

From the cash flow of these three years, there are something deserved to mention:

- For operating cash flows: Inflows of operating flow are mainly came from sales of good which is a circle in every season. For operating outflows, at the beginning of the project, we spent ¥388454 for development costs monthly sustain for 4 months. And ¥195154 for operating costs monthly from the 5th month to the end. Personal cost is stable every month within one year. Miscellaneous expenses and rent is the same in each month.

2. For investing cash flows: We have no plan on any investment since we are a start-up company and we don't have relevant skills in this area currently in the first year. And as for the last two years, we spent some money for buying of investment products(such as bonds).

3. For financing cash flow: We have ¥800000 by investment and ¥1000000 from loan in the first month in 2020. And we should also pay taxes according to laws and regulations.

From the figure, we can see that our profit keeps increasing in this 3 years.

3.3 Depreciation & Amortization

To develop our ICE online entity game website, we spent totally ¥40,000 on hardware(devices) and ¥10,000 on the software, so we have to discuss about their depreciation and amortization when calculating the profit.

3.3.1 Depreciation

Depreciation are not cash-flow instances actually, it refers to the decline in the value of fixed assets. Depreciation is assessed according to the established method.

We use the **Declining Balance Depreciation method** as mentioned in the lecture of Prof. Huang's lecture. The formulas are shown as follows:

$$\begin{aligned} \text{Depreciation}_{\text{year}(t)} &= a * \text{BookValue}_{\text{year}(t-1)} \\ \text{BookValue}_{\text{year}(t)} &= \text{AcquisitionCost} * (1 - a)^t \end{aligned}$$

As for our research, the depreciation period of electronic hardware and other devices are usually 4~10 years. The residual value is 5% of the initial value. So we set as 0.33 and the results is shown as follow:

Depreciation

End of Year	Depreciation in that year	Book Value at end of year
0		¥40000.00
1	¥4000.00	¥36000.00
2	¥3600.00	¥32400.00
3	¥3240.00	¥29160.00
4	¥2916.00	¥26244.00
5	¥2624.40	¥23619.60

3.3.2 Amortization

The software we purchased at the beginning of the development should be managed as intangible assets. They are in accordance with the annual cost of their use and similar to the depreciation of fixed assets, and they should be amortized.

We use **Straight-line method of amortization** to calculate the amortization. The formula are shown as follows:

$$Amortization = \frac{(AcquisitionCost - SalvageValue)}{Lifespan}$$

$$BookValueYear(t) = AcquisitionCost - (t * Amortization)$$

According to the relevance provision of the government, we choose 5 years as the amortization since the software we purchased doesn't have a defined benefit period. The result is shown as follow:

Amortization

End of Year	Amortization in that year	Book Value at end of year
0		¥10000.00
1	¥1000.00	¥9000.00
2	¥900.00	¥8100.00
3	¥810.00	¥7290.00
4	¥729.00	¥6561.00
5	¥656.10	¥5904.90

3.4 Profit & Loss Statement

Statements

- According to the national policies, we needn't to pay any tax in first two years, and we should pay 12.5% of VAT in the third year.
- Depreciation, miscellaneous and amortization are decreasing through these years.
- We pay the salary to the team members monthly.
- We repay the loan in the first 3 years, so the the interest rate becomes 0 at the end of the 3rd year.
- From the total net income, we can see that the net income is increasing with increase of year.

12 Months Profit and Loss Projection

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Total product sales	¥0.00	¥0.00	¥0.00	¥0.00	¥204000.00	¥246000.00	¥288000.00	¥330000.00	¥372000.00	¥414000.00	¥456000.00	¥500000.00
Produce costs	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00	-¥199154.00
Gross income	-¥199154.00											
Office expenses	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00	-¥4300.00
Travel expenses	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00	-¥10000.00
Staff training	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00
Service expenses	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00	-¥5000.00
Equipment and Software purchase	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00	-¥86000.00
Rent	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00	-¥56000.00
Utilities	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00	-¥8000.00
Equipment maintenance fee	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00	-¥4000.00
Property costs	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00
Daily office expenses	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00	-¥6000.00
Depreciation	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33	-¥333.33
Amortization	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33	-¥83.33
Operating income	-¥388870.66											
Loan interest	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00	-¥3560.00
Income before tax	-¥392330.66											
Tax	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00	¥0.00
Income after tax	-¥392330.66											
Other Net Profit	¥0.00											
Total Net Income	-¥392330.66											

3 Year Profit and Loss Projection

	Year 1	Year 2	Year 3	Total
Total product sales	¥2810000.00	¥6000000.00	¥6000000.00	¥14810000.00
Produce costs	-¥2506432.00	-¥2588724.00	-¥2588724.00	-¥7683880.00
Gross income	¥303568.00	¥3411276.00	¥3411276.00	¥7126120.00
Office expenses	-¥26400.00	-¥138000.00	-¥138000.00	-¥54000.00
Travel expenses	-¥80000.00	-¥60000.00	-¥60000.00	-¥200000.00
Staff training	-¥32000.00	¥0.00	¥0.00	-¥32000.00
Service expenses	-¥20000.00	¥0.00	¥0.00	-¥20000.00
Equipment and Software purchase	-¥344000.00	¥0.00	¥0.00	-¥344000.00
Rent	-¥448000.00	-¥336000.00	-¥336000.00	-¥1120000.00
Utilities	-¥64000.00	-¥48000.00	-¥48000.00	-¥160000.00
Equipment maintenance fee	-¥32000.00	-¥24000.00	-¥24000.00	-¥80000.00
Property costs	-¥48000.00	-¥36000.00	-¥36000.00	-¥120000.00
Daily office expenses	-¥48000.00	-¥36000.00	-¥36000.00	-¥120000.00
Depreciation	-¥4000.00	-¥3600.00	-¥3240.00	-¥10840.00
Amorization	-¥1000.00	-¥900.00	-¥810.00	-¥2710.00
Operating income	-¥843832.00	¥2852976.00	¥2853426.00	¥4862570.00
Loan interest	-¥40677.82	-¥25232.57	-¥9055.20	-¥74965.59
Income before tax	-¥884509.82	¥2827743.43	¥2844370.80	¥4787604.41
Tax	¥0.00	¥0.00	¥355546.35	¥355546.35
Income after tax	-¥884509.82	¥2827743.43	¥3199917.15	¥5143150.76
Other Net Profit	¥0.00	¥0.00	¥0.00	¥0.00
Total Net Income	-¥884509.82	¥2827743.43	¥3199917.15	¥5143150.76

3.5 Balance Sheet

Because the balance sheet is based on accuracy data, we are supposed to choose a specific point in time for analysis. In the following calculating we choose December 31th of each year for checkpoint to calculate the balance sheet.

In intangible assets, we have to think about intellectual assets. Here, we have searched for information about intellectual assets. This is because the value of knowledge assets is difficult to measure, so there is no need to consider amortization.

Balance Sheet

	Year 1	Year 2	Year 3
Assets			
Current Assets			
Cash and Cash Equivalents	¥522834.74	¥2854099.58	¥4492574.41
Temporary Investment	¥0.00	¥0.00	¥0.00
Accounts Receivable	¥0.00	¥0.00	¥0.00
Inventory	¥0.00	¥0.00	¥0.00
Prepaid insurance	¥0.00	¥0.00	¥0.00
Others	¥0.00	¥0.00	¥0.00
Long-term Assets			
Long-term Investments	¥0.00	¥0.00	¥0.00
Others	¥0.00	¥0.00	¥0.00
Fixed Assets			
Equipments	¥40000.00	¥40000.00	¥40000.00
Less: Accu Depreciation	-¥4000.00	-¥3600.00	-¥3240.00
Others	¥0.00	¥0.00	¥0.00
Intangible Assets			
Intellectual Assets	¥293409.18	¥659257.81	¥769428.20
Software	¥10000.00	¥10000.00	¥10000.00
Less: Accu Amorization	-¥1000.00	-¥900.00	-¥810.00
Others	¥0.00	¥0.00	¥0.00
Total Assets	¥861243.92	¥3558857.39	¥5307952.61
Liabilities			
Current Liabilities			
Accounts Payable	¥0.00	¥0.00	¥0.00
Wages Payable	¥0.00	¥0.00	¥0.00
Interest Payable	¥34287.77	¥9055.20	¥0.00
Tax Payable	¥0.00	¥0.00	¥750000.00
Long-term Liabilities			
Loan	¥682344.56	¥349260.97	¥0.00
Others	¥0.00	¥0.00	¥0.00
Total Liabilities	¥716632.33	¥358316.17	¥750000.00
Owner's Equity			
Common Stocks	¥0.00	¥0.00	¥0.00
Net Paid-in Capital	¥0.00	¥0.00	¥0.00
Dividends Payable	¥0.00	¥124817.69	¥154943.86
Retained Earnings	¥144611.59	¥3075723.53	¥4403008.75
Total Owner's Equity	¥144611.59	¥3200541.22	¥4557952.61
Total Liabilities and Owner's Equity	¥861243.92	¥3558857.39	¥5307952.61
Total Liabilities and Owner's Equity = Total Assets	Equal	Equal	Equal

In the balance sheet:

1. Cash Equivalent is the Cumulative Cash Flow in the 3-year cash flow table, which can be understood as the money in hand at this point of time.
2. Wage Payable is the salary to be paid in December.
3. Interest is the remaining unpaid Interest.
4. Tax Payable
5. Dividends Payable is the dividend in this year, likewise, we will pay for dividends at the end of the year(after the first year)

The formula in the textbook

$$\text{TotalAssets} = \text{TotalLiabilities} + \text{TotalOwner'sEquity}$$

4. Economic Evaluation

4.1 Break-Even Analysis

Break-Even Analysis				
	Year 0	Year 1	Year 2	Year 3
Cost				
Cost	¥1800000.00	¥4087165.26	¥3721840.16	¥4520840.17
Discount factor	1	0.904977376	0.81898405	0.741162036
Discounted costs	¥1800000.00	¥3698792.00	¥3048127.73	¥3350675.11
Cumulative costs	¥1800000.00	¥5498792.00	¥8546920.00	¥11897595.00
Benefit				
Benefits	¥0.00	¥4610000.00	¥6053105.00	¥6159315.00
Discount factor	1	0.904977376	0.81898405	0.741162036
Discounted benefits	¥0.00	¥4171945.70	¥4957396.45	¥4565050.45
Cumulative benefits	¥0.00	¥4171946.00	¥9129342.00	¥13694393.00
Difference				
Benefits - Costs	-¥1800000.00	¥522834.74	¥2331264.84	¥1638474.83
Discounted benefits - Discounted costs	-¥1800000.00	¥473153.70	¥1909268.72	¥1214375.34
Cumulative benefits - Cumulative costs	-¥1800000.00	-¥1326846.00	¥582422.00	¥1796798.00
Discount rate: 10.50%				

4.2 NPV, IRR and Paybackyear

According to the result of break-even analysis, we can calculate NPV, IRR and Payback-year now and the result of calculation is shown as below:

Result	
NPV	¥1796798.00
IRR	73.62%
Payback Year	Year 2

Conclusion:

It can be shown from the table that the NPV is greater than 0, indicating that the project is worthwhile to be invest. Also, you can see that the cumulative net cash flow is <0 for the first year and >0 for the second year, so the payback year is in the second year. Finally, the calculated IRR is 73% which is very bigger than the discount rate of 10.5%, indicating that the project is profitable.

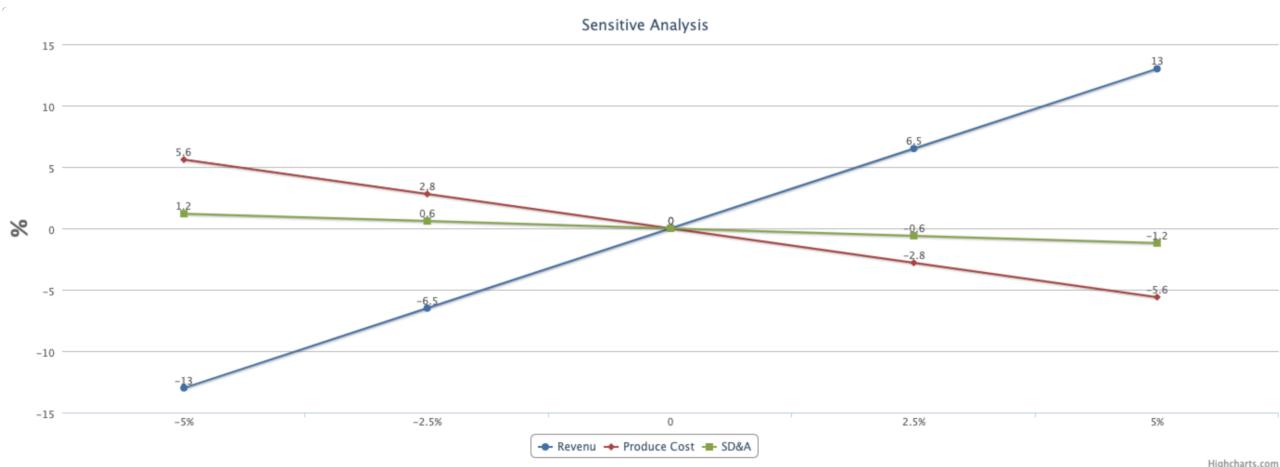
4.3 Sensitivity Analysis

Because we will reach the breakeven point at the second year, we selected it to do sensitivity analysis which is based on its cash inflow and outflow. From all these factors concerning about the cash flow, we chose two of them: the revenue(influenced by both prices and sale volumes) and the produce costs.

Then we got a table to illustrate the sensitivity of these factors shown as below:

Sensitive Analysis of Year 2

	Undiscounted Value	% change in UV	PW	% change in PW
Revenue	¥5750449.75	-5%	¥1661398.90	-12.9824609%
	¥5901777.38	-2.5%	¥1785333.81	-6.9412378%
	¥6053105.00	0%	¥1909269.00	0%
	¥6204432.63	2.5%	¥2033203.63	6.9412085%
	¥6355760.25	5%	¥2157138.54	12.9824317%
Produce Cost	¥2459287.80	-5%	¥2015274.90	5.5521723%
	¥2524005.90	-2.5%	¥1962271.81	2.7760788%
	¥2588724.00	0%	¥1909269.00	0%
	¥2653442.10	2.5%	¥1856265.63	-2.7761081%
	¥2718160.20	5%	¥1803262.54	-5.5522015%
SG&A	¥526110.00	-5%	¥1931946.39	1.18777524%
	¥539955.00	-2.5%	¥1920607.56	0.5938689%
	¥553800.00	0%	¥1909269.00	0%
	¥567645.00	2.5%	¥1897929.89	-0.5938981%
	¥581490.00	5%	¥1886591.05	-1.1877817%



As we can see, just as we expected, when the sales of products increase, the present value will also increase, and vice versa. But in contrast, when the costs increase, the present value will decrease.

Then we pay more attention to their sensitivities. We find that profitability can affect the present value to the greatest extent, and the impact of spending on the present value is smaller. Overall, our projects are generally less sensitive, showing a certain degree of stability while fluctuating costs and profits. In comparison, it is more sensitive to our earnings, which means that we should focus on our pricing plans and revenue to ensure that we understand market changes.

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